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About the special Issue

The purpose of this special issue is to build a community of authors and readers to discuss the latest research and develop new ideas and research directions. The articles in this issue are led by editors who are experts in the subject and oversee the editorial process for papers. The potentially advanced special issue focuses on application of principles and problem-solving techniques of information technology in healthcare and agricultural sector. This special issue is join collaboration between Sri Krishna Arts & Science College- Autonomous & International journal of Life Science & Pharma Research. This provides a platform for the researchers to publish their innovative research findings. It also includes papers on phytochemical screening of medicinal plants and also focuses on wireless sensor networks in health care applications. The papers in this special issue are broadly divided into the applications of Microbial biotechnology, Healthcare, Agriculture, Computer technology, Data science and Artificial Intelligence.

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SP-1

An Empowered Protein Mutation Stability Prediction Using Flying Squirrel Empowered Hesitation Theory-Based Inference Model

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Abstract: The ability to enhance the prediction of single mutation results in protein stability change precisely can assist the pharmaceutical drug designers to reveal the effects of serious disease. But conducting such prediction is very challenging because of the nature of uncertainty about the mutation change. But conducting experiments on mutagenesis of physical proteins is very expensive and time consuming and the data with the mutation effects are very limited. While handling the protein database for predicting the changes in its stability it is often uncertain to discover single point mutation presence. This paper overcome this problem by adapting hesitancy theory which defines the uncertainty in terms of indeterminacy by using intuitionistic fuzzy inference model. The mutation properties are transformed to intuitionistic representation where each attributeis defined in terms of membership grade and non-membership grade values and the hesitancy degree is also involved to handle the uncertainty. This work contributes to empower intuitionistic fuzzy inference by acquiring knowledge of nature inspired algorithm namely flying squirrel searching (FSSA-IFIM), it searches the optimal set of intuitionistic fuzzy rules to improve the detection rate of protein mutation stability more accurately. The performance analysis was done on Protherm dataset S1615 and results provide enough evidence of preeminence of proposed FSSA-IFIM while comparing with other existing protein mutation stability prediction models.

Keywords: Protein, Mutation, Energy Change, Hesitancy, Intuitionistic Fuzzy, Flying Squirrel Searching

INTRODUCTION

Proteins analysis is used in numerous fields like food, pharmaceutical, fuel and many other industries. Proteins have essential merits over chemical catalysts as they are obtained from renewable resources like biodegradable which are highly discriminating (Garman S.C, Garboczi D.N, 2002). Protein engineering enhances proteins properties like activity of catalytic, updating the specificity of thermostability (Kumar et al 2005). Specifically, Gibbs energy variation discovers the DG of the protein thermostatic stability (Peter et al 2017).Particularly in the personalized medicine the usage of computation method to classify the single nucleotides variants and discover those that cause diseases (Niu B et al 2016). A branch of artificial intelligence which involves in prediction is known as machine learning. These machine learning models are used to predict the mutation effects and to infer which residues are dangerous or life threating (Choi et al 2012This paper focuses on predicting the protein stability in presence of single point mutation more precisely even in presence of uncertainty by adapting hesitancy theory empowered with nature inspired metaheuristic model.

Related Work

Ramin Dehghanpoor et al (Ramin 2018) in their paper they compared and evaluated the usage of machine learning paradigms and their capability to forecast the effects of both double and single mutations. The produce mutant protein structure on silico and calculated different rigidity measures by applying random forest, support vector regression, deep neural network models. They announce a voting scheme to produce a single prediction from the individual predictions of those three classification models. Oscar Alvarez et al (Oscar 2020) constructed a robust model which predicts the energy changes of proteins upon on mutation changes. This scheme is grounded on two phase algorithm they used hold out random sampled trailed by artificial neural network for regression. Holdout random sampler is used to investigate the change of energy even in uncertainty and get a possible admissible energy changes which are represented as cumulative distribution. Yang et al (Yang 2019) presented a machine learning model which uses gradient boosted regression tree, by adapting the recent cellular stability method. It is based on constrained proteolysis and mass spectrometry. It produced high performance while using ProTstab method and it is well suitable for large volume protein data stability prediction. This model is used to predict the entire human proteome and computes the correlation of protein stabilities and the localizations of it. Carlos et al (Carlos 2018) in their work presented a web server implementation known as Dyna Mut, it is distinguished among other models, as it examines and visualize protein dynamics by applying sampling conformations and impact of mutations are assessed on protein dynamic and resultant stability form changes in vibrational entropy. The graph-based signatures improve the prediction accuracy of protein stability. Rostam et al (Rostam 2020) devised a protein stability prediction model by applying Gaussian distribution. They motivated this observed study by observing per residue position of protein stability belong to be gaussian. This derivation needs huge number of amino acids to perform this process more effectively. Francois Ancien et al (Francois 2018) devised a stability driven knowledge-based classification model which utilize the protein structure and adapts ANN and solvent accessibility-based combination to predict whether mutation is stabilizing or destabilizing so that it leads to disease occurrence.

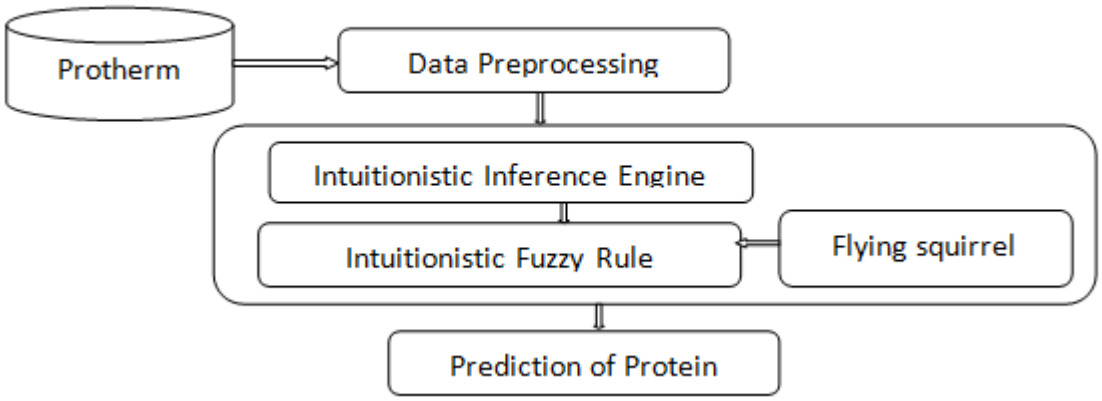


Figure 1: Overall architecture of protein stability prediction using intuitionistic fuzzy inference system empowered with flying squirrel search algorithm

The figure 1 depicts that the model uses the knowledge of intuitionistic fuzzy inference system which helps in predicting the stability of protein, changes in stability shows the possibility of other disease occurrence. Thus, it helps in determining the possibility of disease occurrence at the earlier stages, so that victim's life can be enhanced prominently. This intuitionistic fuzzy logic is used to overcome the problem of inconsistency in accurately determining the protein stability as positive or negative more accurately. This uses two different grades which are independent to each other they are degree of membership and degree of non-membership, which helps in finding the hesitation degree of each instances the process of protein stability prediction.

Preamble of Intuitionistic Fuzzy Logic

Intuitionistic fuzzy logic is a generalization of standard fuzzy logic which represents each instance in terms of three different degrees namely membership, non-membership and indeterminacy (Cheng 2006). The fuzzy logic fails to handle the indeterminacy often occurred in the real time datasets, especially in case of microbiology. So, this work adapts the knowledge of intuitionistic fuzzy representation which has the ability to define indeterminacy by using the hesitation degree. The intuitionistic fuzzy representation of instance in protein stability dataset is represented in a triple format such as $<\mu Att(R), \nu Att(R), \pi Att(R)>$Where R refers to the instance in a Protein stability dataset, Att refers to the attribute of the instance R and μ,ν and π signifies membership degree, non-membership degree and hesitation degree relevant to the stability of the protein. And the value of the hesitancy degree is obtained by $\pi_{Att}(R) = 1-\mu_{Att}(R) - \nu_{Att}(R)$ with the constraint $\mu_{Att}(R) + \nu_{Att}(R) < 1$ $\mu_{Att}(R) + \nu_{Att}(R) + \pi_{Att}(R) = 1$

Working principle of Flying Squirrel empowered Intuitionistic Fuzzy Inference based Protein Stability Prediction

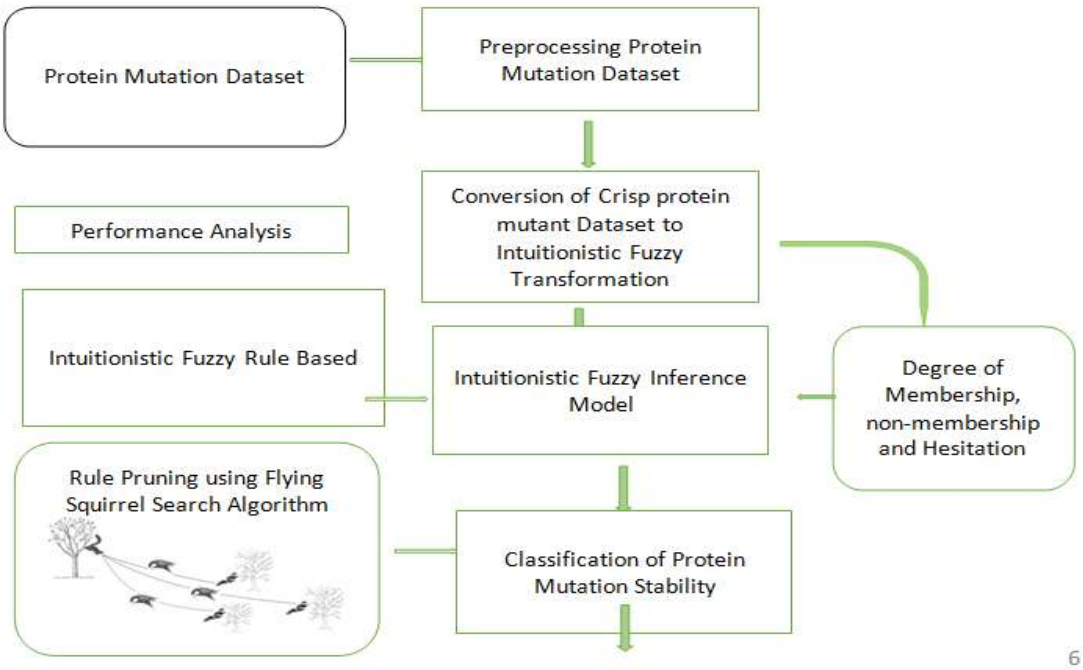


Figure II: Detailed structure of FSSA-IFIM

The figure2 depicts the overall workflow of the proposed model to predict the protein mutation stability using FSSA-IFIM. The dataset collected from Protherm dataset is S1615, which comprised of single point mutation which is collected from 42 various proteins (Cheng 2006). The mutation is defined with six different attributes namely Protein code, mutation, Solvent Accessibility (SA), pH value, temperature and energy change which is labelled as ΔΔG which has the label positive or negative. The collected raw mutation dataset is preprocessed by removal of duplicate entries in the dataset by adapting fuzzy K-means (FKM)based clustering which is done in our previous work (Juliet Rozario and Radha 2019). After that the range of data value is normalized to fall under same range using Z-Score Normalization. Then the crisp input of mutation dataset is fed inside the intuitionistic fuzzy inference model, which converts the crisp value of dataset to intuitionistic representation, then by inferring knowledge from the rule base the rule is generated to classify and predict the stability of the energy. The generated intuitionistic fuzzy Rules are validated using Flying Squirrel Searching Algorithm. The behavior of squirrel in search of location is used for finding the optimized rules in-order to enhance the prediction accuracy in protein mutation stability. Dataset Description The dataset used for predicting the protein mutant stability is collected from Protherm, single site mutation known as s1615 which is constructed from 42 various proteins (Cheng 2006). The mutation comprised of six different attributes namely code of PDB, mutation, accessibility solvent, value of pH, temperature and relative stability of energy change. To make all the attributes value lie in the same range in this work Z-score normalization is applied. This dataset consists of many redundant instances to handle that this paper adopted our previous work (Juliet Rozario and Radha 2019) which focusses on deduplication achieved by constructing fuzzy K-means (FKM) based clustering.By normalizing data, it eliminates the outlier problem in s1615 protein mutant dataset. It is formulated as follows ZWhere mean value of the attribute is denoted by μ, standard deviation of an attribute is signified as σ.Once the protein mutation dataset is normalized using Z-score, then it is fed into the intuitionistic fuzzy inference model, where the further processing of prediction continues.

Construction of Intuitionistic Fuzzy Inference Model for prediction protein mutation stability

Before passing the dataset into inference model, the crisp attribute values are converted to intuitionistic representation where each attribute value of an instance is denoted in the form of $\mu_{Att}(Z)$ and $\vartheta_{Att}(Z)$

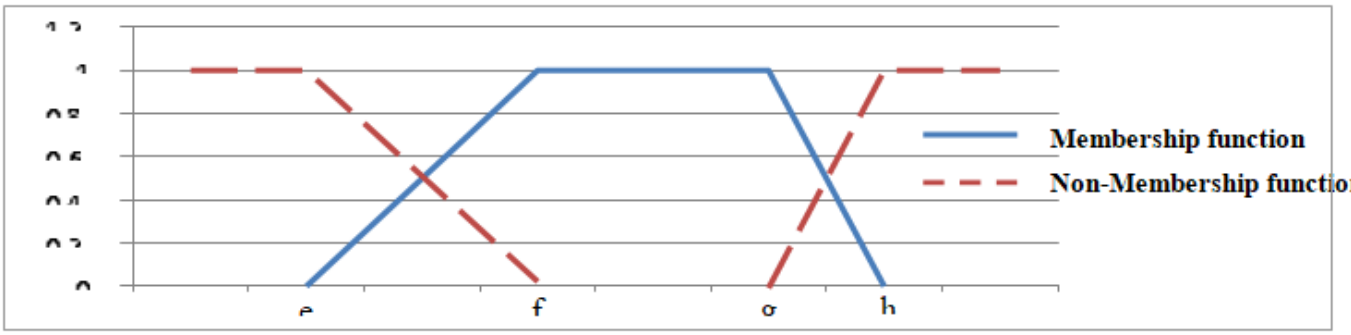


Figure III: Trapezoidal representation of Membership and Non-membership values

The Intuitionistic fuzzy values are defined using its trapezoidal function as depicted in the figure III, which represent the attribute values in form of intuitionistic fuzzy value (Attanasova 1999) four different parameters are involved they are lower limit e, an upper limit g, a lower support limit f and a support limit h, where e ≤ f ≤ g ≤ h (Kavitha et al 2011) . From the figure it can be observed that e and h is located at feet of the trapezium and f and g are at the shoulder point of inverted trapezoid Formula for representing the instance of protein dataset Z's attribute Att's membership value $\mu_{Att}(Z)$ is denoted as follow

$$s: \mu_{Att}(Z) = \begin{Bmatrix} 0 & ; & z \le e \\ \left(\frac{z-e}{f-e}\right) - \in & ; & e < z < f \\ 1 - \in & ; & f \le z \le g \\ \left(\frac{h-z}{h-g}\right) - \in & ; & g < z < h \\ 0 & ; & z \ge h \end{Bmatrix}$$

Formula for representing the instance of protein dataset Z's attribute Att's non-membership value $\square_{Att}(Z)$is denoted as follows

$$\vartheta_{Att}(Z) = \begin{cases} 1-\epsilon & ; \quad z \le e \\ 1-\left(\frac{z-e}{f-e}\right)-\epsilon & ; \quad e < z < f \\ 0 & ; \quad f \le z \le g \\ 1-\left(\frac{h-z}{h-g}\right)-\epsilon & ; \quad g < z < h \\ 1-\epsilon & ; \quad z \ge h \end{cases}$$

After Intuitionistic Fuzzification of protein dataset, they passed into the intuitionistic fuzzy inference system where with the help of intuitionistic fuzzy rule base it starts generation the intuitionistic fuzzy rule to classify an input has the energy change positive or negative.

Generation of Intuitionistic Fuzzy Inference Rules for protein stability prediction

This model is the original brain where the entire logic of this proposed model resides. The reasoning of why the mutant is having positive or negative energy is done by applying if -then type intuitionistic fuzzy rule. The inference engine fires the appropriate IF-Then rule resided in rule base using Mamdani-Larsen inference scheme. Sample Rules

Rule 1: If MT is low and SA is low and pH is low and temperature is low then EC is positive
Rule 2: If MT is low and SA is low and pH is low and temperature is medium then EC is positive
Rule 3: If MT is low and SA is low and pH is low and temperature is high then EC is negative
Rule 4: If MT is low and SA is low and pH is low and temperature is low then EC is positive
Rule 5: If MT is low and SA is low and pH is medium and temperature is low then EC is positive
Rule 6: If MT is low and SA is low and pH is high and temperature is low then EC is negative
Rule 7: If MT is medium and SA is low and pH is medium and temperature is medium then EC is indeterministic
Rule 8: If MT is medium and SA is medium and pH is medium and temperature is medium then EC is indeterministic
Rule 9: If MT is high and SA is high and pH is high and temperature is high then EC is negative

These are the possible sample rules generated by intuitionistic fuzzy inference engine and it may generate nearly 81 rules for predicting the stability of proteins. These generated rules may have redundancy and irrelevancy and highly impacts the performance of the prediction process, to overcome this problem, this research work introduced a nature inspired metaheuristic model known as flying squirrel search optimization algorithm, which involves in selection of significant rules generated by the intuitionistic fuzzy inference and it performs the process of rule pruning and its detailed process is explained in the following subsection.

Flying Squirrel Search Algorithm

In this section, to prune the rules generated by the intuitionistic fuzzy inference engine flying squirrel search algorithm is adapted which is constructed based on the inspiration of nocturnal rodent and arboreal behaviour of squirrel. Its membrane assists the squirrel to glide from one tree to another by changing its lift and resistance ([Jain 2019]). The main concern for evaluating its gliding behaviour which is used during optimal foraging, escaping from predators and cost of foraging (Vernes 2001). The squirrel search algorithm unavoidably falls to local optima and results in converges during the process of optimization. The diffusion behavior and spatial variations are integrated in this approach to overcome the earlier convergence.

Procedure for Rule Pruning using Squirrel Search Algorithm for Improving the Protein Stability Prediction

Begin
Input: Intuitionistic fuzzy Rules generated by Intuitionistic Fuzzy Inference Engine
Initialize the population, iterations,
Steps

1. Assign random location for m flying squirrels using the following equations Yi= [yi1,yi2, … ,yiv] , I = 1,2,3,..m
2. Compute fitness value of each flying squirrel's location
3. Relocate the squirrel's by applying spatial variation and diffusion as formulated

Formula for finding spatial variation to choose a tree to ensure optimal food is expressed as follows
Ni is a random position produced by spatial diffusion which adapts normalized distribution and present location of the ith squirrel is equated as shown $N_i = \frac{(fit-fit_{min})^n}{(fit_{max}-fit_{min})^n}(sv_{max} - sv_{min}) + sv_{min}$
where fit represents fitness function, fit_{min} and fit_{max} refers to minimum and maximum fitness value.

$$Y_i^{(new)} = [Y_i^{(1)}, Y_i^{(2)}, \ldots, Y_i^{(N_i)}]$$

Where each element of $y_{ij}^{(k)}$ of $Y_i^{(k)}$ is defined as $y_{ij}^{(k)} = y_{ij+\square_t^{(2)}.\ N(0,1),j=1,2,..,v,k=1,2,..,N_i}$

$$\sigma_t = \frac{(t_{max}-t)^n}{(t_{max})^n}(\sigma_{ini} - \sigma_{fin}) + \sigma_{final}$$

Where σ_{ini} and σ_{fin} denotes the initial and final standard deviation which is used for computing the spatial diffusion, t refers to the current iteration and t_{max} refers to maximum iteration and n signifies the nonlinear harmonic index

4. Flying squirrel's location is sorted based on the ascending order relevant to their fitness value
5. Declare the flying squirrels on hickory nut tree, acorn nuts trees and normal trees.
6. Arbitrarilychoosefew flying squirrels which are on normal trees to move towards hickory nut tree and the remaining will move towards acorn nuts trees.

While (stopping criteria is not met)

For t = 1 to n1

If R1≥ Pv

$$Y_{at}^{(t+1)} = Y_{at}^{(t)} + v_g.G_c.(Y_{ht}^{(t)} - Y_{at}^{(t)})$$

Else

$$Y_{at}^{(t+1)} = \text{Random Location}$$

End

For t= 1 to n2 If R2 ≥ Pv

$$Y_{nt}^{(t+1)} = Y_{nt}^{(t)} + v_g.G_c.(Y_{at}^{(t)} - Y_{nt}^{(t)})$$

Else$Y_{nt}^{(t+1)}$ = Random Location

End End

For t= 1 to n3

If R3 ≥ Pv

$$Y_{nt}^{(t+1)} = Y_{nt}^{(t)} + v_g.G_c.(Y_{ht}^{(t)} - Y_{nt}^{(t)})$$

Else $Y_{nt}^{(t+1)}$ = Random Location

End End

Compute seasonal constant SCc using the equation shown below

$$SC_c^{(t)}\sqrt{\sum_{j=1}^{d}\left(X_{at,j}^{(t)} - X_{ht}^{(t)}\right)^2},$$

If ($SC_c^{(t)} < SC_{min}$)

Arbitrarily relocate flying squirrels using the equation

$$Y_{nt}^{new} = y_{min} + levy(n).(y_{max} - y_{min}),$$

End

Update the seasonal constant minimum value SCminby formulating

$$SC_{min} = \frac{10E-6}{(365)^{t/(t_{m/2.5})}},$$

Relocation by spatial and diffusion using $y_{ij}^{(k)} = y_{ij+\sigma_t^{(2)}.\ N(0,1),j=1,2,..,v,k=1,2,..,N_i}$

End The location of squirrel on hickory nut tree is the final optimal solution

Output

Significant and Relevant Intuitionistic Fuzzy Rules are selected As the intuitionistic fuzzy inference engine with its rule based and combination of attributes low, medium and high it generates the intuitionistic fuzzy rule. The resultant rules may lead to overfitting or redundancy and irrelevant rules may affect the performance of the prediction process. In order to overcome this problem, the flying squirrel searching algorithm behavior for searching its optimal food source is adapted to determine the optimized intuitionistic fuzzy rules for performing prediction process instead of allowing all the rules to be involved. Initially certain population of the squirrel is assigned to the intuitionistic fuzzy rules Flying squirrel searches the optimal set of rules in a random manner using Spatial Variation and Diffusion. The fitness value of each squirrel's assigned rule is sorted based on ascending order, the rule which fires maximum number of times is considered to be more optimal like hickory tree as it has the smallest fitness value, the next best rules which often fires is considered to become optimized rules and the remaining rules which are not even fired are least number of times fired are considered as normal rules and have the large fitness value. These fitness values are sorted in an ascending order. Then the squirrels moved to the next rules to evaluate its fitness value. Their positions are updated by applying three different cases, when they are selecting normal rules how they move to next best rule, if they are holding possible best candidate rules then how to search for optimized rules are done using their foraging behaviour. The seasonal monitoring is used to ovoid selecting local best rules, and enhance the global rule selection so that it avoids the earlier convergence. The iteration of this searching for optimized rules is continues until it reaches maximum iteration and the convergence normalization is reached. The selected significant rules alone

involved in prediction of protein mutation stability more precisely, even in presence of impreciseness and indeterminacy in applying the intuitionistic fuzzy rule.

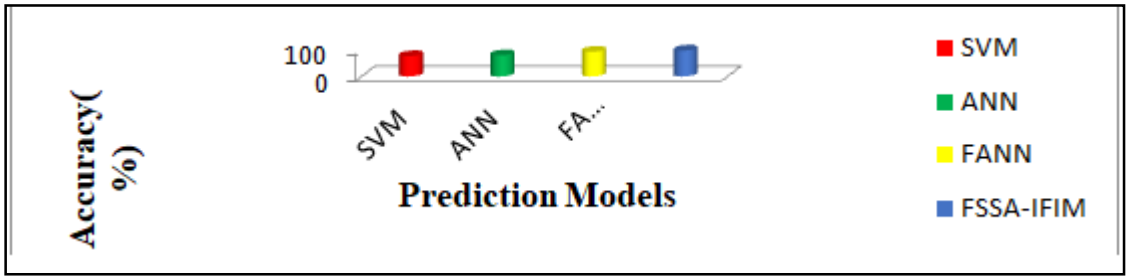
RESULTS AND DISCUSSIONS

This section discusses about the performance analysis of the newly constructed model termed as Flying Squirrel Searching algorithm empowered Intuitionistic fuzzy Inference model (FSSA-IFIM) for predicting the protein mutation stability. The dataset S1615 (Cheng2006) used in this work is collected from Protherm Database which has single point mutation and the mutation is framed by collecting information of from 42 various proteins with 1615 mutation and consist of six attributes namely code of PDB, mutation, accessibility solvent, value of pH, temperature and relative stability of energy change. The proposed model FSSA-IFIM for protein mutation stability prediction is deployed in MATALAB software. Its performance is compared with other prediction models namely SVM, ANN and FANN. The Evaluation metrics used for determining the performance of each models are evaluated using Precision, Recall and Accuracy.

Performance Evaluation based on Accuracy

The evaluation metric accuracy is a measure used to determine the total number of correctly predicted mutation as stabilized or destabilized divided by the total number of predictions done by the model over the protein dataset.

$$\textbf{Accuracy} = \frac{\text{No.of. Mutations predicted as positive + No.of.Mutations predicted as Negative}}{\text{Total number of Mutations predicted}}$$



IV: Performance Comparison Based on Accuracy

The figure iv explores accuracy obtained by four different prediction models which predicts protein mutant stability. While examining stability of protein it is often difficult to predict energy change in presence of impreciseness. The intuitionistic fuzzy inference model with the knowledge of representing hesitation degree overcomes this problem by representing each mutation in terms of membership, hesitation and non-membership. The proposed IFIS produce highest rate of accuracy while comparing with other classification models. The SVM has the ability to handle only small size data, ANN even it has the ability to handle large size data but it fails to handle uncertainty. The fuzzy logic focusses only on membership grade so determining indeterminacy is the toughest challenge so that FSSA-IFIM performs better.

Performance Evaluation based on Precision and Recall

Precision is used to determine quantification of the prediction models involved in protein mutation stability by computing the number of positive mutation predictions that actually belong to the positive mutation.

$$\text{Precision} = \frac{\text{No.of. Mutations correctly predicted as positive}}{\text{Total number of actual Mutations positive}}$$

The precision rate produced by four different prediction models are portraited in the figure vi. The highest rate of true positive that is when the relative stability change is positive, the mutation increases the stability is correctly identified by intuitionistic fuzzy inference system compared to SVM, ANN and FANN. As the IFIS is a robust and most promising predator because it is not highly influenced by outliers. SVM and ANN may suffer from overfitting problem when the pattern of mutation includes uncertainties. The fuzzy inference model using its knowledge based the non-membership portion is highly depended on its membership values during the prediction of energy changes in mutation.

$$\textbf{Recall} = \frac{\text{No.of. Mutations correctly predicted as positive}}{\text{No of mutations correctly predicted positive+No.ofmutations incorrectly predicted as negative}}$$

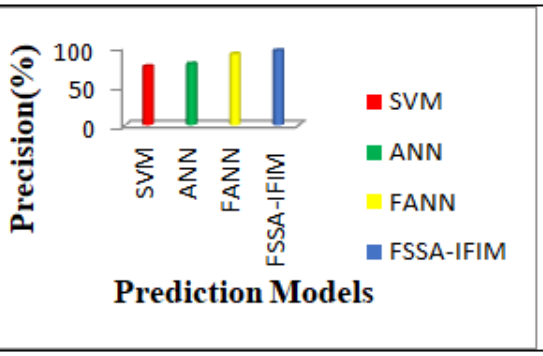


Figure V: Performance Comparison Based onPrecision

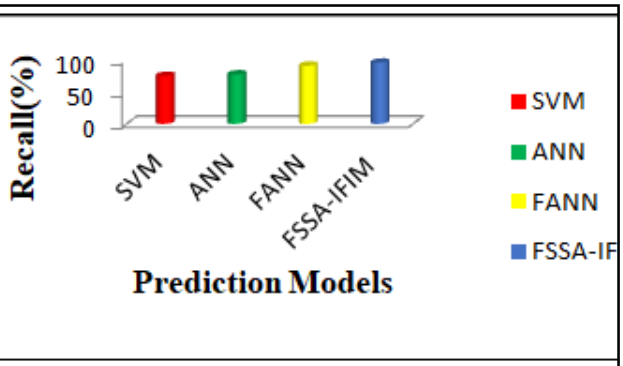


Figure VI: Performance Comparison Based on Recall

Recall is a measure which is mainly used in imbalance prediction problem with two classes, it finds the ratio of number of correctly predicted positive mutations to the total number of mutations predicted as correctly positive and mutations that are actually positive but predicted as negative mutations. The relevancy of the proposed model IFIS generate highest recall rate in prediction of protein mutation stability while comparing the other three classification models. The proposed model analysis the energy change relevant to the uncertainty and the feature subset selection model obtains the potential attributes which involved in determining the changes in reliability stability change of energy when the mutation is identified in a point. Rule pruning done by flying squirrel searching algorithm greatly avoids the irrelevant rules to obtain the highest recall rate by FSSA-IFIM.

CONCLUSION

This paper focused on predicting the energy change due to single point mutation presented on the protein's stability. In specific, the model developed in this work involves in prediction of change of energy upon mutation in the condition of uncertainty. The model FSSA-IFIM is trained and tested with extensive dataset collected from ProTherm database which holds the single site mutation in amino acid. This inference model uses the structural features of mutation such as solvent accessibility, pH, temperature and relative stability of energy change. After representing each mutation in the form of intuitionistic fuzzy valued mutation, hesitation in predicting is resolved more prominently. The size of the rules generated by intuitionistic fuzzy inference engine is scrutinized by the behaviour of flying squirrel searching algorithm, which discovers the fittest intuitionistic fuzzy rules and making them alone to be involved in the process of predicting protein mutation stability overcomes the problem of uncertainty and the simulation results proved its performance by improves the accuracy of detection rate in an optimized manner.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-2

Extraction of Bioactive Compounds From Sea Weed And Its Antibacterial Activity Against Fish Pathogen

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Abstract: Major loss in aquaculture is due to pathogenic bacteria. Antibiotics have been banned for use in aquaculture to treat the infection due to antibiotic resistance. The aim of the present work is to isolate the active compound from sea weed to treat the bacterial infection in fish (*Oreochromis mosambicus*).Pathogenecity of *Pseudomonas aeruginosa* was studied by intramuscular injection. *Gracilaria foliifera* was collected from Rameshwaram, Mandapam. The sea weed was shade dried and grounded in to powder. 100 gms of the powdered extract was added to 100 ml of ethanol and distilled water separately and kept in shaker for 24 hrs. The extract was then filtered and used for further study. Antioxidant activity of the sea weeds was studied. Invitro and invivo antibacterial activity of the extract against *Pseudomonas aeruginosa* was tested. Ethanol extract showed potent antibacterial activity and also inhibited the growth of *the* pathogen. The bioactive compound was purified using silica gel coloum. The compound was identified by GC-MS. The compound isolated were encapsulated and given as feed.

INTRODUCTION

Many bacterial pathogens in the aquatic environment can cause infections disease and as a result cause considerable economic loss in the Aquatic ecosystem. Bacterial pathogens namely *Aeromonas, Pseudomonas,* Vibrio causes huge loss in the aquatic ecosystem. Various heavy metal pollutants and natural toxins accumulates in their body as a result of the toxic substances present in the ecosystem. This increases pollution in aquatic environments which causes food borne diseases to the consumers through the fishes (Venugopal, 2002). In order to overcome these problems plant extracts have been used for treating the bacterial infection in the aquatic ecosystems. Antibiotics have been banned for use for treating this bacterial infection. The current trend of using degradable natural derivatives of biochemical origin is an eco-friendly approach in aquaculture for the control of infection (Stalin et al., 2008). Marine sea weeds are rich source of antioxidants such as flavanoids, polyphenols alkaloids etc. All are reported to have antibacterial activity against various Grma positive and gram negative organisims and can be used as an alternative source for treating bacterial infection.

MATERIAL AND METHODS

Collection Of Sea Weeds

Gracilaria foliifera was collected from Rameshwaram, Mandabam, India and they were identified in Central Salt and Maraine Chemical Research Institute(CSMCRI). They were throughly washed with water to remove impurities present. They were then dried under shade. Dried sea weeds were then powdered and they were stored in polythene bags.

Collection And Maintenance Of Experimental Animals

Healthy fingerlings of *Oreochromis mosambicus* were collected from the nearby farm and they were transported to the laboratory with a battery powered aerator under live condition. They were maintained in the laboratory in fresh water.

Preparation Of Extracts

The method of Thanigaivel et al., 2015 was followed. The extraction was done by maceration method using ethanol and water. The extracts were kept in a shaker for continuous agitation for 24 h and then filtered using filter paper and centrifuged to separate the fibrous matter from the supernatant. The crude extracts of ethanol and aqueous were stored at 4 °C.

Antioxidant And Free Radical Scavenging Assay.

Total Polyphenol Assay

The concentration of phenolic compounds were measured by folin-ciocalteu method.10 microliter of the different extracts (Aqueous and ethanol) separately were mixed with 20 µl of folin's reagent and 50µl of sodium carbonate. They were then made upto 1ml with water. It was then incubated in dark for 1 hour. Absorbance was measured at 725nm. Gallic acid was used as standard and the phenolic components were expressed as gallic acid eqivalents in mg/g.

Determination Of Total Flavanoid Content

The method of Thanigaivel et al., 2014 was followed. Total flavonoid content was determined by colorimetric method described by Liu et al. (2009). To the dried extract (500 µg), 50 µl of potassium acetate, 25 µl of aluminum chloride, 700 µl of water and 325 µl of ethanolwere added. After 30 min of incubation in dark, the absorbance was measured at 415nm. For standard quercetin was used and the results were expressed as mg of quercetin equivalent per gram of dry weight.

Determination Of Antioxidant Activity

The total antioxidant was determined by phosphomolybdenum assay. 10µl of each extracts (Aqeous and ethanol) were mixed with 1ml of reagent solution (10ml of sodium phosphate(Na_2PO_4)+10 ml of ammonium molybdate+10 ml of sulphuric acid) and incubated in boiling water bath for one and half hours. Absorbance was measured at at 675nm. Ascorbic acid was used as standard. Total antioxidant activity was expressed as number of equivalents of ascorbic acid in mg/g of extract.

Determination Of Reducing Power

Reducing power of the sample was determined by adding 10 µl of the extract to 515 µl of phosphate buffer, 500 µl of pottacium ferrocyanide were added and they were incubated at 50°C for 20 min. After incubation 500 µl of TCA was added to the mixture and centrifuged at 6000rpm for 10 min. Supernatant was then taken and mixed with 500 µl of water and 100 µl of ferric chloride and incubated for 10 min and absorbance was measured at 700nm with a spectrometer.

Determination Of Metal Chelating

The chelating ability of the seaweed was estimated by the method of Decker and Andwelch (1990) with minor modifications. This assay is based upon blue colored ferrous ion–ferrozine complex that has absorbance at 562 nm. Briefly, 100 µl of different concentrations of sample and standard were mixed with 100 µl of distilled water and 25 µl of ferrous chloride($FeCl_3$) (0.5 mM) in a microtiter plate. Then 25 µl of ferrozine (2.5 mM) was added. The reaction mixture was shaken vigorously. The absorbance was recorded at 562 nm with a microtiter plate reader, after 10 min of incubation at ambient temperature. For standard compound Ethylenediamine tetra acetic acid (EDTA) was used. The percentage of inhibition of ferrozine–Fe2 + complex formation was calculated according to the standard formula.

$$\% \text{ of scavenging} = A_0\text{-}A/A_0 \times 100$$

A_0=absorbance of the control without sample
A=absorbance of the sample

Determination Of Hydrogen Peroxide (H_2o_2) Scavenging Activity

The capacity of the sea weed to scavenge the hydrogen peroxide was determined by mixing 68 µl of sample and 2799 µl of phosphate buffer salaine. 600 µl of hydrogen peroxide was then added. Absorbance was taken at 230nm using a spectrometer. Quercetin used as standard. The percentage of hydrogen peroxide scavenging was calculated by the formula.

Determination Of Hydroxyl Radical Assay

The scavenging activity of extract was tested by two different solvents. 500 µl of ferric sulphate, 0.35 microliter of Hydrogen peroxide, 150 µl of sodium salicylate was added. Finally 2 µl of ethonal extract and aqueous extract was deed separately. Absorbance was measured at 562 nm by using spectrometer. The percentage of scavenging was calculated by using the formula,

$$\% \text{ of scavenging} = 1(A_1 - A_2)/A_0 \times 100$$

A_1 = Absorbance of sample with ethonal
A_2 = Absorbance of sample with water

Determination Of Free Radical Scavenging Activity By DPPH Method

The scavenging activity of extract was evaluated according to the alternative method of Bandoniene et al. (2002) using the constant DPPH radical. DPPH was measured at 517 nm, but upon reduction by antioxidant or a radical species its absorption decreases. Briefly, the ethanol and aqueous solution 100 µl (1mg) of sample extract was added to 500 µl of (0.2mM) DPPH• solution. The absorbance at

517 nm for 15 min. lower the absorbance the mixture indicated higher radical-scavenging activity. Blank solution was prepared each test sample mixed with distilled water, and the negative control was DPPH solution with ethanol. Ascorbic acid, BHA and also trolox were used as positive controls. The radical scavenging ability was calculated as a percentage DPPH• discoloration using the equation:

DPPH scavenge = Absorbance of control (reference) - absorbance of sample/ absorbance of control (reference) x 100

Determination Of Invitro Antimicrobial Activity

To determine the invitro antimicrobial activity the agar well Diffusion method was followed. Thomas et al, (2014) P*seudomonous aeruginosa* was used to study the antibacterial activity against sea weed. The agar plates were prepared by using Muller Hinton agar and poured aseptically. Then the sterile cotton swab was used to spread the pathogen and the excess sample was removed by sequencing on the sides of the tube. The plate was left for 10min to dry. Seven wells of 8mm diameter were cut. The separated compound was added and to each of the wells. Ethanol was used as a control for the ethanol extract and miliq was added for the aqueous extract. Then the plates were incubated at 37 °C for 24 - 36 hrs .The zone of inhibition was measured.

GC-MS METHODOLOGY

GC–MS Analysis was performed to ascertain the presence of. The sample (2.0 µl of sea weed extract) was taken and injected into the GC–MS manually for total ion chromato-125 graphic analysis in split mode. The selected ion monitoring mode was employed in quantitative analysis in GC–MS (Thanigaivel et al., 2014, 2015a, b).

Pathogenicity by Intramuscular Injection.

The method of Thannigaivel et al., 2014 was followed. The experiments were conducted in triplicates. 25µl of the bacterial sample was injected intramuscularly into each fishes at a diltution 10^{-3} to 10^{-7} and were maintained in fibre glass tanks(100l) containing fresh water at 28 ◦ C. Control fish received only sterile PBS buffer.

Separation of Compounds by Column Chromatography

The ethanol extract of the seaweed sample of G. follifera was adsorbed to silica gel by triturating and kept for 10 hours to dry. The wet slurry method was used to column packing (2 cm x 25 cm) with a solution of silica gel. For preparing a solution of silica gel, n-butanol was subsequently adding this is about three-fourths filled. Before the gel settles, the solution was stirred and quickly added to the column for avoid the air bubbles trapping. A ball of wool was pushed to the column for settle atop the packed gel. A substantial amount of n-butanol: acetic acid: water (4:1:1) was added continuously into the column and allowed to drain. The collected quantity was poured back into the column, also a rubber piece tubing was used to agitate the column and helps to release the trapped air bubbles. About 10 fractions are eluted and collected in dry bottles. The antibacterial activity were again tested for column fractions (Tomer et al.,)

Treatment using the Extract

In vivo antibacterial activity of seaweed extracts against *P. aeruginosa* infection was studied. Four groups of fish were used. Fingerlings of tilapia were arbitrarily divided into four groups. Group I contained the untreated controls. Group 2 consisted of *P. aeruginosa* bacterial culture as a negative control. Group 3 of pathogen infected fish challenged with ethanol and aqueous extracts of the sea weeds. The experiment was monitored for one month and the percentage of survival was calculated

Preparation of Encapsulated Beads

Sodium Casinate solution (4%, w/v) in distilled water(H_2O) was prepared in a heating mantle. After cooling, plant extracts of*G.folliferae*xtract was added at different concentrations and thoroughly mixed by a magnetic stirrer. The solution of polymer containing plant extracts was added drop wise into glycerol like a cross linking agent and 0.1% (w/v) of 2 N HCl as a catalyst, using a 25 ml hypodermic syringe (1.0 mm diameter) with constant stirring. The bead formation in methanol was kept for overnight. The beads were washed with water and left for dried. The entrapment of efficiency was calculated as the ratio between the initial mass be encapsulated.

RESULTS AND DISCUSSION

Total Poly Phenol Content

Sea weeds are a rich source of antioxidants. Our results revealed that the phenolic content was found to be higher in the ethanolic extracts as compared to the aqueous extracts. The amount of phenolic content there in the extract of G. foliifera was found to be 5.26mg/g, 4.75 mg GAE/g respectively. This was matching with the extract as reported by Vijayabaskar , Shiyamala (2012).

Total Flavonoid Content Assay

Total flavonoid content of dried seaweeds extract is showed. Flavonoids are the most important natural phenolics due to their chemical and biological activities, also antioxidant and free radical scavenging properties. G. folifera, which contained significantly higher totalflavonoid content (2.96 mg QE/g in ethanol) and (0.47 mg QE/g in aqeous extract). In this method the ethanol extract's flavonoid content was found higher when compared to other solvents. in. Cox et al. (2010) reported that the brown species, Himanthalia elongata contained significantly higher total flavonoid content while red seaweeds *Palmaria palmata* and Chondrus crispus have the lowest at 6.83 and 7.41 mg QE/g extract, in that order (P b 0.05). To act as antioxidant the capacity of flavonoids depends ahead their molecular structure.

Total Antioxidant Activity Assay

The total antioxidant assay was performed based on the phosphomolybdenum method. The total antioxidant of the sample was found to be 25mg/g in ethanol, 12.5mg/g in aqueous. Phenolic compounds are responsible for the reduction of antioxidant activity (Velioglu et al., 1998).

Reducing Power

The reducing capacity of an extract may serve as indicator of its potential antioxidant activity. The reducing power of G. folifera showed higher reducing ability (50.4 mg GAE/g and aqeous 43mg/g) when compared with both extracts. Reducing power increased with increasing concentration in all the samples. Thanigaivel et al. (2014) reported that the total ethanolic extract of Cheatomorpha antennina showed highest reducing power.

Determination of Hydrogen Peroxide Scavenging Activity

In vivo formation of Hydrogen peroxidewhich is due to the action of many oxidizing enzymes such as superoxide dismutase can cross cell membranes and may slowly oxidize a number of compounds (Nagavani et al., 2010). Our results revealed that the hydrogen peroxide scavenging was found to be 95.7% was found to be in ethanol extracts and aqueous was 61.1%.

Hydroxyl Radical Scavenging Activity

The hydroxyl radical scavenging activity is the most efficient method to scavenge the reactive oxygen species since it induces damages in adjacent biomolecules (Gutteridge, 1984). The hydroxyl radical- scavenging effects of the pepino extract, at concentrations of 0.2 mg/ml and 0.5 mg/ml were found to be 59.76% and 13.65% in ethanol and aqeous respectively at a concentration of 1.0 mg/ml (Gutteridge, 1984). These results were corroborated with our present study.

DPPH Assay

DPPH has been used extensively as a stable free radical to evaluate reducing substances and is a useful reagent for investigating free radical scavenging activity of the components (Bhaigyabati et al., 2011). In the differential extraction method, the free radical scavenging activity of the sea weeds was 25.21% and 23.42% in ethanol and aqueous respectively.

Hydroxyl Radical Scavenging Activity

This was investigated using Fenton reaction and results are showed as ethanol 59.76% and aqeous was found to be 13.65% in this study. When the radical scavenging activity of two sea weeds were compared it was found that the extract of G. folifera exhibited the highest inhibition. Hydroxyl radical which is the potent reactive oxygen species in biological system, causes cell damage by reacting with polyunsaturated fatty acid moieties (Alam et al., 2013). T he hydroxyl radical- scavenging effect of the seaweed extract of C. antennina was 62.14% for 10 mg/ml and 88.23% for 50 mg/ml concentration of the extract (Gutteridge, 1984; Thanigaivel et al., 2014).

Metal Chelating Ability

Metal chelating activity was studied by the reduction of Ferrozine iron, which forms a complex with a red color by forming chelates with Fe2+. A comparison of the extraction process showed metal chelating ability was greater in ethanolic extraction of G. folifera 39.97 mg /g than in aqeous 14.07mg/g was obtained. Chelating activity of extracts was initiated by the phenolic compounds. Thanigaivel et al. (2014) reported that chelation activity of C. antennina was found to be very efficient in the tests conducted with different sample concentrations. The chelating activity increased because of the reduction of the ferrous ion. Soler-Rivas et al. (2000) reported that the ethanol extract exhibited higher chelating effect. These results agree with the results of the present study.

In Vitro Antibacterial Activity

Compounds identified from ethanol and aqueous extract of the seaweeds were tested against *P.aeruginosa*. In vitro antibacterial activity was performed to demonstrate the potent activity of biomolecules extracted from the two seaweeds and their ability to inhibit the pathogenic organism. The activity of the fractions were found to be effective.

In Vivo Pathogenicity by Intramuscular Injection Study

Clinical symptoms such as exophthalmia, reddishness on the body, septicemia were observed in the present study. 85 % mortality was observed . Our results corroborate with that of Nash et al. (1992) and Alapide-Tendencia and Dureza (1997)
Who observed the same symptoms when injected intramuscularly. The percentage of mortality which occurred reached 100% at the 96th hour of post infection. Pseudomonas septicemia is one of the most pathogenic bacteria affecting fishes specially O. niloticus in fish farms in Egypt.

GC-MS Analysis

The phytocomponents identified in the ethanolic extracts of the sea weeds show they have highly active components which are responsible for the a variety of properties like antibacterial, antimicrobial and antiviral recognized to them according to the Dukes database. The general bioactive compounds extracted from the ethanol extract are revealed in the chromatogram. The compounds Benzonitrile, Cyanomethyl Benzenesulfonate, N-Hexadecanoic acid, Oleic acid etc., along with some other active compounds which were also identified. These active compounds were further helps to study in vitro and in vivo activity.

Treatment Using The Sea Weeds

The method of (Thanigaivel et al 2014; Thomas et al 2013b) was followed. The fishes were experimentally infected by the bacterium using intramuscular injection.. The extract 20µl was injected intramuscularly for treating the pathogen. 80 %b of survival was observed in the treated fishes.

CONCLUSION

The different method of solvent extraction clearly reveals the presence of phytocomponents and antioxidant molecules which are responsible for the various biological activities including antiinflammatory, antimicrobial, antibacterial, anti-cancer, and antidiabetic. The compounds identified and extracted from these sew weeds can used as natural remedy for treatment of bacterial infections in fish farms since it is a cost effective and eco-friendly approach. The active components identified by GC–MS are reported to have antibacterial activity and antimicrobial properties. Therefore, further studies are proposed to prepare fish feeds containing bioactive natural products with antioxidant capacities from these seaweeds for their value in aquaculture.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-3

Enhanced Deep Recurrent Neural Network With Sparrow Search Algorithm Based Optimized Protein Stability Prediction

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Abstract: In recent years, prediction of protein stability becomes very important in the medical field to advance the genetic based disease detection and discovery of drugs. There are many machine learning methods are presented to forecast the single mutations effects on protein stability. But machine learning models suffers from the problem of overfitting because they work in a biased manner related to the features of the datasets. The standard deep learning models can overcome this problem by its deep structure but the parameters involved in prediction process are assigned in a random manner. Thus, this paper focuses on more effective prediction of protein stability because of single mutation by devising an enhanced deep recurrent neural network which extracts the significant features by Long Short-Term Memory (LSTM) layers. The parameters involved in hidden layers such as weight and bias which influence the activation of hidden units are assigned with optimized values. This work induced sparrow search algorithm to assign the optimal weight values of Deep Recurrent Neural Network (DRNN) and thus it produces more accurate result compared to other multilayer networks and standard deep neural networks as shown in the simulation results. The sparrow search algorithm with its food searching behavior chooses the best values for the parameters and fine tunes the functionality of DRNN for protein stability prediction.

Keywords: *Protein stability, Deep Recurrent Neural Network, Sparrow Search Algorithm, Long Short-Term Memory, single mutation, machine learning*

INTRODUCTION

Knowledge about the protein structure, its functionalities and sequence paradigms are very essential for designing and analyzing proteins. The stability of protein structure is changed due to single amino acid mutation. Occurrence of mutation in a protein sequence position will modify the side chain atoms of the residue in the corresponding position (Lee C, Levitt M 1991). Thus, it is essential to predict accurately the stability change in protein due to mutation. To collect the random mutation details it requires important resources and time. But it is difficult task in the field of molecular biology to predict the destructive mutations and protein stability alteration (Cheng J, Randall A 2006). There are two types of methods used for performing the protein stability prediction they are energy-based approach and machine learning model. While using energy-based model it involves statistical, physical or other direct computation for determining the direction of relative change in energy. The machine learning models are trained with dataset to predict the change of protein stability. They predict the energy as positive or negative by feeding the input features to the machine learning approaches. It is a kind of binary classification model which predicts the output of energy increased as positive and energy decrease as negative. In this paper, deep learning model is used for predicting the protein stability in the presence of single mutation. The deep learning approaches greatly works in huge volume of dataset and it understands the depth knowledge about the protein stability changes with the given input attributes. The feature extraction is done with in each layer of the deep neural network to produce optimized prediction. The detailed description of deep recurrent neural network is given in the following sections.

Related Work

This section discusses about some of the existing protein stability prediction models using machine learning and deep learning.
Ays et al (Ays¸egulOzen, Mehmet Gonen 2009) in their work performed feature extraction using sequence and structure such as likelihoods substitutions of amino acid, fluctuations and equilibrium of the alpha and beta carbon atoms with packed density. They used regression methods and classification models to predict the protein sign and stability change. Yang et al (Yang, Y., Ding, X., 2019) designed a ProTstab cellular stability model which depends on proteolysis and mass spectrometry limitation. They used gradient boosting-based regression trees. The large datasets are well suited for predicting the stability of the proteins.
Montanucciet al (Montanucci, L, Capriotti E, Frank Y 2019) introduced an untrained model which is known as DDGun which is an anti-symmetric characteristic related to evolutionary information. They used single and multiple variation to analyse the energy change in protein based on its structure and sequence information. Huali Cao et al (Huali Cao, Jingxue Wang, Liping He 2019) designed a neural network-based prediction model for determining the proteins stability because of point mutations. The input attributes explore the solvent accessible surface area of mutated residue as essential and vial attribute and reported that buried hydrophobic portion is the main determinant of protein stability. Li et al (Li B, Yang YT, Capra JA, Gerstein MB 2020) developed a ThermoNet model of 3d convolutional neural network for predicting the protein stability by analysis the structured based point mutation. Protein structure is used as input in Convolutional Neural Network which treats the structure of protein as multi-channel. Sanavia et al (TizianaSanavia, GiovanniBirolo, 2020) in their work conducted a detailed investigation on neurodegenerative disease based on the mutation in protein structure. They highlighted new issues needed to be focused to attain reliable prediction of protein stability.

Chen et al (Chen Y, Lu H, Zhang N, 2020) devised a novel PremPS model which comprised of ten evolutional and structure-based features to determine the stabilizing and destabilizing mutations. They used nine different datasets to estimate the mutation stabilization. All the existing deep learning models involved in protein stability perdition uses the random parameter values, which may consequence in high false classification results. To overcome this problem, this proposed model introduced an enhanced deep recurrent neural network with sparrow search algorithm to fine tune the parameters involved in deep learning,

Deep Recurrent Neural Network

The popularity of using deep architectures are highly increased in recent days, one among them is Recurrent Neural Networks (RNN). RNN is used for various applications like embedding words, language modelling, handwriting recognition, speech recognition (Goodfellow I,Bengio, 2016). Like conventional neural network model, RNN also has connections among hidden nodes formed as directed graph with temporal sequence. This model allows to shows temporal dynamic behavior and uses its internal state which is known as memory to process the input with are variable length sequences.

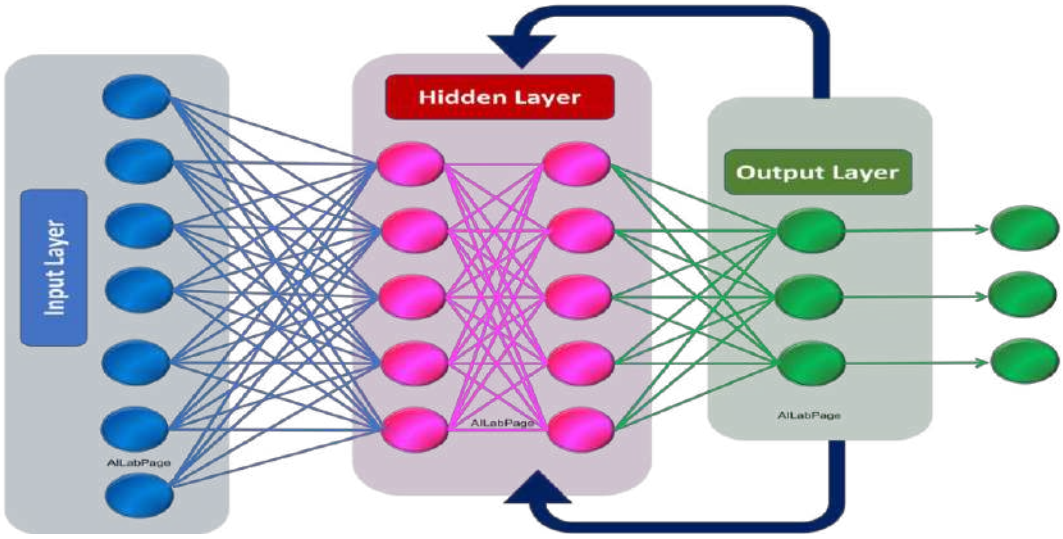


Figure Simple Architecture of deep Recurrent Neural Network

RNN is also referred as Feedback Neural Network (FNN). There are two popular units in RNN, they are Long-Short Term Memory (STM) and Gated Recurrent Unit (GRU). The major variation among them is related to the parameters involved during learning process. Both the units have same size of hidden state but LSTM have more parameters while compared with GRU.

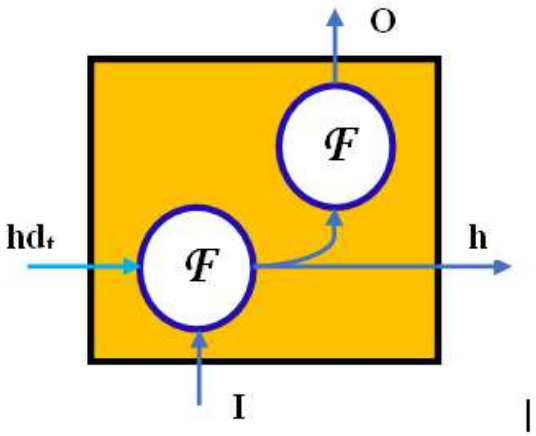


Figure 1 RNN Node Representation

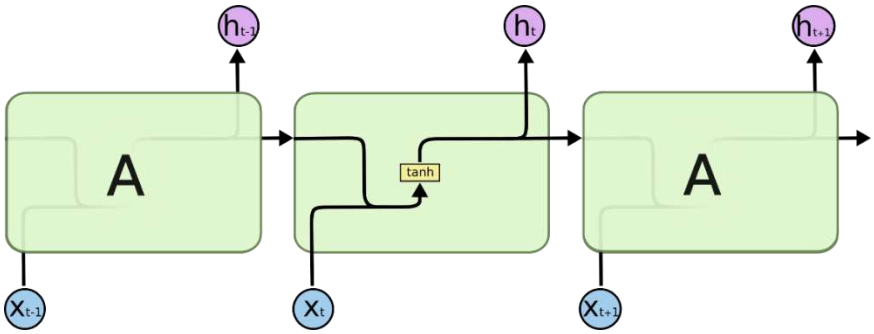
As exposed in figure 1, each node of RNN has a function for producing the current hidden state hdt and output ot by utilizing its current input ct and the previous hidden state hdt-1 according to the equation given below

$$hd_t = F(Wt_h hd_{t-1} + U_h x_t + bs_h)$$
$$O_t = F(Wt_y hd_t + bs_y)$$

Where WThd is the weight of the hidden to hidden recurrent link, Uhd is input to hidden connection and WTo refers to hidden to output connections. bshd is the bias of hidden state and bso is the bias of the output state. The activation function F is related with each node. This function is a Rectified Linear Unit (ReLU).

Long Short-Term Memory (LSTM)

While training standard Recurrent Neural Network (RNN) it is very tough due to its exploding issue which hinders the capability of gradients. To avoid this issue LSTM is used to overcome the long-term dependency, which use memory cells instead of standard nodes. In standard RNN a chain of repeating modules is presented with a single layer.



RNN with repeating module and single layer tanh

Still LSTM also have chain like structure but repeating module have four interacting layers. Each link of LSTM carries complete vector, from a node's output to the input of the other nodes (Ordonez, F.J.,Roggen 2016). Pointwise operations are done in pink circle, learned neural network layers are denoted by yellow boxes, concatenation is denoted by merging lines and forking line represents its content copied and moved to different locations.

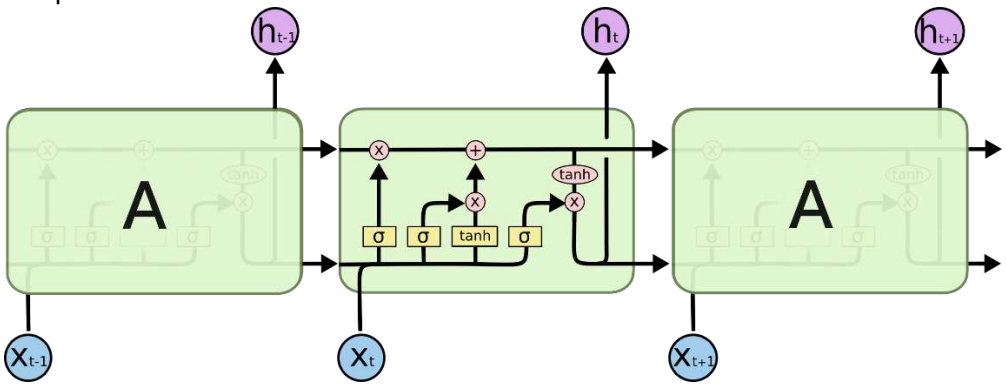


Figure LSTM with four interacting layers

As the LSTM have memory cells which have recurrence for both internal and outer, with more parameters and gate units. Function of each cell is listed below

- New information flow is controlled by Input Gate IPi
- Relevant to internal state, what content has to be forgotten is determined by Forget Gate fgt
- The gate which controls the information flow to the output is known as output gate ott
- The main input to the cell is in modulation gate mgt
- Cell internal recurrence is handled by Internal state cit
- Information of previous state within the content window is done by hidden state hdt

$$IP_t = \sigma(bs_i + U_i x_t + Wt_i hd_{t-1})$$

$$fg_t = \sigma(bs_f + U_f x_t + Wt_f x_{t-1})$$

$$ot_t = \sigma(bs_o + U_o x_t + Wt_o hd_{t-1})$$

$$mg_t = \sigma(bs_g + U_g x_t + Wt_g hd_{t-1})$$

$$ci_t = fg_t ci_{t-1} + fg_t ci_t$$

$$hd_t = \tanh(ci_t) ot_t$$

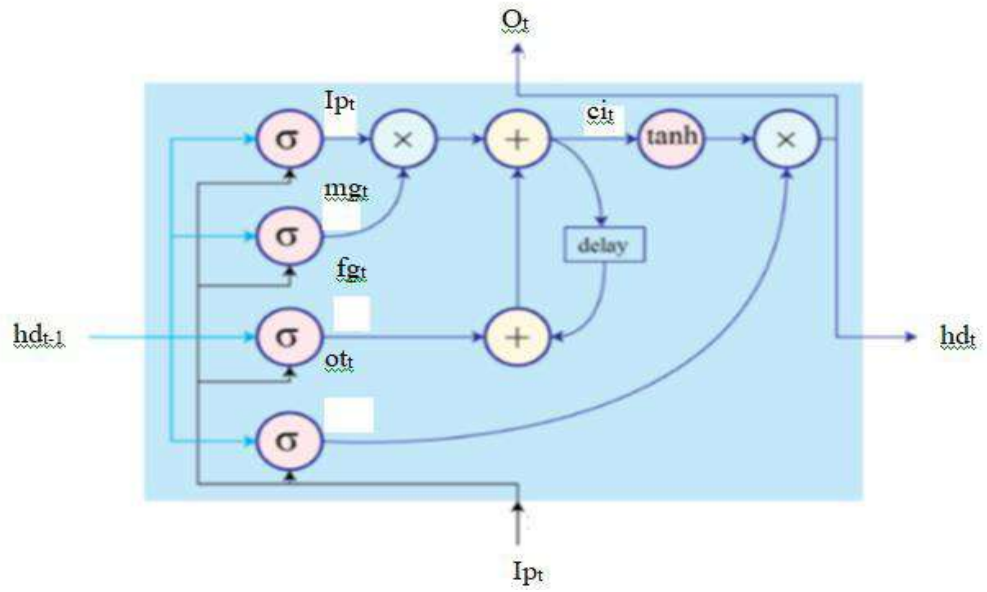


Figure Cell Structure of internal ci_t and outer recurrence hd_t

Methodology: Enhanced Recurrent Neural Network with sparrow search algorithm

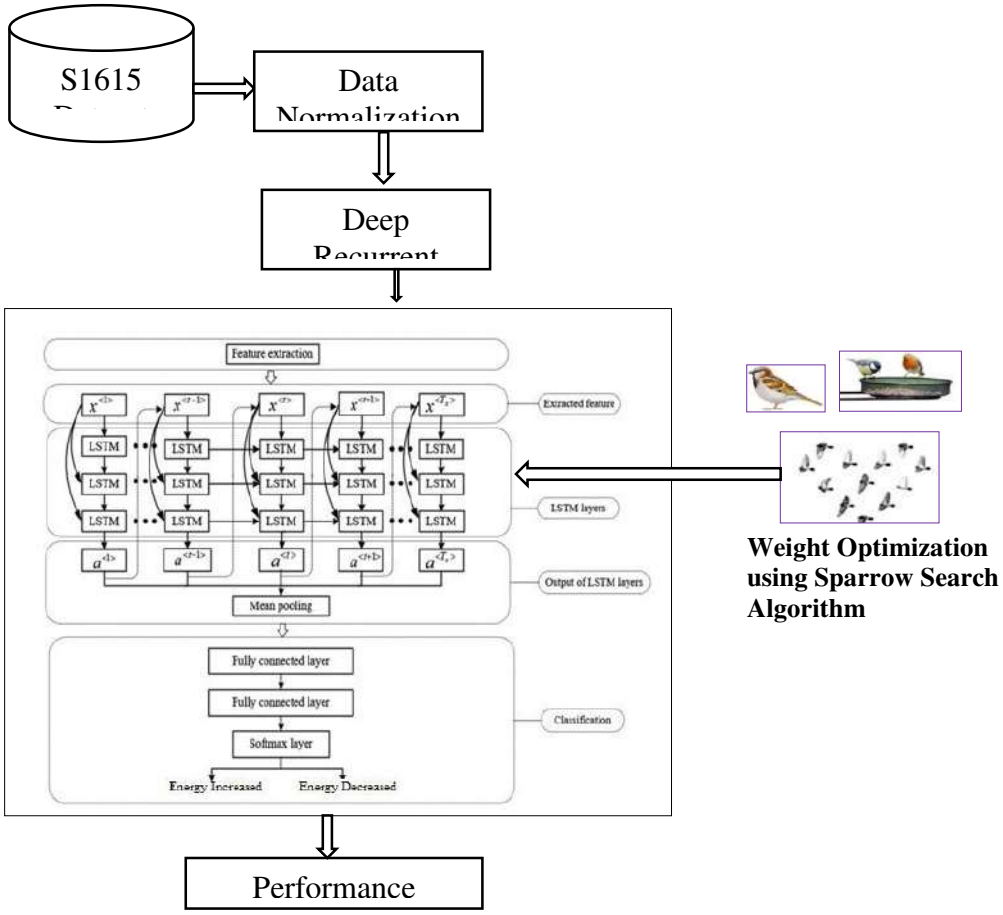


Figure Overall Framework of Proposed Enhanced Deep Recurrent Neural Network with Sparrow Search Algorithm

The figure depicts the entire workflow of the proposed enhanced deep recurrent neural network with LSTM as hidden layer to perform the prediction and classification of protein mutation stability (Juliet Rozario, Dr. B. Radha 2019). The dataset collected from ProTherm dataset is (Cheng, A. Randall, 2006) S1615 single mutation site, which is normalized using min-max normalization for treating all the attributes of dataset to same range of values. The deep recurrent neural network receives the input data and forward it to the layers of the LSTM to perform prediction process. In standard RNN the weights assigned to hidden units are done in a random manner, but in this proposed work the weights are assigned using the knowledge of sparrow search algorithm. The sparrow search algorithm with its food searching behavior identifies the optimized weights and those are assigned to the hidden units. Thus the proposed model classifies the energy variation as decreased or increased based on the protein mutation stability.

Dataset Description

In this work the dataset used for protein stability prediction is collected from S1615 ProTherm Database (Cheng, A. Randall, 2006). It is a single site mutation data of 1615 instances collected from 42 various proteins. The attributes involved in stability prediction is code of the protein denoted as PDB, position mutated, accessibility solvent, value of pH, temperature and energy change owing to a mutation in a single position $\Delta\Delta G$.

Sparrow Search Algorithm

Sparrow search algorithm (Xue J, Shen B 2020) is developed based on the inspiration of the sparrows behavior by applying the following rules:

1. The energy reserved by producers are high, which offers foraging directions or areas for scroungers. To discover areas with rich food source is done by it and depending on the energy reserved its fitness value is computed
2. When the predator is detected by a sparrow, the individuals started chirp as alarming signal. If the alarm value is greater than safety threshold, then the produce takes the responsibility to lead all scroungers to the safe place.
3. Once a sparrow searches for better food source for a long period of time then it will become the producer sparrow, but the proportion of the scroungers and producers will remain unchanged in the entire population.
4. The higher energy sparrows will be treated as producers. Many starving scroungers will move to other places for gaining more energy by collecting better food source.
5. Most of the scroungers follow the producers who can able to offer best food for searching food. At the same time, few scroungers may regularly monitor the producers and strive for food in order to raise their own predation rate.
6. Sparrows which are at the edge of the group, moves quickly to the safe area to reach better position when they predict about the danger, meanwhile sparrows in the middle of the swarm arbitrarily walk close with others.

Figure Process of Sparrow Search Algorithm

In this sparrow search algorithm, virtual sparrows are used for discovering the food and the sparrow's position is denoted in matrix format as follows

$$SX = \begin{bmatrix} SX_{1,1}\ SX_{1,2} \dots \dots SX_{1,d} \\ SX_{2,1}\ SX_{2,2} \dots \dots\ SX_{2,d} \\ \vdots \quad \vdots \quad \vdots \ \vdots \ \vdots \\ \vdots \quad \vdots \quad \vdots \ \vdots \ \vdots \\ SX_{n,1}\ SX_{n,2} \dots \dots SX_{n,d} \end{bmatrix}$$

Where d represents the dimension of variables, n is the number of sparrows used for optimization. All the sparrow's fitness value is represented in a vector is as shown below

$$Fit_X = \begin{bmatrix} fit([SX_{1,1}\ SX_{1,2} \dots \dots SX_{1,d}]) \\ fit([SX_{2,1}\ SX_{2,2} \dots \dots\ SX_{2,d}]) \\ \vdots \quad \vdots \quad \vdots \ \vdots \ \vdots \\ \vdots \quad \vdots \quad \vdots \ \vdots \ \vdots \\ fit([SX_{n,1}\ SX_{n,2} \dots \dots SX_{n,d}]) \end{bmatrix}$$

Where n refers to number of sparrows, fit_x is the fitness value of each row of an individual. The producers with better fitness values have highest priority to obtain food during searching process. As the producers are responsible for searching of best food source and guide the entire population movement, they have the ability to search in a broad range of area than the other scroungers in the group.

The location of the producers during each iteration is updated as formulated

$$SX_{ij}^{Ct+1} = \begin{cases} SX_{ij}^{ct}.exp\left(\frac{-i}{\alpha.itr_{max}}\right) & if\ RL_2 \geq ST \\ SX_{ij}^{ct} + Q.L & if\ Rl_2 < ST \end{cases}$$

Where ct signifies the current iteration and the dimension is represented in terms of j = 1,2,…d. □□□□□ denotes the jth dimension of the ith sparrow at iteration ct. itr refers to maximum iteration. $\alpha \in [0, 1]$ represents arbitrary number. $RL_2 \in [0, 1]$ is the alarm value and $ST \in [0.5, 1.0]$) is the safety threshold value. The normal distribution is denoted using arbitrary value Q and L is the matrix. There are no predators around the producers when $RL_2 < ST$ so they enter in wide search mode. If $RL_2 > ST$ then few of the sparrows detected the predators then all the sparrows need to quickly fly to safe space. Some of the few sparrows tries to compete the producer to increase its energy by represented as

$$SX_{ij}^{ct+1} = \begin{cases} Q.exp\left(\frac{SX_{worst}^{ct} - SX_{ij}^{ct}}{i^2}\right) & if\ i > n/2 \\ SX_p^{ct+1} + \left|SX_{ij}^{ct} - SX_p^{ct+1}\right|.A^{+}.L\ otherwise \end{cases}$$

Where optimal position occupied by the producer is represented as SX_p and current global worst position is signified asSX_{worst}. When $i > n/2$ it recommends that the ith scrounger with worse fitness value like to be most starving. Initial Position of the sparrow population is defined as

$$SX_{ij}^{ct+1} = \begin{cases} SX_{best}^{ct} + \beta.\left|SX_{ij}^{ct} - SX_{best}^{ct}\right| & if\ fit_i > fit_g \\ SX_{ij}^{ct} + K.\left(\frac{\left|SX_{ij}^{ct} - SX_{worst}^{ct}\right|}{(fit_i - fit_w) + \in}\right) & if\ fit_i = fit_g \end{cases}$$

Where SX_{best}signifies the present global optimal position, the step size is controlled by the β parameter with the normal distribution. $fit_g$is the global best fitness value and fit_w is the worst fitness value. $fit_i > fit_g\ signifies\ that$ sparrow is at the edge of the group. $fit_i = fit_g$refers to the sparrow at the middle of the group.

Algorithm Procedure of Sparrow Search Algorithm (SSA)

Input: list of Weights wt; maximum iteration imax, number of producers prd, no of sparrow who observe danger sd, alarm value RL_2, number of sparrows nsp, population of sparrows pn
Begin
While ct<imax
Identify the current best individual and worst individual by ranking fitness values of each individual
RL_2 = rnd(1)
For i = 1 to prd
Update the sparrow's location using the equation as shown

$$SX_{ij}^{ct+1} = \begin{cases} SX_{ij}^{ct}.exp\left(\frac{-i}{\alpha.itr_{max}}\right) & if\ RL_2 \geq ST \\ SX_{ij}^{ct} + Q.L & if\ Rl_2 < ST \end{cases}$$

End for
For i = (prd+1) to pn

Update the competence sparrow position as formulated below

$$SX_{ij}^{ct+1} = \begin{cases} Q.exp\left(\frac{SX_{worst}^{ct} - SX_{ij}^{ct}}{i^2}\right) & if\ i > n/2 \\ SX_p^{ct+1} + \left|SX_{ij}^{ct} - SX_p^{ct+1}\right|.A^{+}.L\ otherwise \end{cases}$$

End for
For M = 1 to SD

$$SX_{ij}^{ct+1} = \begin{cases} SX_{best}^{ct} + \beta.\left|SX_{ij}^{ct} - SX_{best}^{ct}\right| & if\ fit_i > fit_g \\ SX_{ij}^{ct} + K.\left(\frac{\left|SX_{ij}^{ct} - SX_{worst}^{ct}\right|}{(fit_i - fit_w) + \in}\right) if\ fit_i = fit_g \end{cases}$$

End for
Get the current new location
If the new location is better than previous, update it
ct = ct+1
end while
Return SX_{best}, fit_g
End
Output: Optimized Weights

Algorithm: Enhanced Recurrent Neural Network with sparrow search algorithm

Input: Dataset of S1615
Output: Prediction of Mutation Stability

Begin

- Apply the input values of each instance to the network and perform forward propagate
- Activation of hidden layer is done by
- $Net_j=\sum_i wt_{ji}Z_i$
- $Z_j=hd(net_j)$
- Evaluate error rate by finding the difference among actual output and observed output
  $\alpha_k=out_k - tar_k$
- Perform backpropagation δ' to obtain δ_j for each hidden unit j
  $\delta_j=hd'(Z_j)\sum_i wt_{ji}\delta_k$
- Update the weights in the hidden units by calling the sparrow search algorithm
  Call(SSA)
- Out= softmax(hd_j)

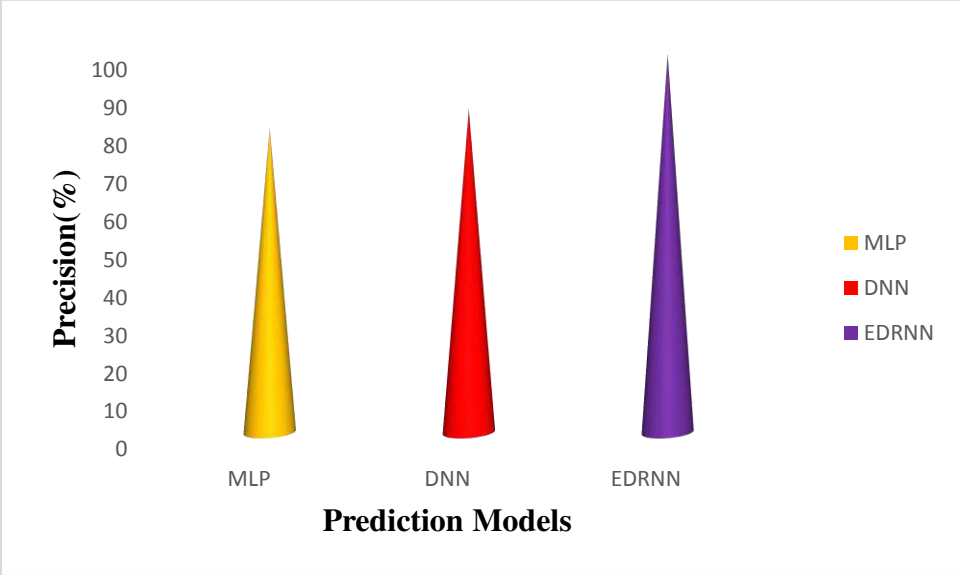
In algorithm 2 explains about the enhanced recurrent neural network functionality by receiving input from s1615 dataset, the input layer receives the input values and it is forwarded to LSTM layer and using activation function the hidden units are activated, by finding the difference among expected value and actual value, the weight are reassigned by inducing the knowledge of sparrow search algorithm to optimize the assignment of weights to improve the prediction of protein mutation stability more accurately.

RESULTS AND DISCUSSIONS

This section discusses about the performance analysis of the proposed Enhanced Deep Recurrent Neural Network for prediction the protein stability and model are simulated using python code. The Protherm dataset with a single point mutation is used for predicting protein stability with six different attributes PDB, pH, solvent accessibility, mutation, temperature and energy change with 1615 records. But after removing records with missing and redundant instances the final records involved in prediction process is 1505 instances. The performance of proposed EDRNN is compared with multiple layer perceptron network (MLP)and standard Deep Neural Network. The evaluation metrics used for performances analysis are Precision, Recall, F-measure and Accuracy.

Performance ComparisonBased on Precision

$$\text{Precision} = \frac{\text{correctly predicted positive cases}}{\text{Total number of positive cases predicted}}$$



FigurePerformance analysis based on Precision

From the figure it is shown that prediction of mutation stability using three prediction models Multiple Layer Perceptron (MLP), Deep Neural Network (DNN) and Enhanced Deep Recurrent Neural Network (EDRNN). The result proves that EDRNN produced highest precision rate while comparing with other prediction models because it inherits the pattern of inputs more deeply and long short-term memory is used to remember previous state value in protein mutation structure classification. Both MLP and DNN adopts back propagation so that assignment of weights are done in a random manner so that they produce less precision rate.

Performance ComparisonBased on Recall

$$\text{Recall} = \frac{\text{No.of. correctly predicted positive cases}}{\text{No of correctly predicted positive cases and no.of negative cases incorrectly predicted}}$$

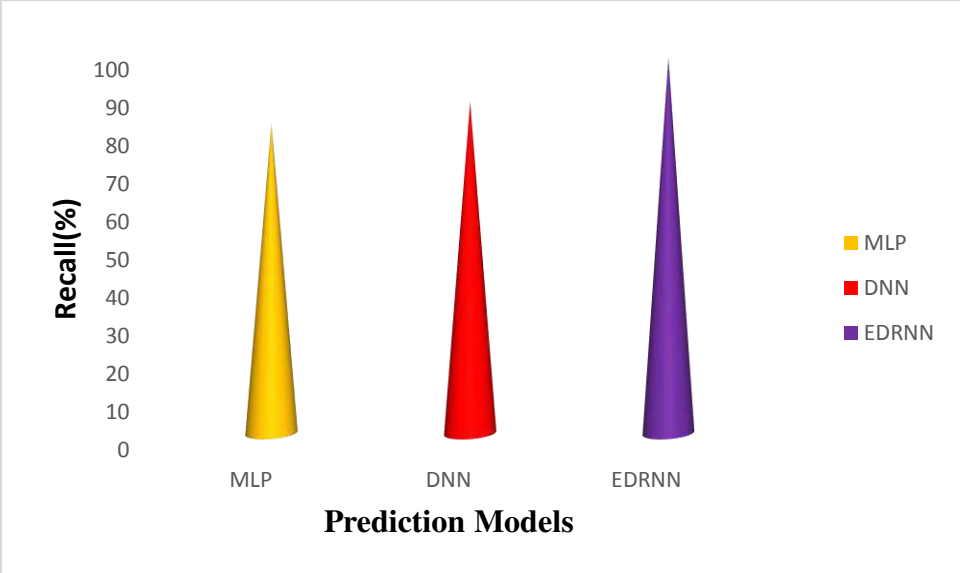


Figure Performance

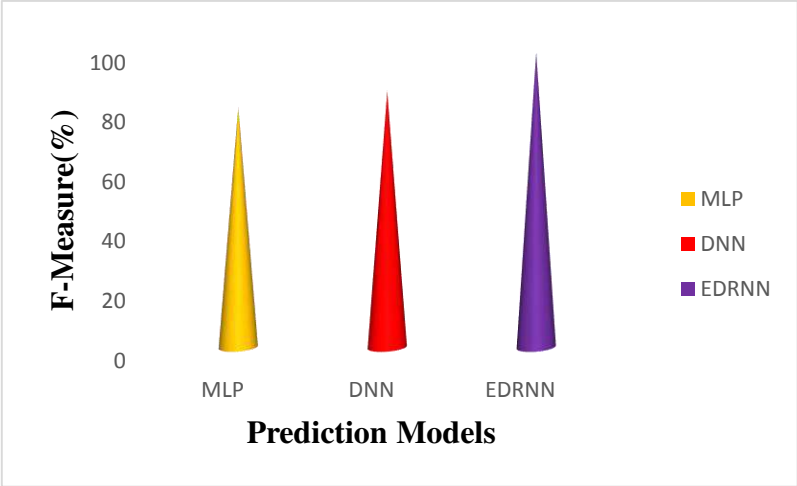
Analysis Based On Recall

The figure reveals effectiveness of proposed EDRNN in prediction of protein stability due to mutation effects. Recurrent neural network with LSTM in its training phase discovers pattern of protein dataset and stability of energy. unlike standard deep neural network in which weights among the links are assigned in a random manner, the proposed EDRNN adapts sparrow search algorithm.

The behaviour of sparrow in searching for their food is utilized to assign the weight values and bias values in the RNN-LSTM network to reduce the error rate. The conventional MLP and DNN depends on the back propagation and the assignment of weights are done in a trail and error manner so that they produce very less recall rate.

Performance ComparisonBased on F-Measure

$$\text{F-Measure} = 2 * \frac{\text{Precision rate} * \text{Recall rate}}{\text{Precision rate} + \text{Recall rate}}$$

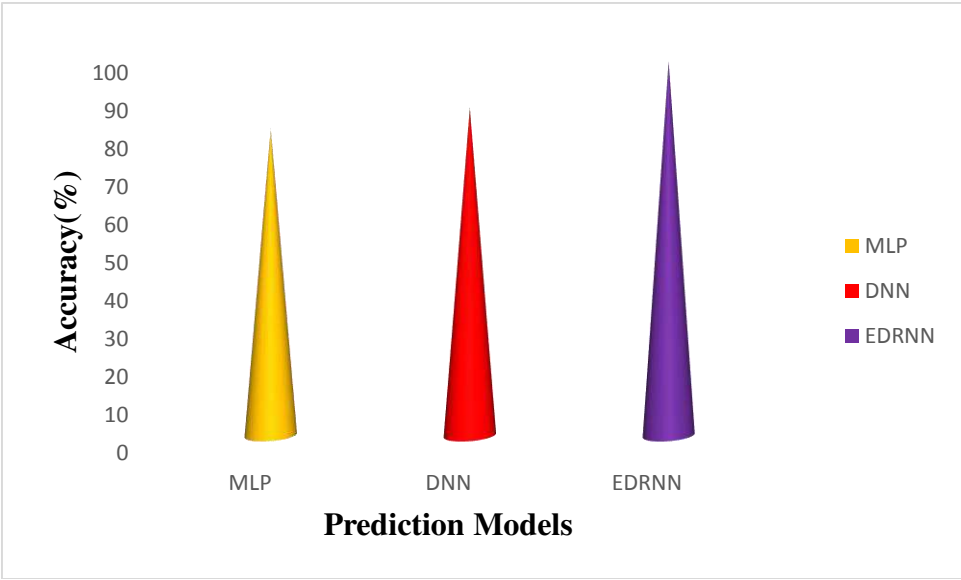


FigurePerformance analysis based on F-Measure

F-Measure is a hormonic mean which is influenced both by precision and recall rate obtained by three different classification models as shown in the figure. The proposed model extracts the feature vectors using their kernel function with successive layer of LSTM and the memory cell which remembers the sequence of protein patterns and based on it stability of energy is predicted.

PERFORMANCE COMPARISONBASED ON ACCURACY

$$\text{Accuracy} = \frac{\text{No of cases correclty predicted as postive and negative}}{\text{Total number of instances}}$$



FigurePerformance analysis based on Accuracy

The accuracy in prediction of protein stability is achieved higher by proposed enhanced Deep Recurrent Neural Network. This is because two important factors which influences classification accuracy rate. By utilizing LSTM, it increases remembrance of previous

states and the temporal sequences highly determines the actual patterns more accurately. By optimizing the process of weight assignment in the hidden nodes also improves the correct detection rate of protein stability.

Table Performance analysis based on the confusion matrix		
Confusion Matrix of EDRNN		
	IS	DS
IS	1085	13
DS	6	401

The table depicts the confusion matrix of EDRNN as it produces more accurate results, the correctly predicted increased energy is 1085 instances and decreased energy is 401 instances. Its false positive is 13 instances and the false negative is 402 instances. The accurate prediction of instances is 1486 out of 1505 total protein instances. Thus,the accuracy obtained by EDRNN is 98.74%by integrating the intelligence of sparrow search algorithm for weight assignment in hidden layers.

CONCLUSION

This paper focuses on protein stability prediction with single mutation by developing deep recurrent neural network. While training standard Recurrent Neural Network (RNN) it is very tough due to its exploding issue which hinders the capability of gradients. To avoid this issue LSTM is used to overcome the long-term dependency, which use memory cells instead of standard nodes. It also handles overfitting problem while handling large volume of protein dataset for prediction of protein stability. The parameters involved in LSTM are fine tuned in this proposed work by inducing the intelligence of sparrow search algorithm. The fitness value of each sparrow is estimated depending on the weight value chosen by them. The sparrow with best values has highest fitness value and thus it assigns the optimized weights in the hidden units. The simulation results proved the prominence of the proposed EDRNN in protein stability achieved highest accuracy rate compared to the standard Multi-Layer Perceptron Network and standard Deep Neural Network.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-4

Cauliflower Disease Identification Using Image Segmentation Based On Pso K-Means Clustering

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Abstract: Agriculture is the primary source of income for almost 9.87 million people in India. Pest and diseases cause great economic loss to farmers through reduced yields and increased costs of pesticides and other control measures. Health monitoring and diseases detection on a plant is exceptionally imperative for manageable farming. Early detection of a healthy plant is essential to avoid pest attacks. Support Vector Machine (SVM) is used to classify the types of pests that exist in the cabbage plants namely *Aphids, Looper, Cutworm, Snail,* and *Squash bugs* identified and healthy cabbage is classified based on significant features. The main objective of this paper is to segment a plant using Particle Swarm Optimization (PSO) K-means clustering that efficiently enhances the classification accuracy and processing time. The proposed work classifies pests more significantly than the traditional segmentation method. The overall accuracy of the proposed method attains 98.04 % and the pest classification accuracy for Aphids, *Looper, cutworm, Snail* and *Squash bugs* are 97.93%, 98.80%, 97.50%, 98.40%, and 97.56% respectively.

Keywords: Pests Detection, segmentation, k-means clustering, image processing, Particle Swarm Optimization (PSO), and Support Vector Machine (SVM)

INTRODUCTION

India is a cultivated country and about 70% of the population depends only on agriculture. Farmers have a large range of diversity for selecting appropriate crops and finding suitable pests for the plant. Pest on plants leads to a significant reduction in both the quality and quantity of agricultural products. Identification of the pest is vital to prevent losses in the yield and quantity of the agricultural product. Health monitoring and pest detection on the plant are very critical for sustainable agriculture. The most common pest that exists in the plants are *whiteflies, aphids*, and *thrips*. It is a very challenging process to monitor the pest manually. Because the disease easily spread and affects various parts of plants such as stems, leaves, and fruits. Diseases can be detected by either or all of the following:

a) Identifying the infected object/part
b) Extracting the set of features of the infected object/part
c) Detecting and classifying the diseases.

Hence, it requires a tremendous amount of work, expertise in the pest, and also require excessive processing time to classify the plants. In today's world, many researcher-developed automation processes by efficiently applying image processing techniques to enhance monitoring systems in the field of agriculture. Hence, computerized processes are being used to monitor the plant process and diseased plants. The image processing can be used in various agriculture applications such as pest detection in leaf and stem, to identify the affected area and to determine colors of the affected area, etc. The objective of this paper is to segment the pest and healthy plants using Particle Swarm Optimization (PSO) K-means clustering then the significant features extracted which are further classified by using a machine learning approach called Support Vector Machine (SVM). The article is organized as follows: Section II. discusses the related work carried out in the area of pest detection and classification techniques Section III. describes the proposed work elaborately. The experimental results of the pest detection and classification approach are depicted and discussed in Section IV Finally, the conclusion and future enhancement of the research work are given in Section V.

Review of Literature

The experts in the field are fascinated to develop a fast pest identification system that assists the farmers to classify the pest and increase plant productivity. In the current world, numerous efforts have been carried out to develop an automatic pest identification system by applying image processing techniques[17]. The different methods and image processing techniques used by various researchers in automatic pest identification systems are elaborated on in this section. The whiteflies from the leaves have been detected and estimated whiteflies density by introducing a Relative Difference in pixel Intensities (RDI) algorithm. The total dataset consists of 100 images and is segmented for processing. The proposed algorithm works better for overlapping white files and attains 97% accuracy but does not detect the complete shape of the whitefly[15]. In 2013, R. G. Mundada and V.V. Gohokar provided a solution for the false detection of white files using a support vector machine classifier. The whitefly and aphid have been classified to detect the affected and unaffected leaves. The extracted features were classified using SVM and attained good accuracy[14]. Gaurav Kandalkar, et al (2014), developed a decision support system using a neural network. Initially, the images are processed and segmented based on thresholding techniques to extract the significant features. The extracted features are further classified by using Radial Basis Function (RBF) neural network[7]. Johnny et.al

(2014) proposed a pest identification system based on a neural network. The acquired image has been segmented and an important feature extracted. To identify the insects Kohonen Self Organizing Map is applied and the proposed work uses the background subtraction of object detection[8]. Yogesh Kumar, et al (2017), proposed adaptive threshold-based feature extraction techniques to identify the pest in plants. The proposed work attains significant accuracy of 95% inidentifying the pest and achieves 97% accuracy for the neural network classifier[18]. Ganesh Bhadaneintroduces a prototype system for detecting pests in the affected images of various leaves. The real-time dataset has been created by capturing images and segmenting to distinguish the infected parts of the particular plants. The features are extracted and object extraction is implemented based on background subtraction. The result suggests that the respective plant's infected parts are detected successfully[5,6]. Muhammad Danish Gondal and YasirNiaz Khan, (2015) implemented a computer vision-based pest identification system based on the RMI algorithm. The image has been segmented the resultant output features were extracted and classified using the SVM algorithm. Compared to the traditional algorithm the proposed work detects the whiteflies with actual shape and efficiently achieved 97% accuracy [11]. Doreswamy and Salma proposed an approach where they combine a clustering and stochastic technique to select effective features from the high dimensional breast cancer data set in quickly. In their paper, they used PSO to optimize Fast k-Means algorithm[4]. Zheng et al. (2019) established a CropDeep species classification and detection dataset, including 31,147 images and more than 49,000 annotation examples from 31 different categories. These images are collected in a real natural environment with different cameras, and the most advanced deep learning classification and detection model is used to provide a wide range of baseline experiments. The results show that the existing classification method based on deep learning can achieve more than 99% classification accuracy and only 92% in object detection accuracy[20]. Zhang et al. [19]combined the pooling of spatial pyramids with the improved YOLOv3, deconvolution is implemented by using the combination of up-sampling and convolution operation, which enables the algorithm to effectively detect small size crop pest samples in the image and reduces the problem of relatively low recognition accuracy due to the diversity of crop pest attitudes and scales. The average recognition accuracy can reach 88.07% by testing 20 classes of pests collected in the real scene. From the previous study, it's inferred that computation accuracy for pest identification and classification detection is essential with minimum time complexity. Hence the proposed work introduces Particle Swarm Optimization in K-means clustering for segmenting plant images and the obtained results are given as input for the feature extraction techniques. The extracted features are classified using the Support Vector Machine.

Proposed work

Image processing is a method to perform some operations on an image, to get an enhanced image or to extract some useful information from it. It is a type of image processing in which input is an image and output will be in the image, characteristics, and features associated with that image. The proposed methodology consists of five phases, which include data acquisition, pre-processing, Segmentation using k-means clustering and PSO-based k-means clustering, feature extraction, and classification. The significant image processing steps used in the proposed work system architecture are depicted in Fig.1.

1. Data Acquisition

The performance of the proposed work is proved using the real-time data that are captured by using canon camera IXUS 190 20.0-megapixel digital camera which has a resolution of 640 x 480 pixels and 320 x 240 pixels of the image resolution with 25 megapixels. The captured images were processed using a local machine equipped with an Intel i3 processor and 4 GB RAM. The real-time database has been created differently for pests affected cabbage leaves such as *Aphids, Looper, Cutworm, Snail,* and *Squash bugs*. The total number of images used in the database is 1000 pests affected cabbage plants and unaffected cabbage plants. A generated sample cabbage image is shown in Fig. 2. The image files are saved in the .jpg format.

2. Pre-Processing

Pre-processing involves noise introduced during the data acquisition, correction of distortion, and degradation[16]. During the pre-processing, the image is enhanced so that pests on leaves can only be focused.

1) Color image to gray image conversion

During pre-processing of the image, the large-scale storage complexity has been avoided by converting the color image into a gray image. The acquired cabbage plant leaf color image consists of pixel information consisting of the intensities of three components namely: Red, Green, and Blue (RGB). The entire database pests plant image is in RGB (Red, Green, and Blue) form. The color transformation structure for the RGB leaf image is created, and then, a device-independent color space transformation for the color transformation structure is applied. It requires three channels to process any image during the computer vision processing method. This is the major reason for converting image into grayscale so that they can be processed easily and occupies less storage. The color images were converted into grayscale images by using Equation (1).

$$I(x, y) = 0.2989 \times B + 0.5870 \times G + 0.1140 \times B \qquad (1)$$

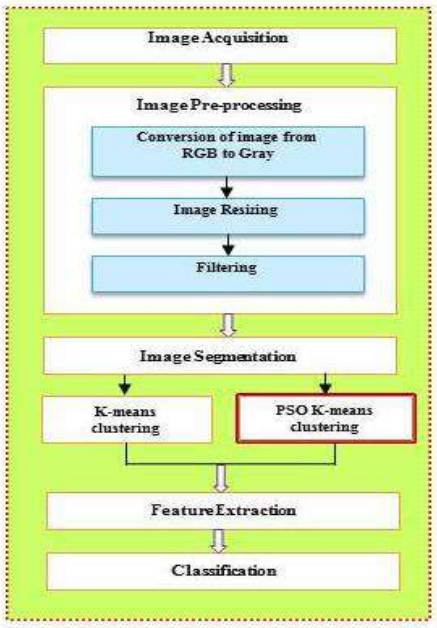

Fig.1. Architecture system of proposed work

Fig.2. Sample Dataset of pest affected cabbage plant

2) Resizing

Depending upon the application multiple image resizing techniques are used. The fundamental image resizing techniques exists namely nearest-neighbor interpolation, bilinear, and bi-cubic. The proposed work uses bi-cubic interpolation techniques for image resizing. Compared to other techniques bi-cubic interpolation enhances accuracy.

3) Filtering

During the filtering process, low-frequency background noise is removed. Average and median filters are applied to the images. The PSNR value is calculated for both the average and median resulting images. The average filter provides better results as compared to the median filter. Therefore, the proposed work uses an average filter for further processing.

3. Segmentation

It is the process of partitioning the image into a set of pixels or multiple segments. The segmentation can be utilizing different strategies like Otsu's strategy, k-implies grouping, changing over RGB picture into the HIS model, and so forth.

1) K-Means Clustering

Many clustering algorithms are used to solve image segmentation problems, one of them is k-Means. k-Means clustering is one of the nonhierarchical data clustering methods to divide the data into clusters, thus the data that have the same characteristic are grouped into the same cluster and the data having different characteristic is grouped into another cluster[3]. In the K-means clustering segmentation process, a technique is used to partition n observation into K clusters. Therefore, K is the number of clusters in the segmented image. In the proposed work three clusters (k= 3) are used and clustering is done depending upon the colors which is present in the segmented image. The algorithm for k-means clustering is as follows:

Step 1: *Pick center of cluster of the k cluster ,either randomly or based on some heuristic.*
Step 2: *Assign each pixel in the image to the cluster that minimizes the distances between the pixel and the cluster.*
Step 3:*Again compute the cluster centers by averaging all of the pixels in the cluster. Repeat step 2 and 3 until convergence is attained.*
The process k-Means is done by minimizing sum squares of distance between the corresponding cluster centroid and data as in Equation (2) where $\boldsymbol{n_j}$ constitute the quantity of features in the $\boldsymbol{j}^{\boldsymbol{th}}$ cluster.

$$c_j = \frac{1}{n_j}\sum_{i=1}^{n_j} x_j \qquad (2)$$

2) PSO based K-Means Clustering

Particle swarm optimization algorithm (PSO) is an evolutionary computational technique based on the movement and intelligence of swarms. Kennedy and Eberhart proposed the Particle Swarm Optimization technique[10]. PSO is initialized with a group of random particles and then searches for optima by updating generation. Each particle is flown through the search space, having its position adjusted based on its distance from its own personal best position and the distance from the best particle of the swarm [1,4,5,9,12]. The following steps explain the Particle Swarm Optimization based on K-means clustering Algorithm and the flow chart of PSO-based K-means clustering is shown in Fig.3.

Step 1: *Initialize cluster centers for each particle randomly.*
Step 2: *For each particle, assign each pixel to a cluster that has the minimum distance to its cluster center.*
Step 3: *Calculate the fitness function for each particle and find the global best solution.*

$$v' = v + C_1R_1(pbest - x) + C_2R_2(gbest - x) \quad (3)$$

$$x' = x + v' \quad (4)$$

where,
v is the current velocity,
v' the new velocity,
x the current position,
x' the new position,
R_1 and R_2 are even distributed random numbers in the interval [0, 1],
C_1 and C_2 are acceleration coefficients,
where C_1 is the factor that influences the cognitive behaviour, and C_2 is the factor for social behaviour.
Step 4: *Update the cluster centers.*
Step 5: *Repeat the procedure until the cluster converges.*

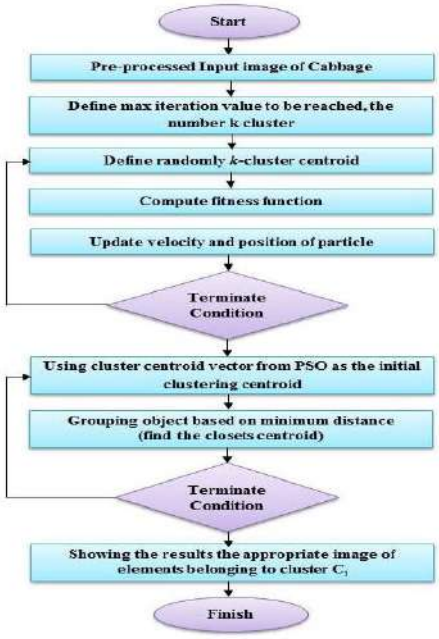

Fig. 3.Flow chart of PSO based K-means clustering

4. Feature Extraction

The image feature extraction is the most important technique in image processing. It plays a major role in the detection of infected cabbage. After segmentation the image features are extracted from the image to detect cabbage leaf. Feature extraction is an essential stage that represents the final results to predict healthy cabbage leaf and infected cabbage of an image. Feature extraction reduces the number of resources required to describe a large set of data. It is the process by which certain features of interest within an image are detected and represented for further processing. The feature is described as a function of one or more measurements. Each feature specifies some quantifiable property of an object and is computed such that it quantifies some significant characteristics of the object. In the proposed work various feature parameters obtained from clustered image and optimized cluster.

1) The first order statistics

First order feature extraction is a method of retrieval based on characteristics of the image histogram. The Histogram shows the probability of occurrence of the value of the degree of grayscale pixels in an image. From the values produced in the histogram can be calculated several parameters of the first order namely: mean, variance, skewness, kurtosis and entropy [16].

a) *Mean:* Mean is the measure of the average intensity value of the pixels present in the region as represented in Equation (5).

$$\mu = \frac{1}{n} f_n P(f_n) \quad (5)$$

b) *Variance:* Variance is the measure of variance value of an image in Equation (6)

$$\sigma^2 = n(f_n - \mu)^2 P(f_n) \quad (6)$$

c) *Skewness*: Skewness is a measure of asymmetry in a statistical distribution in (7).

$$\alpha_3 = \frac{1}{\sigma^3} n(f_n - \mu)^3 P(f_n) \quad (7)$$

d) *Kurtosis:* Kurtosis is a measure of peaks distribution related to the normal distribution in Equation (8).

$$\alpha_4 = \frac{1}{\sigma^4} n(f_n - \mu)^4 P(f_n) \quad (8)$$

e) *Entropy:* Entropy shows the randomness of the pixels of an image .The higher entropy value, the more random texture in Equation (9).

$$H = -nP(f_n).^2 \log P(f_n) \quad (9)$$

2) The second order statistics

One of the techniques to obtain the second order features is calculating the probability of a relationship between two pixels at a distance and orientation invariant. There are several stages for the second order, the first is forming of the matrix co-occurrence and the second is specifying the characteristics as a function of the matrix. This work uses six features of the second order statistics i.e. Energy, Contrast, Correlation, Homogeneity and Inverse difference moment (IDM) [16].

***a) Energy:* Energy is the sum of squared elements in the gray level co-occurrence of matrix (10).**

$$\text{Energy} = \sum_{i,j} P(i,j)^2 \qquad (10)$$

b) Contrast: Contrast is the measure of the difference between the brightness of the objects or regions and other objects within the same field of view in Equation (11).

$$C = \sum_{i,j} |i,j|^2 P(i,j) \qquad (11)$$

c) Correlation: Correlation is the measure of degree and type of relationship between adjacent pixels in Equation (12).

$$correlation = \sum_{i,j} \frac{(i-\mu i)(j-\mu j)P(i,j)}{\sigma_i \sigma_j} \qquad (12)$$

d) Homogeneity: Homogeneity is the closeness of the distribution of elements in the GLCM in Equation (13).

$$Homogeneity = \sum_{i,j} \frac{P(i,j)}{1+|i-j|} \qquad (13)$$

e) Inverse difference moment (IDM): Inverse difference moment is a measure of image texture usually called homogeneity. IDM features obtain the measure of the closeness of the distribution of GLCM elements to the GLCM diagonal (14).

$$IDM = E(x-\mu)^k \qquad (14)$$

These feature extraction parameters are very much helpful for the identification of the disease type of cabbage. The extracted features are further used to classify the images as the respective dataset.

5. Classification

If the cabbage leaf has been identified as an infected one, then the type of pest has to be detected. To perform classification, first, train the SVM. For this reason, collect the images of common pests in the crops and the features are extracted [8,13]. Based on these features Support Vector Machine (SVM) is used to train and test the data. The proposed work classifies the cabbage into two types infected cabbage and healthy cabbage. For identification, after the averaging filtering, a special type of mask is used. Then the filtered image is convolved with the mask. Then extracting the region properties and gray co-occurrence matrix properties the classification is done in two types. The type of pests has been identified and the SVM classifier efficiently detects the respective category. The real-time database is provided for the SVM classifier training and testing as 60% and 40%.

RESULTS AND ANALYSIS

The experiment is carried out using a real-time database of cabbage plant images captured from Ooty situated in Tamil Nadu, India. The experimental work is carried out through MATLAB software[2]. The following samples of the Cauliflower plant were taken as input:

a) Cauliflower leaf with *Aphids* disease
b) Cauliflower leaf with *Looper*disease
c) Cauliflower leaf with *Cutworm* disease
d) Cauliflower leaf with *Snail*
e) Cauliflower leaf with *Squash bugs* disease

The processed cauliflower images output of the original image and contrasted enhanced image is shown in Fig.4. The segmented result of the k-means clustered image of cauliflower is depicted in Fig.5. Finally obtained features of cauliflower plant affected with disease namely*Aphids,Looper, Cutworm, Snail* and *Squash bugs* classified into respective classes based on SVM, percentage of disease-affected region in cauliflower and the classification accuracy is represented in Fig.6, Fig.7, Fif.8, Fig.9 and Fig.10. The proposed segmentation of PSO k-means classification results of each pest has been identified and depicted in Fig.11.

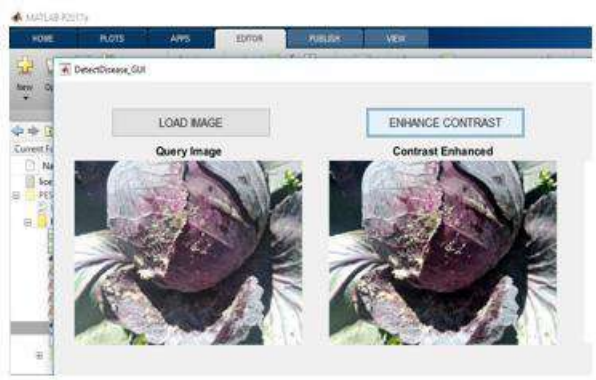

Fig.4. Cauliflower Original image affected with *Aphids* disease and respective image contrast enhancement output

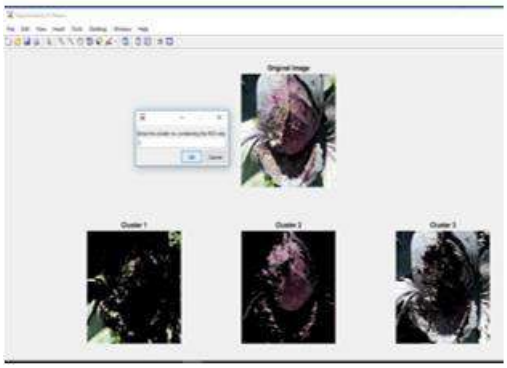

Fig.5. Cauliflower affected with *Aphids* disease output of k-means clustering

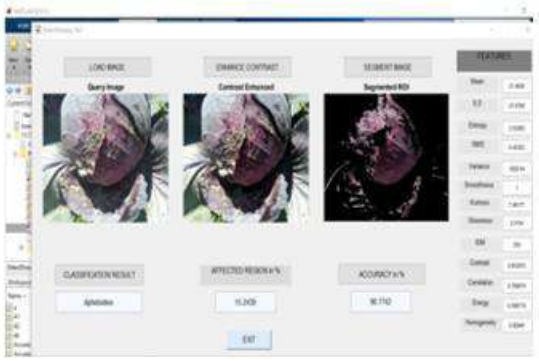

Fig.6. Cauliflower affected with *Aphids* disease output of feature extraction, classification class, affected region and accuracy

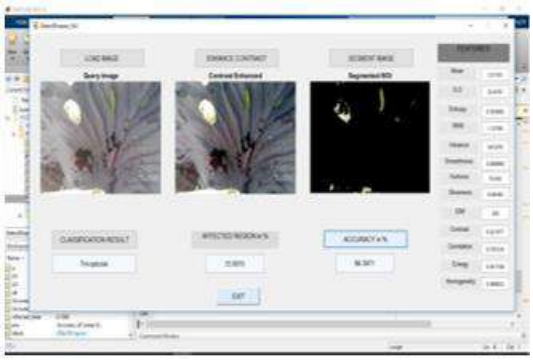

Fig.7. Cauliflower affected with *Looper* disease output of feature extraction, classification class, affected region and accuracy

Fig.8. Cauliflower affected with *Cutworm*disease output of feature extraction, classification class, affected region and accuracy

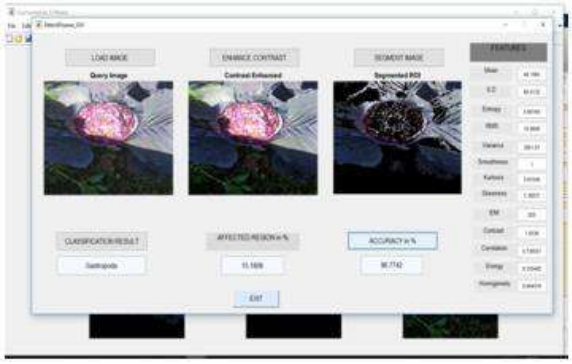

Fig.9. Cauliflower affected with*Snail* output of feature extraction, classification class, affected region, and accuracy

Fig.10. Cauliflower affected with *Squash bugs* disease output of feature extraction, classification class, affected region and accuracy

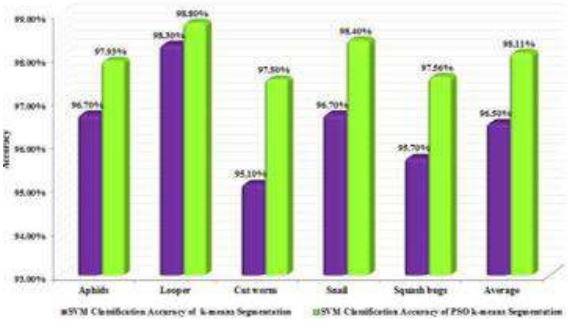

Fig.11. Classification accuracy of traditional and proposed PSO k-means clustering

Conclusion and Future Work

The proposed method of segmentation, based on the PSO-k-means clustering algorithm for detection of diseases in Cauliflower plant leaf has been successful in disease identification and classifying the diseases. It requires no prior information regarding several segments as the case is with other existing methods. With veryless computational effort, the optimum results were obtained. It effectively shows the efficiency of the proposed algorithm in disease detection and classification of cauliflower leaf diseases. Experimentation results reveal that only a few samples were misclassified. The average accuracy of classification of the proposed algorithm is 98.04% compared to the traditional classifier's 96.50%requirement of faster speed to reduce thesearch time is the major limitation of the image segmentation technique. In the future, the research could extend to the exploration of the artificial neural network, Bayes classifier, and other hybrid algorithms for the classification of segmented images to improve the pest identification rate.

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SP-5

Bioethanol Producing Efficient Renewable Feedstock Production By Bacterial Isolates From Compost Soil

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Abstract: Efficient ethanol production requires the addition of expensive process and on other hand biofuels from renewable feedstock has seen large scientific interest since they could be used to supply energy and alternative fuels. Bioethanol is one of the majority exciting biofuels due to its optimistic impact on the environment. To reduce the production cost of ethanol by using feedstock, a study on how to produce ethanol efficiently by adding feedstock from waste paper, grass and dry leaves. Bioethanol mostly produced from sugar- and starch-containing raw materials. Various available types of lignocellulosic agro wastes and its product such as grass, dry leaves and waste paper was pre treated for the production of fermentable sugars by enzymatic digestion of microbe which is isolated from compost soil. The bacterial isolated were identifying through biochemical test and staining procedure. The enzyme cellulase activity analyses by Miller method using glucose as standard. The digestive feedstock from various lignocellulosic materials enhances in the ethanol production by *Saccharomyces cerevisiae*. The ethanol production is higher in using feedstock from waste paper, grass and dry leaves was comparable with added nutrients (yeast extract and peptone) and pH adjustment using H_2SO_4, indicating that waste paper is not only a carbon source but also an excellent nutrient source act as a feedstock for the ethanol production by *Saccharomyces cerevisiae*. Waste paper is considered as one of the major components of municipal and industrial wastes and has the potential to be used as an excellent alternative feedstock for ethanol production.

Key words: Bioethanol, Renewable Feedstocks, Lignocellulosic Raw Material, Enzymatic Digestion.

INTRODUCTION

Ethanol as most important alcohol can be produced by converting the sugar content of any starchy material into alcohol with the evolution of carbon dioxide (CO_2) under controlled environmental conditions (Tomme et al., 1995). The process is fermentation in accordance with embden-meyerhoff pathway (EMP) catalysed by enzymes produced by bacteria and fungi. The fermentation process is essentially the same process used to make alcoholic beverages. In this process yeast and heat are used to break down complex sugars into more simple sugars, producing ethanol. Starchy materials are first hydrolysed to fermentable sugars, and subsequently fermented with the required yeast species to produce ethanol (Jarvis, 2003). During the fermentation process, part of the sugar is assimilated by the yeast cells and part is transformed into glycerol, acetaldehydes and lactic acid (Zhang & Lynd, 2004). Production of ethanol from ligno-cellulosic materials such as corncob, cornstalk, cornhusk, sugarcane bagasse and sugarcane bark though face challenges, but can substitute bio-ethanol production from edible food substances. The energy produced is both renewable and available in large quantities throughout the world (Zhang & Lynd, 2004). It would also allow agricultural land to be used more efficiently and at the same time prevent competition with food supplies. Until recently the problem was that the complex mixture of sugars that make up these leftover materials could not be efficiently converted into ethanol by *Saccharomyces cerevisiae* because they have a very strong crystalline structure surrounded by lignin which makes it difficult for enzyme accessibility. However, these problems have been overcome through two ways (i) pre-treatments such as acid hydrolysis (Bahkali, 1996) and (ii) hydrolysis by enzyme through fermentation by bacateria. This study reports on bioethanol producing efficient renewable feedstock production by bacterial isolates from compost soil. Increasing need for bioethanol as an energy source has stimulated worldwide investigations in search of cheaper substrate for bulk ethanol production. The primary challenge with biofuels use is the availability of suitable feedstock in sufficient quantity for large-scale adoption. As an oxygenated com-pound, ethanol provides additional oxygen in combustion and hence obtains better combustion efficiency. The main environmental advantages of fuel ethanol are its sustainability in using a renewable resource as a feedstock, thus stimulating independence of fossil fuel and retaining the level of greenhouse gas (CO2).

MATERIAL AND METHODS

The study deals with the bioethanol production from agrowaste (grass, dry leaves and paper). Screening of cellulose utilizing bacteria and characterization of selected bacterial species on the basis of morphological, bio-chemical test, optimizing the parameters for bacaterial growth. Feed stock preparation for ethanol production through yeast.

Screening and Isolation of Bacteria.

Cellulase-producing bacteria were isolated from soils by serial dilution method, pour plate or spread plate method using CMC agar media. The plates were incubated at 35, 40, 45, 50, and 55°C for 24 hours. To visualize the hydrolysis zone, the plates were flooded

with an aqueous solution of 0.1% Congo red for 15 min and washed with 1 M NaCl (Apun et al., 2000). To indicate the cellulose activity of the organisms, zone of clearance around the colonies on CMC agar was measured. Moreover, a quantitative assay method was used to determine the cellulase activity of the selected bacteria isolate in liquid medium. The cellulase activity of the culture was measured by determining the amount of reducing sugars liberated by using a DNS method (Miller, 1959). A bacterial isolate with the highest activity was selected for optimization of cellulase production.

Bacterial Identification.

The bacterial isolates were identified by means of morphological examination and some biochemical characterizations. The parameters investigated included colonial morphology, Gram reactions, endospore formation, catalase production, VP reaction, indole production, starch hydrolysis, catalase, and oxidase. The results were compared with Bergey's Manual of Determinative Bacteriology (Buddingh, 1975).

Enzyme Production Medium.

Production medium contained (g/L) glucose 1 gm, peptone 5 gm, NaCl 5gm, beef extract 3gms. 10ml of medium were taken in a 100 mL conical flask. The flasks were sterilized in autoclave at 121°C for 15 min, and after cooling, the flask was inoculated with overnight grown bacterial culture. The inoculated medium was incubated at 37°C in shaker incubator for 24 h. At the end of the fermentation period, the culture medium was centrifuged at 5000 rpm for 20 min to obtain the crude extract, which act as enzyme source.

Enzyme Assay.

Cellulase activity was measured by Miller methods (Miller, 1959). A reaction mixture composed of 0.2 mL of crude enzyme solution with 1.8 mL of 0.5% carboxymethyl cellulose (CMC) in 50 mM sodium phosphate buffer (pH 7) was incubated at 37°C in a shaking water bath for 30 min. The reaction was terminated by adding 3 mL of DNS reagent. The colour was developed by boiling the blend for 5 min. OD of samples was measured at 575 nm against a blank containing all the reagents except the crude enzyme.

Process Optimization for Maximum Cellulase Production

pH.

Flasks with broth containing the optimum con-centration of substrate and carbon source are taken and the pH of the broth is adjusted to 6.0, 7.0, 8.0, 9.0, 10.0, and 11.0 in different flasks using 1 N HCl and 1 N NaOH and sterilized. The cultures are inoculated and incubated at constant temperature. After the incubation period, the cell free culture filtrate is acquired and used as enzyme source.

Temperature.

Production medium at constant pH 7 was inoculated with overnight grown selected bacterial strain. The broth was incubated at different temperatures from 35, 40, 45, 50, 55, and 60°C for 24 h. After incubation period, the cell free culture filtrate is occurred and used as enzyme source.

Carbon Sources.

The effect of various carbon sources such as cellulose, glucose, maltose, lactose, and fructose at the concentration of 2% was examined in the production medium.

Nitrogen Sources.

Various nitrogen sources like yeast extract, urea, and ammonium sulphate were examined for their effect on enzyme production by replacing 0.5% peptone in the production medium.

Agro-Based Waste Material.

To find out the suitability of agro-based waste as substrate for enzyme production, different substrates, that is, grass, dry leaves, paper, are taken in the growth medium under submerged condition. The enzyme activity is measured after 24 h for enzyme production

Feed stock preparation for ethanol production through yeast.

Cellulosic material was used as feed stocks. Grasses dry leaves and paper were grinded using motor and pestle with 0.9% NaCl and make it powdered form. Measure 2.0g of feed stock of each (grass, dry leaves, and paper) and placed them in three different glass bottles and labelled accordingly. A fourth glass bottle was labelled as control without any feedstock.

Pretreatment:

Added 50 mL of hot distilled water in the glass bottles and swirled to mix. Loosened the caps of bottles and incubated in the hot water bath for 30 min. After incubation, the tubes were cooled down to room temperature.

Enzymatic digestion:

Added 2mL of cellulase enzyme produced by isolate in all bottles and incubated at 37°C for 24 hours. After incubation add 2g of active yeast to each of the bottles and swirled to mix. An airlock was given to the top of the tubes. The air lock allows carbon dioxide to escape, keeping the pressure low in the bottles. Incubated for 24 hours at 37°C for ethanol production

Estimation of bioethanol (colorimetric method)

In 10 clean test tubes, T1 (grass), T2 (dry leaves), T3paper) T4 (Blank). Added ethanol (standard) in S1, S2, S3, S4 and S5 in the concentrations; 0.2 mL, 0.4 mL, 0.6 mL, 0.8 mL and 1mL in the test tubes In Blank add the distilled water. Add potassium dichromate and sulphuric acid. After proper mixing of the constituents, the tubes were kept in dark for 2 hours after which optical density (OD) values were taken in 575nm.

RESULT
Cellulase.

producing bacteria were isolated from compost soil. Based on the morphological and biochemical characteristics, the isolated microorganism was identified as*, Bacillus sp.* (Table 1).

Effect of pH

Isolated culture was allowed to grow in media of different pH ranging from 6.0 to 11.0. Maximum enzyme activity was observed in medium of pH 7.0 by *Bacillus sp,* (Figure 1). This result was in parallel with the finding of other workers for different *Bacillus subtilis* strains (Abdel-Mawgoud et al., 2008; Chantawannakul et al., 2002; Wu et al., 2008).

Effect of Incubation Temperature.

Enzyme activity recorded at different temperatures revealed that isolated bacteria to yielded maximum cellulase production at 40° C (Figure 2). The temperature was found to influence extra-cellular enzyme secretion, possibly by changing the physical properties of the cell membrane. Optimum temperature for maximum growth of *Bacillus subtilis* 115 and *Bacillus subtilis* was 40° C (Jansová et al., 1993). Ray et al reported that minimum cellulase yield was observed when fermentation was carried out at 45° C, while maximum yield was obtained at 40° C by *Bacillus subtilis* and *Bacillus circulans* (Ray et al., 2007).

Effect of Carbon Source.

Various sources of carbon such as cellulose, fructose, maltose, and lactose were used to replace glucose which was the original carbon source in growth media. Results showed that glucose got the highest cellulase production compared to other carbon sources at 24 h incubation. Lactose and cellulose also exposed high cellulase production at 24 h of incubation. Hence, glucose was found to be the finest source for cellulase production (Figure 3).

Effect of Nitrogen Source.

Production of extracellular cellulase has been shown to be sensitive to suppression by different carbohydrate and nitrogen sources. The effect of nitrogen sources was studied in the growth medium, where peptone was changed by ammonium sulphate, urea, and yeast extract. Among the various nitrogen sources tested, yeast extract was found to be the best nitrogen source for cellulase production (Figure 4).

Effect of Agro-Based Waste Material.

The effect of agro based by-products as alternative substrate on bacterial cellulase production under fermentation was studied by several workers. In the present study paper was found to be the best inducer of cellulase enzyme production by *Bacillus Sp* (Figure 5).

Estimation of Bioethanol (colorimetric method)

In all three agro waste digested feed stock utilized by yeast and produce ethanol. On the calorimetric value at 575 nm of ethanol production were observed in all three samples of agro waste and compare three sample, paper blend with cellulase feed stock shows the high ethanol production (Figure 6).

Table 1 Staining and Biochemical Test (*Bacillus* sps)	
Catalase	Positive (+ve)
Gas	Negative (-ve)
VP (Voges Proskauer)	Positive (+ve)
Indole	Negative (-ve)
Motility	Positive (+ve)
MR (Methyl Red)	Negative (-ve)
Oxidase	positive (+ve)
Gram Staining	Gram Positive (+ve)
Shape	Rods
Spore	Positive (+ve)

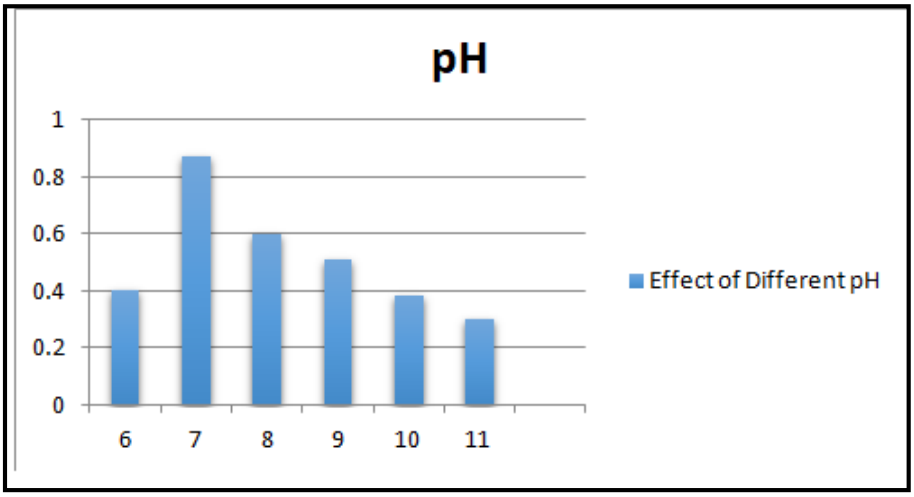

Figure: 1 Effect of pH in cellulase activity

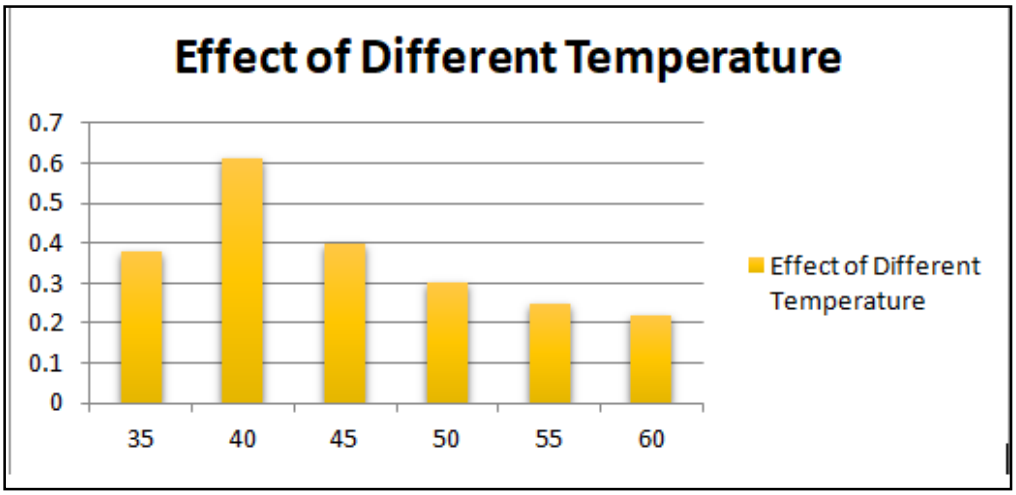

Figure: 2 Effect of Temperature in cellulase activity

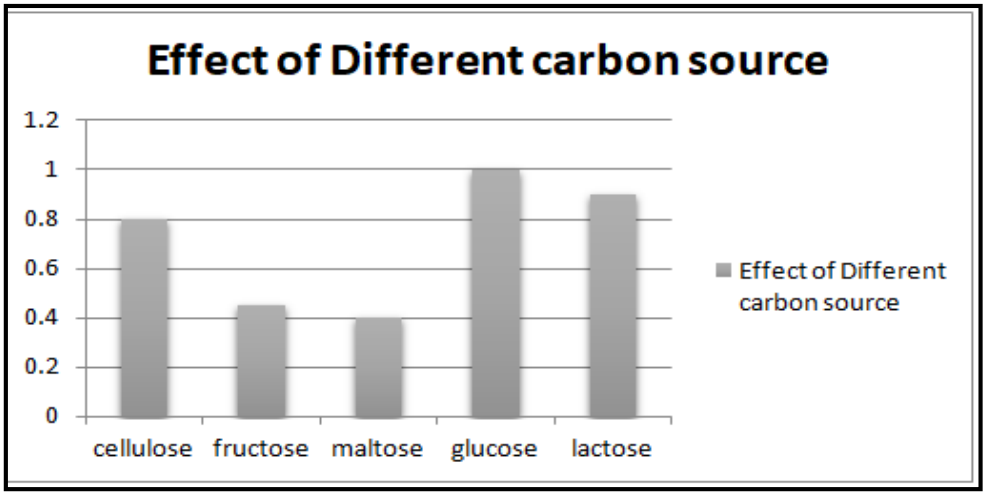

Figure: 3 Effect of Carbon source in cellulose activity

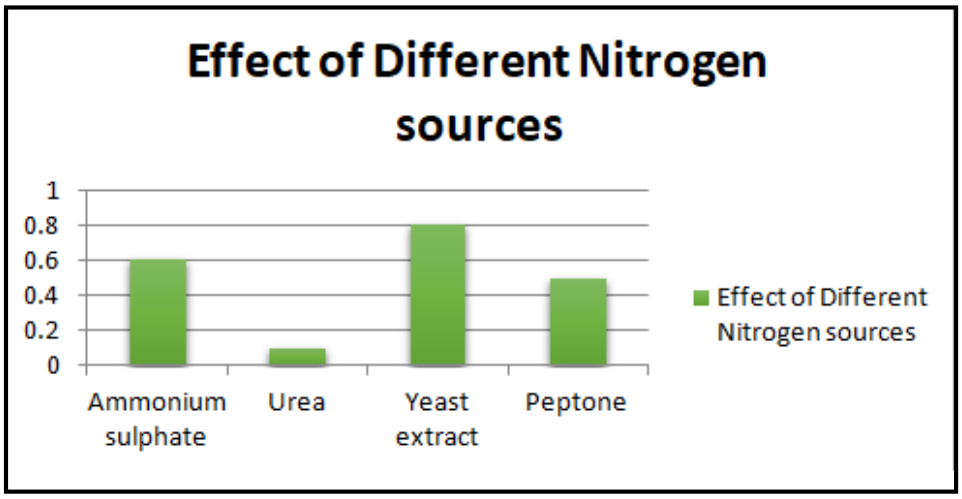

Figure: 4 Effect of Nitrogen source in cellulase activity

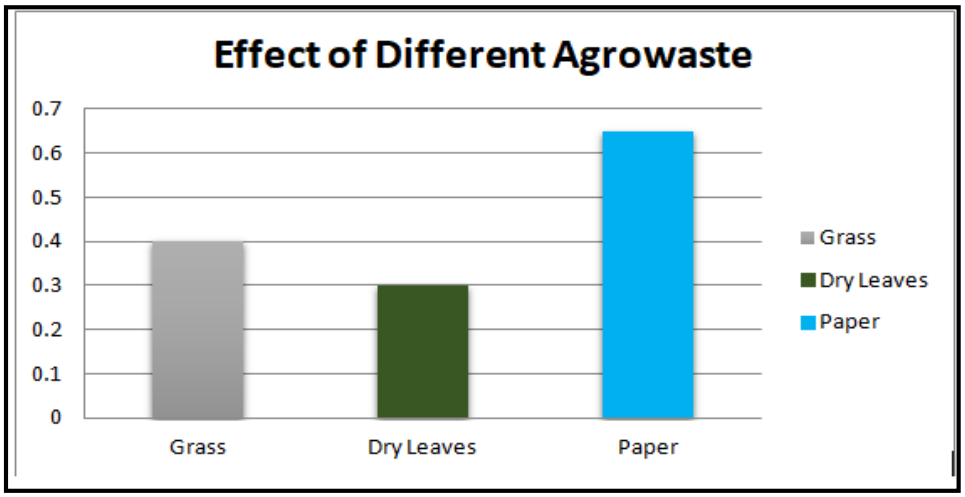

Figure:5 Effect of Agro waste in cellulase activity

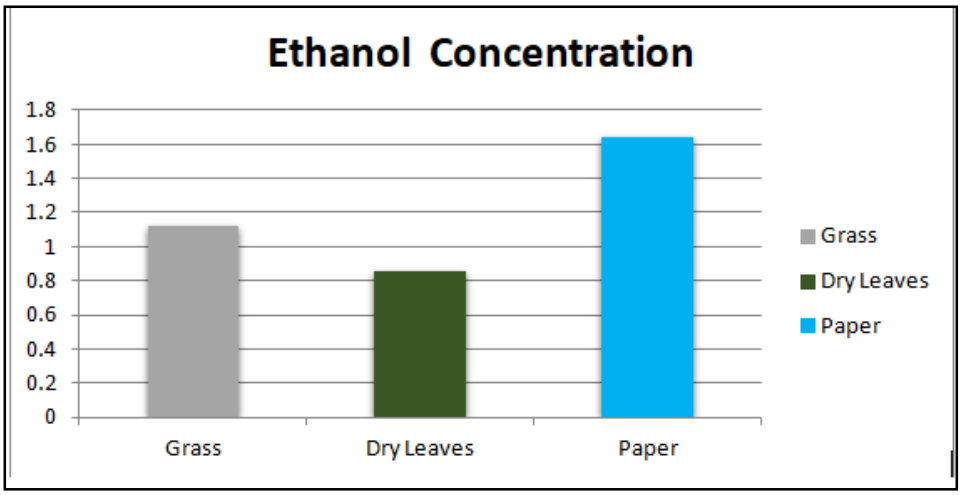

Figure: 6 Determination of Ethanol Concentration in different feed stock

CONCLUSION

The aim of the present work was to Bioethanol producing efficient renewable feed stock production by Bacaterial Isolates from compost soil. Isolate and identify a cellulase producer from soil. *Bacillus sp,* produced maximum yield of cellulases. The optimum temperature and pH were determined as 40° C and 7 pH and best carbon and nitrogen sources were glucose and Yeast Extract. This information has enabled the ideal formulation of media composition for maximum cellulase production by this organism. After optimization, the mass production was carried in one litre of optimized media at 40° C for 48 hrs at a pH of 7 on a rotary shaker at 110 rpm. Bacteria, which have high growth rate as compared to fungi, good potential to be used in cellulose production. The Agro based waste such as grass, dry leaves and paper were used for efficient renewable feed stock preparation by cellulase enzyme activity. Yeast is not directly able to utilize the agro waste due to the presence of complex polysaccharide in agro based waste and its product. Using Bacteria and its product the preparation of bioethanol producing efficient renewable feed stock is possible and it helps in the ethanol production by using yeast.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-6

Cognitive Radio Wireless Sensor Networks In Precision Agricultural Management

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Abstract: Emergent of plants at present includes both science and arts. Concerning 95% of plant life, is of both food crops and cash crops which are grown-up in the field. Due to era immemorial, humans have learnt the way of to nurture plants in normal ecological environment. In a few clement the climatic circumstances are awfully unpleasant to grow crops. Humans developed methods of raising a few sky-scraping crops constantly by providing shield from the extreme frozen climate, Known as Greenhouse Technology. Wireless Sensor Network (WSN) consists of spatially scattered nodes to supervise corporeal or ecological surroundings such as temperature, resonance, shuddering, strain, action or pollutant which courteously pass their data through the network Base station. But due growing traffic it is advisable to use Cognitive Radio Wireless Networks. A cognitive radio wireless sensor network is one of the contestant areas everywhere cognitive techniques used for opportunistic band admission.

Keywords: Wireless Sensor Network, sensor networks, cognitive sensors

INTRODUCTION

A network based remote monitor and power for greenhouse systems using the SPOT modules [Janos et al] present a way out for far-flung monitoring and control of the greenhouse system through internet. Modules have a net base customer interface with prospect of controlling the sensors and signals. Web base remote monitoring arrangement uses an Ethernet adapter which permits you to control the system. The cognitive technique is the progression of significant all the way through observation, preparation, analysis, performing, and endlessly updating and promotion with a history of learning. Cognitive radio is integrated with wireless sensors to defeat the numerous challenges in existing WSNs. CR has the capacity to recognize the unutilized band in an authorized and unauthorized band , and consume the vacant band opportunistically. The incumbent or crucial users (CU) have the precise to use the range anytime, whereas inferior users (IU) can make use of the range only when the CU is not using band.

Correlated Work

CR-wireless sensor networks (CR-WSNs) are a dedicated ad hoc network of dispersed wireless sensors which are prepared with cognitive radio capability. CR-WSN is poles apart in numerous aspects with a predictable WSN and unadventurous dispersed cognitive radio networks (CRNs).Here we give different aspects among ad hoc CRNs, WSNs, and CR-WSNs. CR-WSNs in general engross a huge quantity of spatially scattered energy-constrained, nature configuring, WS nodes with cognitive capabilities. They entail cognition capacity for a towering scale of teamwork and variation to carry out the preferred harmonized tasks. They have not only to convey data packets, but also to guard present authorized users. The green breathing space monitor system based on CR-Wireless Sensor Network [Shuo et. al] is planned to examine ecological factor for built-up green space. By means of a Wireless Sensor set-up, the real-time portion of temperature and clamminess gather from the real atmosphere evidently reflects the dynamics of temperature and clamminess both contained by and external of green space. In the meantime, the in sequence of the heat fascinated and the clamminess released by urban green space can also be obtained. Finally, it is obvious that temperature and humidity were diverse contained by and outer surface of the green space, the green space has a affirmative consequence on cooling and humidifier, changes in the temperature and humidity is progressively "enveloping" starting east to west. The mixture of WSN and Cognitive Radio power is aim at the ecological in sequence monitor, a multi-parameter monitoring organization is intended on low-power wireless communication equipment to perk up overall level of organization mechanization and monitoring. The monitoring consequences for hotness and humidity have exposed that system is constant, high consistent in data communication and easy to employ, and generally used in a range of areas for automatic control of green parameters. In CR-WSNs, a wireless sensor node selects the most suitable control on one occasion an idle control is recognized and vacates the feed when the entrance of a approved user on the strait is identified. The cognitive radio method is almost certainly the most capable technique for civilizing the effectiveness of the WSNs. CR-WSNs increase band consumption, and also fulfills the end-to-end aim, raise association competence and expand the duration of WSNs

Efficient Spectrum Utilization And Spaces

The Electromagnetic gamut is an expensive gift of natural world. The quantity of accessible useable gamut bands cannot amplify, but can use further resourcefully. With the omission of developed, methodical and remedial (ISM) radio bands, one requires an authorization from the government of the particular realm to make use of the radio bands. Outstanding to the elevated expenditure connected with band licensing, numerous researchers and hardware manufacturers comprise paying attention on emerging procedure for ISM bands. Therefore, ISM bands are overloaded restraining the expansion of new technologies [Zhou et. al]. On the added point, a lot of licensed gamut bands are moreover underutilized [FCC]. The purpose of wireless sensor network (WSN) for irrigation power

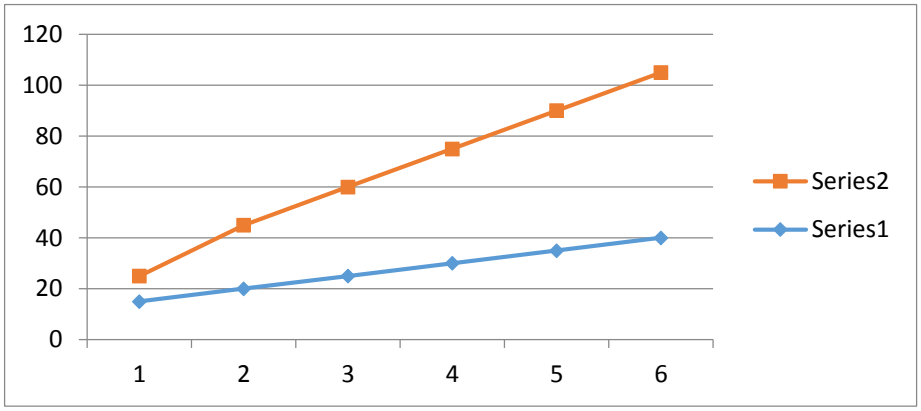
monitoring is unruffled of a number of nodes including networking ability can be given for an ad hoc and constant monitoring purpose. The parameter implicated in the water stipulation control such as the water intensity and glide association of the gate of scheming the flow of water will be considered in the real time by sensors which throw the data to the pedestal station or monitoring room. Here, the elemental design and accomplishment of WSN featuring a Zigbee expertise jointly with the IEEE 802.15.4 attuned transceiver. The simple water flow manage circuit is projected. The developed proposal is expenditure successful and allows simple customization. A number of preface results of capacity to estimate the consistency and efficiency of the system are also offered.

Irrigation Management Using CR-WSN

Precision irrigation is a significant carry out in water- economy agriculture cropping organization, allow producers to make the most of their output while saving water. While the perfect irrigation quantity is complicated to get hold of as the force factor was a great deal. To deal this problem, a fluffy decision-making technique of irrigation quantity based on ET and top soil water impending is given here. This calculation and monitoring the soil water is done using CR-WSN. And the soil water latent and crop vapor transpiration are selected as participation variables of the fluffy organizer. The wireless sensor network was used to transmit the irrigation have power over signal includes the soil water impending signal and the qualified clamminess, air temperature, solar rays, wind rapidity and etc. The experiment fallout shows that the technique and scheme has several advantages, such as financial, realistic, with high statement reliability and organize accurateness. The CR-wireless sensor network is residential to test and manage the temperature and dampness of the barn. Detailed measures are after handing out the changeable in sequence which are gathered by the wetness and heat sensor, using Zigbee harmony they will transport the packets with wireless information broadcast in the middle of all these nodes and then propel it into PC. It will demonstrate the temperature and humidity of the store in the superior mechanism edge. If the constraint is more than the capacity of the set assessment of PC, they can make a equivalent adjustment from end to end freshening system and then make it reasonable.

RESULT

The CR- WSN manages to preserve energy and also improves the irrigation process. For the imitation, the network playing field deployed in a 100m X 100m field having 100 nodes which are positioned arbitrarily in the network field. We have been considering the packet size of 4000 bits (500 bytes) and each node has 0.5 joule energy. The nodes improve in sending data which results in improvising the agriculture.



Graph1: Comparison of CR-WSN Sensor Nodes in Farms

CONCLUSION

A CR wireless sensor network is a sort of wireless sensor network which comprises spatially-placed self-directed CR outfitted wireless sensors to observe the objective or ecological circumstances considerately. Here the development of CR-WSNs, opportunity, technological issues, investigates trends and challenges. A few of the topical study consequences in CR-WSNs. CR wireless sensor networks are at a standstill in their formative years. Numerous areas stay put to be explored and superior. For the accomplishment of CR-WSNs, enormous examine is required in quite a few aspects. Important development in hardware, software and algorithms are required to construct elegant CR wireless sensors. The CR-Sensor networks can be used for irrigation management and for maintain the precision agriculture. In future it can be extended further to implement signals to control pesticides in the field

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SP-7

IOT Based Soil Characteristics Recording System For Improving The Agricultural Productivity

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Abstract: Agriculture is not only a primary resource but also a most significant economic system of a country and provides some basic raw materials for most of the industrial products directly or indirectly. For the optimal growth of crops, adequate volumes of nutrients are needed around the root zone of the crops. Generally, soils contain various amounts of nutrients and moisture levels depending on the patterns and differences in the management of the agricultural field. It is most imperative for the farmers to know the amount of nutrients present in the soil so that farmers can know how much nutrients should be added in the form of organic or mineral fertilizers into the soil in order to optimize the crop growth, production as well as crop yield. Internet of Things (IoT) becomes the most trending and dominating technology as almost all the fields and industries have started to adopt this technology in their operations to increase their productivity and improve efficiency. In recent days, smart farming has raised among farmer communities which majorly depends on IoT for increasing productivity. In the proposed model, sensors are placed inside the agriculture field for extracting moisture level of the soil, temperature, and pH of the soil as well as the level of nutrients present in the soil that helps in various decision making like the supply of fertilizers, analyses of the expected growth of crops, etc. The proposed model employs the mechanism of recoding the NPK levels, pH, moisture, and temperature of the soil at a specific latitude and longitude position by observing the soil condition using IoT tools. The extracted details are stored in the cloud storage for future use. Various experimental analysis has been performed from which various factors that influence the soil characteristics are identified and are analyzed.

Keywords: Agriculture Productivity, Soil Nutrients, Moisture, Temperature, Soil pH, Internet of Things

1. INTRODUCTION

Agriculture is the process of growing and cultivating essential food crops with the process of raising food for humans and other needs. It is the foremost source of national income for most developing countries as it is not the only occupation for people but also a way of life. At present, agriculture above and beyond farming includes forestry, dairy, fruit cultivation, poultry, beekeeping, mushroom, and even more. Agriculture plays a critical role in the entire life of a given economy. Agriculture is the backbone of the economic system of most of the developing country. About 70% of people of India are dependent on agricultural farming for their livelihood[1]. The various reasons for considering agriculture as significant is that it is used as a source of livelihood, contribution to national revenue, a supply of food as well as fodder, significant in international trade, marketable surplus, source of raw material, foreign exchange resources, great employment opportunities, and economic development. Various factors influence agricultural farming such as economic factors, climatic factors, and physical/environmental factors[2]. Some of the economic factors are subsidiaries, commodity prices, laws, and labor whereas climatic factors include light, water, rainfall, temperature, air, relative humidity and, wind, and the environmental factors include topography, climate and soil. With these factors, farmers are required to face severe competition to gain better productivity by reducing the production cost. Commonly, the production cost is divided into two wide categories as fixed costs and variable costs. Fixed costs are the costs that are fixed such as implementation costs for tools, machinery, farm buildings, work animals, etc. The variable cost varies with the productions. As the name implies, the variable costs can increase or decrease based on the usage of items. In agriculture, most of these types of expenses cannot be reduced such as the cost of seed, manure and, irrigation. But few expenses on variable costs like the amount spent on fertilizers, labor, can be reduced by analyzing the soil and act accordingly. Smart farming through the use of IoT technologies will help the farmers to reduce generated wastelands and enhance productivity[3]. The environmental conditions and the soil conditions can be easily and accurately monitored with the help of IoT devices. Precision farming is a process or a practice that makes the farming procedure more accurate and controlled for raising livestock and growing crops[4]. The use of information technology and the items like sensors, autonomous vehicles, automated hardware, control systems, robotics are the key components. IoT based agricultural convergence technology creates high value in terms of quality and increased production and also reduces the burden on farmers in an ample manner. In addition to agricultural IoT, the future of agriculture is "Precision Agriculture". The factors that are critical for analyzing the soil nutrient levels include soil type, cropping history, fertilizer application, irrigation level, topography, etc. These factors give insight regarding the chemical, physical, and biological statuses of soil to identify the limiting factors such that the crops can be split accordingly[5]. Soil mapping opens the door for sowing different crop varieties in a specific field by analyzing the soil properties and use them better, like seed suitability, time to sow, and even the planting depth, as some are deep-rooted and others less.

2. FACTORS AFFECTING SOIL FERTILITY

Maintaining an adequate supply of mineral nutrients to crops is one of the most vital requirements for sustained crop growth and productivity. Soil fertility is affected by several factors such as climate, rainfall, biological behavior of soil, chemical, and physical properties. A review on interrelationships between the soil properties and soil fertility is necessary for better production by supplying nutrients thereby enhancing soil quality[6]. Plants derive their nutrition from the surface as well as sub-surface of the soil. Soil nutrients follow a definite trend of distribution with depth in a given landscape. Soil fertility varies from location to location for cultivation land. Soil pH is considered the driver of soil fertility because of its direct impact on soil nutrient availability and plant growth. A pH range of 5 to 7 seems to promote the readiest availability of nutrients. Electrical conductivity is a measure of soluble salt concentration in the soil solution. A higher concentration of dissolved salts in any soil affects plant growth unfavorably. Adequate fertilizer can help plants to produce good yields and quantities. Soil organic content is recognized as a key indicator of soil fertility and sustainability of the agricultural system. It is recognized as a source of plant nutrients such as Nitrogen (N), Phosphorous (P), Potassium (K), and other micronutrients. These elements promote the growth of the plant in different ways. Nitrogen promotes the growth of leaves and vegetation, Phosphorous stimulates root and plat growth and Potassium endorses flowering, fruiting, and keep regulation of nutrients and water in the plant cell[7]. Knowing the values of NPK concentration in soils can inform environmental scientists about nutrient deficiency or surplus in soils which is then used to support plant production and also provide a general insight into the basic biogeochemical cycles of an ecosystem. Each type of plant has an optimum level of soil nutrients that will produce maximum growth. The availability of organic carbon may promote the availability of certain elements by supplying soluble complexing agents. Soil fertility is a dynamic natural property that can change under the influence of natural and human-induced factors. Soil fertility is affected by the physical, chemical, and biological properties of soil. Socio-economic factors such as a shortage of livestock per house led to a decline in traditional soil fertility management practices. This will have substantial effects on soil fertility unless farmers use measures to add nutrients to their soils[8]. Thus, this paper focuses on analyzing the soil quality such as moisture level, temperature, pH, and other nutrients level using various sensors. These values are extracted from the soil using the internet of things and are stored in cloud storage. The user can access and fetch the details from the cloud storage whenever necessary. The organization of the paper is as follows. Section 3 presents the related works. Section 4 presents the proposed model of soil analysis using various input sensors. Section 5 explains the experiment analysis and observations identified from the investigations. Finally, the paper concludes with the CONCLUSION section.

3. RELATED WORKS

The fertility of the soil depends on the major nutrients present in the soil such as Nitrogen (N), Phosphorus (P), and Potassium (K), minor nutrients such as iron, manganese, copper, zinc, boron and Sulphur and physical properties such as pH, organic carbon, and electric conductivity. NPK plays a major role in determining soil fertility[9]. Numerous works concentrate on analyzing various soil properties including soil nutrients[10]. Smart farming has become a most significant field of research for improving productivity[11]. An automated soil tester has been proposed for testing various soil properties[12]. The proposed model employs various sensors for analyzing the temperature, moisture, and pH values of the soil. The model works based on the GPS and IoT mechanism. The obtained results are then stored in the database for future use. Similarly, optical sensors were also suggested for analyzing soil nutrients present in the particular location for improving productivity [13]. The experiments show that the interaction between the light and NPK samples from various places made the intensity of light as low when the voltage is dropped. An IoT based system for detecting soil pH, temperature, and moisture has been measured for analyzing the soil. The system produces the result yet it communicates them to the farmers' mobile using Bluetooth[14]. The analysis of pH value also affects the presence of nutrients in the soil[15]. The temperature, as well as moisture level present in the soil, also helps in distinguishing the soil type[16-17]. Similarly, a wireless sensor-based irrigation system with rule-based analysis model was suggested to improve the efficiency of water usage with an objective of conserving the water in dry areas by using drip irrigation system[18]. Several features including GPS based remote controlled monitoring system for analyzing the moisture and temperature, security, leaf wetness, and various proper irrigation facilities have been considered for smart farming[19].

4. PROPOSED MODEL FOR SOIL ANALYSIS

The overall framework of the proposed research work is shown in figure 1. The figure delivers the conceptual design idea of using IoT and cloud in order to implement smart farming. The model has various modules including input sensors such as moisture sensor, NPK sensor, pH sensor, temperature sensor, central module with Raspberry Pi Microcontroller and GPS, and output module containing display unit and cloud storage. The proposed model uses the concept of IoT and cloud storage in the agriculture field by employing sensors to make them smarter. The central focus of the research is to collect the soil data from the NPK sensor and process the data for analyzing the level of soil nutrients such as Nitrogen (N), Phosphorous (P), and Potassium (K) in the soil. It also develops a centralized soil repository at different geographical locations through cloud storage. With help of the details gathered, the farmers can monitor the soil nutrients and detect the fertility changes happened in the soil. This helps them to do appropriate actions for improving the soil fertility and choosing appropriate crop rotation. Apart from soil nutrients such as N, P, and K, other characteristics of soil also affects the crop growth such as soil moisture, pH values measuring the acidity or basicity of the soil, and soil temperature. The system collects and records the soil information such as the current value of N, P, K, pH, moisture, temperature of the soil at a specific location along with the location in the cloud storage that are necessary for crop growth and yield. For accomplishing the aim of the proposed model, the work deals with three main modules such as input modules with sensors, data processing with a microcontroller, and output with device and cloud for displaying the results. The various data from sensors are read as input and supplied to the

microcontroller for the processing which is the central and core component of the proposed design model and output from the microcontroller is displayed as an output in a display unit and the same data are stored in the cloud storage for further processing.

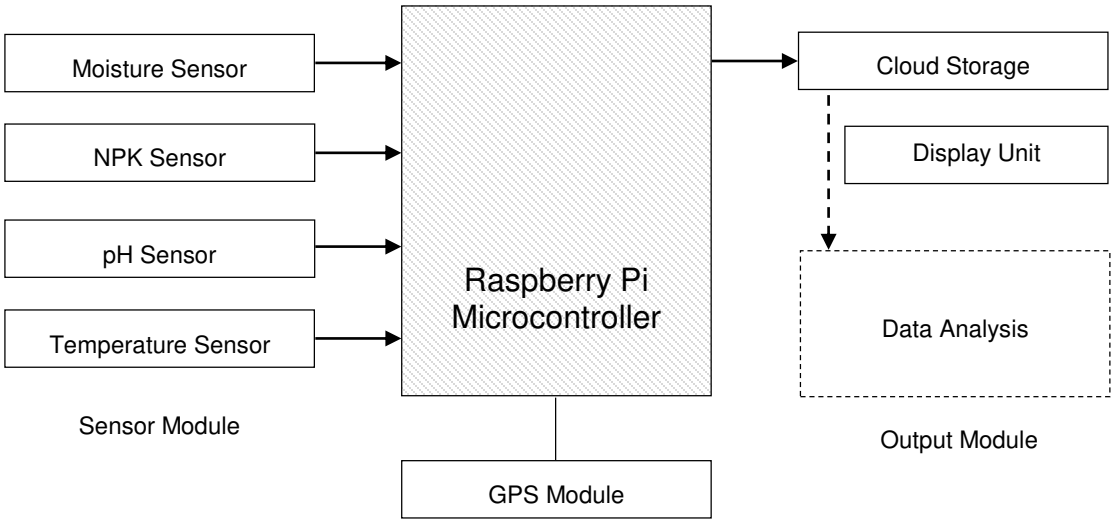


Fig 1*Overall Conceptual Design of the Proposed Framework*

The sensors read the values of soil fertility and other characteristics at a specific location, and read data are supplied to the cloud storage then these data can be allowed to access by the farmers and users based on their request. The various sensors included in the system are moisture sensor, NPK sensor, pH sensor, temperature sensor. These sensors are controlled by the microcontroller. The microcontroller collects the data from the sensors and sends the details to the output module. When the power is on, the microcontroller enables the input and output modules. It collects the data from the input module periodically, and update them in the cloud for future use. The data stored in the cloud can be extracted from the cloud using the mobile application. On receiving the request, the application collects the data from the cloud and displays them to the user.

Input Sensor Module

The input module extracts various characteristics of the soil using various sensors such as moisture, NPK values, pH values, and temperature. The moisture of the soil plays an essential role in the growth of the plant. Supplying water to the plants is also indispensable to change the temperature of the plants. Generally, the dry soil consists of solid materials as well as pore spaces in the ratio of 55% and 45% respectively. On pouring the water into the soil, the pores are filled with water resulting in 55% of solid material, 30% pores, and 15% water. This can be represented as 15% volumetric water content. However, the water content will not exceed 45% as only the pores can be filled with water. The moisture sensor contains the fork-shaped probe with two visible conductors and the sensor acts as a variable resistor whose resistance fluctuates according to the water content in the soil[20]. Here the resistance is inversely proportional to the soil moisture. Maximum water in the soil provides better conductivity which results in lower resistance whereas the minimum water in the soil affords poor conductivity and results in higher resistance (last minute engineers). This also helps the farmers to save water and electricity as well as protect crops from a shortage of water or excess water[18]. The moisture data is collected from the sensor at different periods of time. The timer is set to transmit the collected data to the database stored in the cloud storage. In the proposed work FC-28 soil moisture sensor is used with the voltage requirement of 5V[22]. The pH sensor is responsible for collecting soil pH values. pH is the numeric representation of gram-equivalent per liter of hydrogen ion concentration in any solution[11]. pH monitoring is a crucial component for crop growth[15]. The availability of soil nutrients gets highly affected by the pH of the soil as soil nutrients are tied together with the pH values. It also affects the presence of toxic elements in the soil and the activity of bacteria in the soil. The best pH for plants is typically between 5.5 and 6.5. The lower pH value will be more acidic and higher pH value will be alkaline. The pH sensor has a single probe that gets contacted with soil by penetrating in to the ground. The probe has two electrodes such as a glass electrode and a reference electrode. The glass electrode attracts hydrogen ion in the soil creating a voltage which is then compared with the reference electrode. The difference value is then converted to the pH value. The idea on which the pH sensor relies is on the hydrogen ions present in the soil. The more hydrogen ions present in the soil indicates high conductivity which implies more acidity of the soil indicates more conductivity. Crops need proper environmental conditions for their finest growth as well as health. Soil temperature is a measure to identify how heat or cold the soil is. Soil temperature also affects various processes such as photosynthesis, microbial activity, moisture in the soil, soil translocation, and so on in the ecosystem[17]. It also affects the uptake of nutrients by the soil. The soil temperature is highly influenced by various factors including the heat from the sun, the water content in the soil, the slope of the land, and the heat capacity of the soil[23]. Generally, the temperature sensor can be used to measure the soil temperature and it provides a temperature in terms of Celsius as output after measuring the soil. The temperature of the soil may vary from 0o as a minimum value to approximately 40o as maximum[16]. For better plant growth, the optimum average temperature of the soil must lie between 20°C to 30°C[24]. In the proposed work DS18B20 temperature sensor is

used for implementation and it provides a temperature reading with the number of bits between 9 to 12 and is connected to the central microcontroller. It works with a voltage of 3 to 5.5V. NPK sensor is used to identify the fertility level of soil based on the values of nitrogen (N), phosphorous (P), and potassium (K). The identification of the level of nutrients present in the soil is most significant as it helps to decide the volume of fertilizers to be added to the soil to neutralize the nutrients present in the soil for the proper growth of plants and crops. The nutrients in the soil can be measured either using a sensor or spectrometer. However, the spectrometer does not provide a result with 60%-70% accuracy. The NPK sensor provides better results with an output as a numeric value. The proposed system uses an IP68 soil NPK sensor that works with a power supply ranges between 12V – 24V. The various sensors such as moisture sensor, pH sensor, temperature sensor, and NPK sensor are shown in Figure 2. As the agricultural field have different soil type in different parts, it is necessary to analyze the soil at various locations in the agricultural field. Thus, it is necessary to collect the soil at various locations and the soil details along with the location are also need to be stored in the database.

(a) Moisture Sensor (b) pH Sensor (c) Temperature Sensor (d) NPK Sensor

Fig 2 *Sensors used in Input Module*

The GPS module is used for this purpose to extract the appropriate location in terms of longitude and latitude. The proposed system employs the NEO-6M GPS module for implementing GPS positioning (Yen, 2007). The voltage supply required for this GPS module is 2.7V to 3.6V. The algorithm pseudocode for accessing various soil characteristics using moisture sensor, pH sensor, temperature sensor, and NPK sensor is given in Figure 3. Once the values are stored in the soil database created in the cloud storage, the user can access them using any display device after a successful authentication. The sample implementation page for user interaction is shown in Figure 4. In the proposed model, the data about various soil characteristics such as moisture level, pH of the soil, the temperature level of soil, and level of nutrients such as nitrogen, phosphorous, and potassium present in the soil are collected and the details are sent to the cloud storage using the dedicated microcontroller. The microcontroller employed in the proposed model is ESP8266 which communicates with the sensors and sends the data to the cloud storage with the help of Raspberry Pi. On storing the data, the mobile device can access the details based on prominent authentication to be known for maintaining the proper characteristics of the soil for framing. However, the model can be extended to perform various data analyses stored in the soil database using mining techniques for more extracting more knowledge from the soil database. Here, the user is allowed to register their details with the cloud initially. While registering the user details, the personal details of the user and device details if necessary, along with the land details consisting of longitudes and latitudes for the particular user are also stored in the user profile database. Then the sensors are activated periodically, and the collected details are stored in the cloud then and there. The request is sent by the user to the cloud from the mobile app or web site for extracting the details. On seeing the request, the cloud verifies whether the device request is legitimate and verifies the authentication details provided by the user. If the user is identified as an authenticated user, then the data pertaining to a geographical location is extracted from the user database. The extracted geographical location is compared with the geographical location stored in the soil database. The records containing soil details from the soil database that matches the given geographical location is extracted and displayed in the device display. The algorithm pseudocode for displaying the soil details in the display is given in Figure 5.

```
Input: Timer, Soil_DB
Output: Data Collection
Begin
moisture_sensor_pin = A0;
ph_analog_pin = A0;
temp_sensor_pin = A0;
n_add = []; p_add = []; k_add = [] //Initializing with predefined addresses
moisture_value = 0;
ph_value = 0;
temp_value=0;
n_value, p_value, k_value = 0;
gps_value = 0;
If current_time = timer then
    //Moisture Sensor
    Enable moisture sensor
        moisture_value = analogRead(moisture_sensor_pin);
        Transmit the moisture_value to the cloud
            Store extracted moisture_value in Soil_DB
    //pH Sensor
    Enable pH sensor
        ph_value = analogRead(ph_analog_pin);
        Transmit the ph_value to the cloud
            Store extracted ph_value in Soil_DB
    //Temperature Sensor
    Enable temperature sensor
        temp_value = analogRead(temp_sensor_pin);
        Transmit the temp_value to the cloud
            Store extracted temp_value in Soil_DB
    //NPK Sensor
    Enable NPK sensor
        n_value = read(); //Reading using predefined address of nitrogen
        p_value = read(); //Reading using predefined address of phosphorous
        k_value = read(); //Reading using predefined address of potassium
        Transmit the obtained n_value, p_value, k_value to the cloud
            Store extracted n_value, p_value, k_value in Soil_DB

    //GPS Positioning
    Enable GPS module
```

Fig 3 ***Algorithm Pseudocode for Acquiring Values from Soil using Sensors***

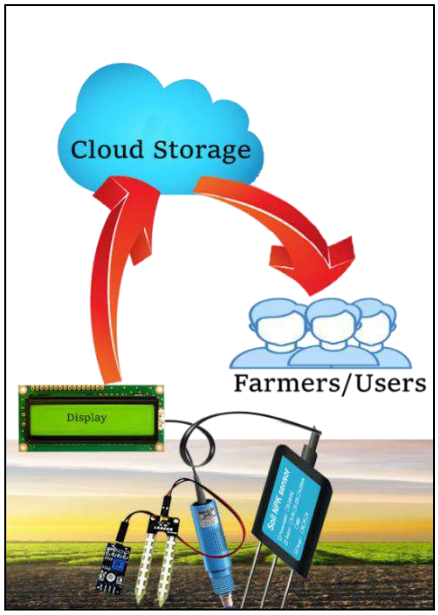


Fig 4 *User Interaction Page in System Implementation*

```
Input: Soil_DB, Device Request, User_DB
Output: Soil Characteristics
Begin

    Receive device request dev_req for accessing the database
    If dev_req is legitimate then
        Get the authentication details user_auth from the user
        If user_auth is the one stored User_DB then
            Extract geographical position gp_user for user_auth from User_DB
            If gp_user is gps_data stored in the Soil_DB then
                Extract the soil data from the Soil_DB stored in the cloud
            End If
        End If
        Display the soil details in the device display
     End If

End Program
```

.

Fig 5 *Algorithm Pseudocode for Displaying the details in the Display*

5. EXPERIMENTAL RESULTS AND OBSERVATIONS

Working of moisture sensor is observed at four different levels including i) initial day on successful implementation, ii) 2 days after implementation iii) after watering the soil, and iv) two days after watering the soil. The changes in the moisture level of the soil at various distances are noted down for analysis. From the experimental analysis, it is observed that the top-level has a higher moisture level easily, however it loses its moisture content quickly due to temperature and air. The moisture level of the soil increases by distance on an increase in time. The values obtained for different distance is presented in Table 1. The corresponding graph is also plotted in Figure 6. From the analysis, it is very clear that the moisture level varies based on time as well as distance.

Table 1 *Moisture level with Varying Distance*

Time Period	Distance (in cm)						
	2	5	10	15	20	25	30
First Day	438	346	278	234	291	328	394
2 Days Later	494	432	368	312	357	401	479
After Watering the Soil	146	184	389	382	416	484	561
2 Days Later after Watering	223	168	314	368	391	491	589

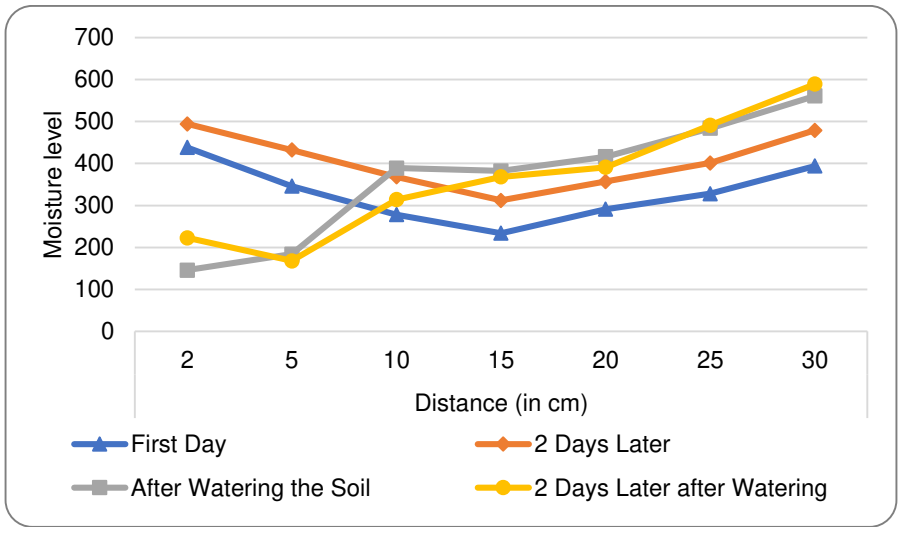
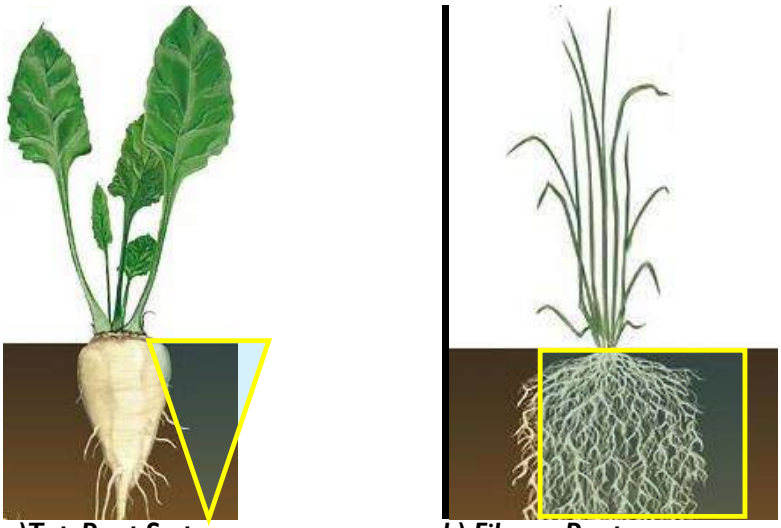


Fig 6 *Moisture Level of the Soil with Varying Time and Distance*

Moisture is one of the key factors for the growth of plants. Generally, the roots of the plants observe the moisture as far as possible for performing the process of synthesis and growth. Since all the plants do not have a similar type of roots, the depth of the roots varies based on their type. Thus, there is a direct correlation between the root depth of plants, the moisture level of the soil, and plants' growth. For example, fibrous roots grow from the base of the stem and spread horizontally. For these types of root soil moisture around the plant is necessary. However, on the other hand, taproots have a single primary root that grows deep into the soil. They are always under the surface of the soil and so adequate moisture is necessary at the position of the plants and not around them. This is shown in Figure 7. The triangle and square given in yellow color represent the moisture required region for Taproot and fibrous roots.



a)Tap Root System ***b) Fibrous Root***

Fig 7 *Moisture required region for plants having different roots*

The average pH value of the soil is measured at five different locations by varying depths at four different periods such as i) initial day on successful implementation, ii) 2 days after implementation iii) after watering the soil, and iv) two days after watering the soil. The experimental analysis is performed by detecting the average pH value at 5 different locations at various depths such as the surface of the soil (0 cm), 10 cm, 20 cm, 30 cm, and 40 cm respectively. The obtained results are presented as a graph in Figure 8. From the analysis, it is clear that the pH value increases with an increase in the soil depth.

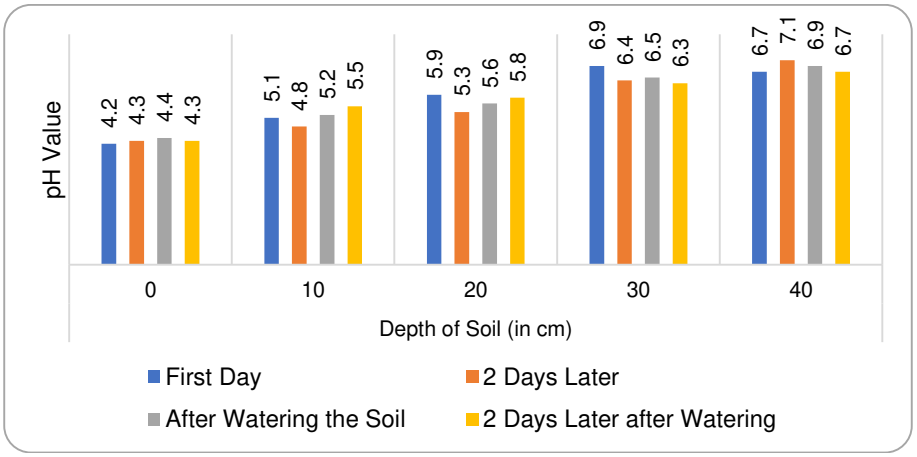


Fig 8 ***Average pH Value of the Soil with Varying Time and Depth***

The temperature of the soil is analyzed by taking the reading by varying the depths as 0cm, 10 cm, 20 cm, 30 cm, and 40 cm at four different time period such as i) initial day on successful implementation, ii) 2 days after implementation iii) after watering the soil and iv) two days after watering the soil. Also, the reading is noted at various times in a day such as 6.00 am, 12.00 Noon, 6.00 pm, and 12.00 midnight. The obtained results are presented in Table 2 which also contains the average value. For easy analysis, the meantime given in table 2 is also presented as a graph in Figure 9.

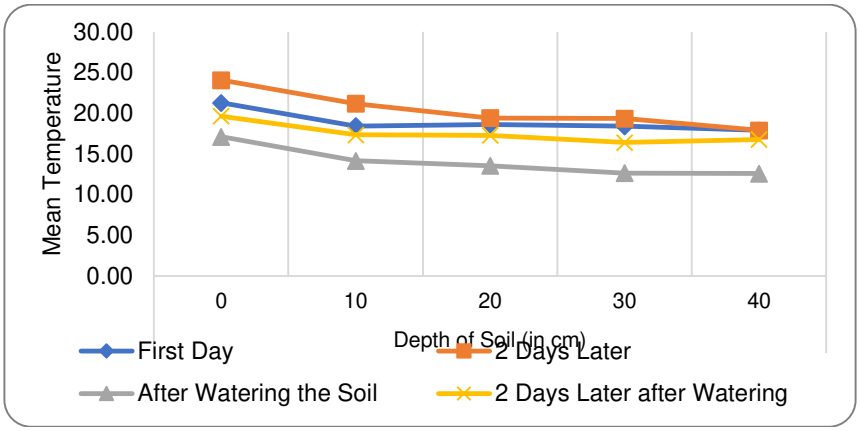


Fig 9 ***Soil Temperature Analysis Graph***

Table 2 ***The temperature of the Soil with various Depth, Time Period and Time***

Time Period	Soil Depth	Various Time in a Day				
		6.00	12.00	18.00	24.00	Mean
First Day	0	14.8	28.3	26.7	15.3	21.28
	10	15.4	17.2	19.5	21.6	18.43
	20	18.6	18.8	18.3	18.8	18.63
	30	17.8	18.2	18.7	18.9	18.40
	40	17.2	17.9	18.2	18.3	17.90
2 Days Later	0	17.5	30.2	29.5	19.1	24.08
	10	18.3	19.2	22.8	24.4	21.18
	20	19.2	19.6	19.1	19.7	19.40
	30	19.4	19.5	19.2	19.3	19.35
	40	17.2	17.9	18.2	18.3	17.90
After Watering the Soil	0	11.5	23.1	21.4	12.4	17.10
	10	12.3	14.7	16.4	13.2	14.15
	20	13.2	13.4	13.7	13.9	13.55
	30	12.7	12.5	12.6	12.8	12.65
	40	12.4	12.9	12.7	12.3	12.58
2 Days Later after Watering	0	13.3	26.5	24.5	14.23	19.63

	10	13.4	16.7	18.9	20.4	17.35
	20	17.2	17.2	17.5	17.2	17.28
	30	16.2	16.5	16.3	16.6	16.40
	40	16.4	16.2	17.3	17.2	16.78

From the graph, it is clear that the temperature is more during 12.00 Noon and 6.00 pm at the surface than at the depths. The temperature of the soil is decreasing on increasing the depths whereas the temperature of the soil is very minimum after watering the soil than on normal days. Similarly, soil nutrients are most significant and thus the analysis has been made by varying the depths as 0cm, 10 cm, 20 cm, 30 cm, and 40 cm at four different time period such as i) initial day on successful implementation, ii) 2 days after implementation iii) after watering the soil and iv) two days after watering the soil. The presence of nitrogen, phosphorous, and potassium is identified and the percentage of NPK values is presented as a graph in Figure 10.

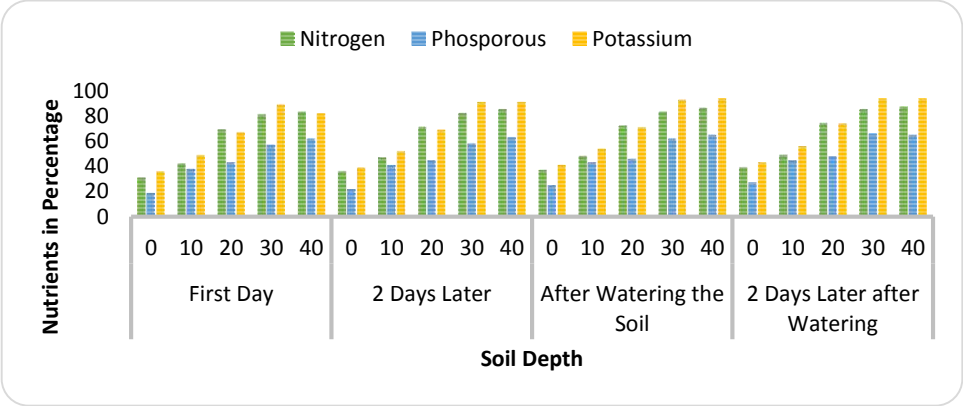


Fig 10 ***Soil Nutrients Analysis Graph***

From the analysis, it is clear that the level of nitrogen, phosphorous, and potassium level of the soil also varies based on the depth and time variance. Thus, the depth and time is the most significant parameter to be considered in each process of plantation. Based on the extracted knowledge, the user or the farmer can get adequate knowledge which will be highly helpful in crop cultivation. Though the model records the various soil characteristics in the cloud storage and retrieves them based on the request from the user, the model can be extended to analyse the data stored and apply mining techniques for extracting useful knowledge.

6. CONCLUSION

Owing to the importance of agriculture, the optimal development of the crops with sufficient nutrition is considered to be the most essential for improving the productivity of agriculture based on its global position. For the potential development of a crop, the value of NPK is much more important to add additional minerals and organic fertilizers. Not only the information regarding the level of nutrition in the soil is imperative but also other details such as pH of the soil, moisture and the temperature of the soil are also necessary for the proper growth of the crops. Through IoT, smart farming is enabled to identify the soil characteristics for achieving better crop production. The proposed model highly focuses on recording NPK values, moisture level, temperature, and pH of the soil through IoT enabled devices and sensors in the database which is then stored in the cloud to identify the better irrigation of a crop in a specified location. The details stored about the soil in the cloud storage can be then retrieved by the users at anytime and anywhere. The results of the proposed model show the importance of each soil characteristic such as moisture, pH, and nutrients level of the soil. The future work can be enhanced by analyzing the data stored in the cloud using various mining techniques for effective results in which it can analysis the soil and other weather conditions and then recommend the crops that are suitable for cultivation on a specific land.

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SP-8

Current Status Of Carbapenem Resistance In Tertiary Care Referral Hospital In South India

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Abstract: The continuing increase and regional –wise varying pattern of prevalence of muti-drug resistant carbapenem- resistance urges the need of determination of current scenario in multispecialty tertiary care center in south India. Method: This prospective and consecutive analysis included 1391 gram –negative bacilli which were recovered from 2658 clinical specimens collected over a period of 4-years.Using standard protocol, all clinical specimens were subjected microbiological analysis .The antibiotic susceptibility and minimum inhibitory concentration for each isolate was evaluated by vitek 2 compact system and phenotypic test .According to the CLSI criteria, ertapenem resistance defined as an MIC of =2µg/ml,and meropenem,imipenem , and doripenem resistance defind as an MIC of =4µg/ml.Of the 1391 GNB, 560 (40%) were carbapenem –resistant MDR isolates and the rate of carbapenem resistance was found to be higher in Citrobacter freundii (100 % 4 of 4).k.penumoniae exhibited resistance was noted among Citrobacter freundiire recovered from respiratory specimens (100 % 2 of 2) and blood specimens (100 % 2 of 2) followed by Enterobacter aerogenes recovered from urine specimen (73 % ; 8 of 11), and K.Pneumoniae (70% ; 14 of 20) and P.aeruginosa (70 % ; 26 of 37) from pus & wound swabs specimens.A steady increase carbapemem –resistance was noted in the past four years and it more prevalence among Klebsiella pneumonia and the rate of carbapenem
resistance identified was higher in Citrobacter freundii, Enterobacter aerogenes (57%; 8 of 14) than Klebsiella pneumonia (49 %; 326 of 667) and P.aeruginosa (43 %;50 of 118) Thus , thesignificant CRE prevalence rates recorded in different parts of India emphasize the need for controlling the further dissemination of CRE.

Keywords: MDR, Carbapenem – resistance, Gram – negative bacilli, MIC, Prevalence of MDR

INTRODUCTION

Bacterial resistance poses to the major threat in public health world-wide and medical progress (Nordmann, 2014). It is continuing to increase and changing regional-wise susceptibility pattern rapidly and the steady trend of resistance has leads to emergence of multi drug resistance (MDR) bacteria(Logan & Weinstein, 2017; Nordmann, 2014; Nordmann & Poirel, 2014)**.**Rates of MDR amongst gram-negative bacilli (GNB) have increased markedly world-wide during past decade(Logan & Weinstein, 2017; Nordmann, 2014; Nordmann & Poirel, 2014).In addition, infections caused by MDR bacteria are associated with significantly higher mortality rates than infection caused by GNB that are susceptible to antimicrobial agents(Jean et al., 2013).Since, negligible toxicity and higher potency against MDR GNB, carbapenems become the preferred last resort antibiotics for the treatment for MDR GNB infections(Jean et al., 2013).As a results, they are often used as "last-line agent" when patients with infection become gravely ill or organisms become MDR hence limiting treatment option for infections(McKenna, 2013)**.**
As a result, which in turn there have been emergence of carbapenem-resistance bacteria mostly due to production of carbapenemase, which are β -lactamase enzyme with capacity to hydrolyse not only the carbapenems but also all the other β-lactum agents and most are resistant against inhibition by β-lactamase inhibitors(Queenan & Bush, 2007). Isolates with carbapenemase-mediated resistance are of special clinical concern because multi-institutional outbreaks haven reported world-wide(Patel et al., 2009). The regional-wise surveillance and current treading of carbapenemase-mediated resistance will influence decision making among clinician about the rational use of carbapenems(Datta & Wattal, 2010; Hawkey & Livermore, 2012; Jean et al., 2013; Livermore, 2012; Meletis, 2016). It is therefore the understand of carbapenem resistance trend in south India, Coimbatore region will definitely help in selection of appropriate empirical antibacterial agents while treating the MDR GNB infections. Hence, the aim of the study was determined the current scenario of prevalence of carbapenem resistance and antibacterial resistance pattern of carbapenem resistance bacterial pathogens isolated from hospital acquired infections in referral hospital in south India.

MATERIAL AND METHODS

Setting & Patients

This prospective and consecutive analysis was conducted after the approval of the Institutional Review Board at a multispecialty tertiary care referral hospital, KGM Hospital Coimbatore, South India between 1[st]January 2018 and 31[st]December 2020. Gram-negative bacilli

(GNB) recovered from clinical samples, blood, urine, stool, pus, wound swab, drainage fluids, sputum, endotracheal secretion, bronchoalveolar lavage, CSF & other body fluids collected from patients hospitalized in different speciality unit, as well as from OPD patients coming to the hospital for treatment between the period of 2018-2020 were included in this study.

Laboratory Procedure:

Using standard protocol, all clinical specimens were subjected microbiological analysis(Collee J G, Miles R S, 1996).The bacterial pathogens isolated were identified and antibiotic susceptibility testing were done using biochemical identification and Kirby-Bauer standard disc diffusion method and the same were confirmed by Vitek 2 Compact System (Biomerieux, France)(Bauer et al., 1966; Pawar et al., 2016; Tamma et al., 2016, 2017; Tamma & Simner, 2018; Wayne, 2018).Quality control was performed according to the Clinical Laboratory Standards Institute (CLSI) performance standards, recommendations, guidelines, and reports. Antibiotic susceptibility profiles and minimum inhibitory concentration (MIC) were evaluated also phenotypic test for the detection ofβ -lactamases and carbapenemases(Bauer et al., 1966; Pawar et al., 2016; Tamma et al., 2016, 2017; Tamma & Simner, 2018; Wayne, 2018).Carbapenem a resistance was defined according to the Clinical and Laboratory Standard Institute criteria, with ertapenem resistance defined as an MIC of ≥2µg/ml, and meropenem, imipenem, and doripenem resistance defined as an MIC of ≥ 4 µg/ml. *E.coli* ATCC 25922 and *P.aeruginosa* ATCC 27853 were used as quality control strains for each run of MIC test. MIC testing was repeated if the results for ATCC strains were outside the expected range recommended by the CLSI(Bauer et al., 1966; Pawar et al., 2016; Tamma et al., 2016, 2017; Tamma & Simner, 2018; Wayne, 2018). All microbiological procedures were performed by certified microbiologists.

RESULTS

Table 1summarizes pattern of clinical specimens were analysed over a period of four years. A total of 2658 clinical specimens were subjected to microbiological analysis, culture and antibacterial susceptibility testing, of which, 1502(56.4%) were found to be positive for bacterial growth. Of the 1502, 1391(93%) were gam-negative bacilli and these 1391 non-repetitive isolates were included in this study Of 1391 GNB, 560(40%) were carbapenem-resistant MDR isolates (i.e., resistant to at least three or more classes of antimicrobial agents) and the remaining 831(60%) were susceptible to carbapenem antibiotics. The predominant GNB isolated was *Klebsiella pneumoniae* (48%; 667 of 1391) followed by *Acinetobacter baumannii (*24%; 340 of 1391), *E. coli* (11%; 158 of 1391) and *P. aeruginosa* (8.3%; 115 of 1391). The rate of carbapenem resistance identified was found to be higher in *Citrobacter freudii* (100%; 4 of 4), *Enterobacter aerogenes* (57%; 8 of 14) than *Klebsiella pneumoniae* (49%; 326 of 667) and *P. aeruginosa* (43%; 50 of 118) **(Table 2).** The in-vitro antibacterial resistance pattern of carbapenem-resistant GNB isolates to other antibacterial agents are presented in **table 2.** The *Klebsiella pneumoniae* exhibited resistance to highest number of antibiotics followed by *P.aeruginosa*. The in-vitro antibacterial resistance of GNB isolates to carbapenem antibiotics clinical specimens wise are documented in **table 3.** The higher rate of MDR carebapenem resistance was noted among *Citrobacter freundii* recovered from respiratory specimens (100% 2 of 2) and blood specimens (100%; 2 of 2) followed by *Enterobacter aerogenes* recovered from urine specimen (73%; 8 of 11), and *Klebsiella pneumoniae* (70%; 14 of 20) and *P.aeruginosa* (70%; 26 of 37) from pus& wound swabs specimens. **Figure 1** depicts the yearly distribution of recovery of GNB and detection of carbapenem-resistant bacterial isolates. It is observed that the rate of recovery carbapenem-resistant MDR found to be higher (55%; 359 of 199) in 2020. There is a steady increase noted in occurrence carbapenem resistance.

DISCUSSION

Bacterial resistance is an ever-evolving survivaltactic that has enabled bacteria to outlast available antibiotics. Resistance among GNB is not necessarily new phenomenon. Organisms, such as *Pseudomonas aeruginosa* have always had a unique ability to evade new antimicrobial therapeutics and develop resistance. The biological pressure imposed by the continuous exposure to different antibiotics during clinical application has led to the cumulative acquisition of resistant traits in major human pathogens resulting in multidrug-resistant (MDR)(Ruppé et al., 2015). Among the emerging MDR bacteria are the extended spectrum β -lactamase-producing (ESBL) *Klebsiella pneumoniae* and *Escherichia coli*, carbapenem-resistant Enterobacteriaceae (CRE) and multi drug resistant *Acinetobacter baumannii* (MRAB)(Ssekatawa et al.,2018).Carbapenemase-producing Enterobacteriaceae were only occasionally observed until the 1990s, but since the late 1990s, KPC-producing *K. pneumoniae* spread globally and are endemic in the USA, Israel, Greece, and Italy, with a carbapenem resistance prevalence of 60.5 % being recorded in 2012 in Greece(Papp-Wallace et al., 2011). This study found that 40.2% of GNB isolates demonstrated an MDR profile with carbapenemase production, and this is similar to Wattal *et al*(Okoche et al., 2015). study conducted in a tertiary care hospital in Delhi, reported a high prevalence of carbapenem-resistant, ranging from 13% to 51%. Whereas Moolchandani *et al* (K Pawar et al., 2020)reported 55.7% MDR GNB in patients in ICU of hospital in South India and Jaggi *et al.* reported 29.5%carbapenem-resistant in North India, 12.3% in Central India(Nair, 2013), and Pawar *et al.* reported 31.8% carbapenem-resistant GNB in Western India. The present study was carried out in 1391 GNB isolates recovered from patients who were already receiving antimicrobials before hospitalized in and presented to OPD and most of the GNB isolated from clinical specimens recovered patients who already undergo invasive procedures(Porwal et al., 2014).These factors, previous medical treatment and longer duration of hospital stay might have contributed for the high prevalence of CRE in the study. The prevalence of rate of CRE is high even in developed countries. Logan *et al*. depicted a global map that highlights dramatic worldwide dissemination of carbapenemmase gene by country and region(Logan & Weinstein, 2017). The prospective, multinational European Survey reported 35% *Klebsiella pneumoniae* and 19% of *E. coli* possess a carbapenem-resistant gene(Grundmann et al., 2017). Similarly, A study reported

35% carbapenemase-producing bacterial isolates in Philippines(Velasco et al., 2017). Greece reported highest carbapenem-resistant GNB, in 2001 survey carbapenem resistance reported as <1% and this increased to 30% in hospital wards and 60% in ICUs by 2008(M. et al., 2010).Israel was second country (after the United States) report outbreaks of infections caused KPC- producing *K.pneumoniae* in Tel-Aviv during 2004-2007 outbreak with 55.5 incident of carbapenem-resistant *K.pneumoniae* infection per month per 100,000 patients(Leavitt et al., 2007; Schwaber et al., 2011).North American datasets analysis reported 50% of all CRE isolates tested appear to be CRE(Guh et al., 2015).Most recently, a population and laboratory based surveillance study of 7 US metropolitan area during 2012-2013 found an overall annual CRE incidence of 2.93 cases per 100,000 population(Guh et al., 2015). Our prevalence is also much higher than that obtained in studies from China(Hu et al., 2014) and Germany(Miró et al., 2013) as well as in a surveillance study in Spain which reported carbapenems encoding gene prevalence of 0.04%. These differences may be due to restricted use of antibiotics in these countries compared to India where most drugs are available over the counter without prescription by a clinician.[39] Our findings are however comparable to those observed in Nigerian(Yusuf et al., 2013), where a study reported a prevalence of 33.5%in a hospital setting. Study in Uganda reported a prevalence of the carbapenems phenotype of 22.4% and genotype of 28.6% among Enterobacteriaceae resistant to third generation cephalosporins(Okoche et al., 2015).Across the globe, the researchers have observed carbapenem resistance is continuously increasing and divergent in prevalence rates. The complexity of the overall problem is reflected by the use of different carbapenems in hospitals, differences in susceptibility breakpoints, inadequate level of infection control, and low availability of rapid diagnostic methods to facilitate early appropriate interventions in patients who are either colonized or infected by carbapenem-resistant pathogens(Nordmann & Poirel, 2019). Far more worrying is the on-going dissemination of carbapenem-resistant *Enterobacteriaceae*, majorly contribute to the intrinsic human gut flora. Further carbapenemas producing *Enterobacteriaceae* are spread rapidly because of horizontal transmission of plasmid encoding genes responsible for carbapenemase production. This is occurred mainly by faeco-oral route in community acquired infections as well as in hospitalised patients("Overcoming Antibiotic Resistance," 2019).The gut microbiome is constantly challenged by biotic and abiotic perturbations. Antibiotics represent the most acute of these challenges, as they inhibit or kill microbes by targeting conserved cellular processes. Periodic antibiotic exposure, through therapy or contamination, resulting in both acute and persistent microbiome reconfigurations. This means changes in the relative and absolute abundance of microbial species and their encoded functions, including potential permanent loss and gain. The suite of genetic determinants that enable microbiome resistance to antibiotics. In the present study, higher rate of MDR carbapenem resistance seen among *Citrobacter freundii (*especially recovered from respiratory specimens &blood), *Enterobacter aerogenes* (from urine), *Pseudomonas aeruginosa* (from wound specimens) and *Klebsiella pneumonia* (wound specimens).*Citrobacter* infections usually supervene upon debilitated, hospitalized patients, with multiple comorbidities, who are at increased risk of acquiring a *Citrobacter* strain in the hospital environment(Samonis et al., 2009).The rational choice of antimicrobial therapy for *Citrobacter* infections can be problematic, since the dissemination of MDR frequently evidenced(Samonis et al., 2009). *Enterobacter* infections can be acquired from exogenous as well as endogenous sources being ubiquitous in nature as a saprophyte in soil and sewage and as a commensal in human gastrointestinal tract. In health care settings, infections mainly due to endogenously from previously colonized sites in an infective individual, mainly the colonization of the gastrointestinal tract with Enterobacter spp. in the debilitated patients. Colonization leads to infection mainly because of prolonged hospital stay, debilitating underlying illnesses, immunosurveillance and indwelling devices/ implants have been risk factors for Enterobacter spp. MDR strains infection in dissemination. Carbapenem resistance among Enterobacter sp. Is largely documented.

Tables and Figures

Table 1. Carbapenem susceptible and resistance pattern of gram-negative bacilli according to the clinical specimens received

S.N	Name / Type of Clinical Specimens	Total no. of specimens subjected microbiological analysis	No. of specimens that showed positive growth for bacteria alone	%	No. of specimens showed culture-postive for gram-negative bacilli (GNB)	No. of isolates that showed susceptibility to carbapenem group of antibiotics	%	No. of isolates that showed resistance carbapenem group of antibiotics	%
1	Sputum & respitatory tract specimens	985	682	69.2	643	423	65.7	220	34.2
2	Urine	630	338	53.6	328	180	54.8	148	45.1
3	Blood	524	218	41.6	206	110	53.3	96	46.6
4	Pus & wound swab	460	234	50.8	190	103	54.2	87	45.7
5	Body fluids	59	30	50.8	24	15	62.5	9	37.5
	Total	2658	1502	56.5	1391	831	59.7	560	40.2

Table 2. Comparative in-vitro antibacterial resistance of gram-negative bacterial isolates recovered from clinical specimens (Sputum/ other respiratory specimens, urine, blood, pus/wound swabs, and body fluids)

Name of the GNB isolates	No. of isolates recov-ered	No. of isolates resistant to carbapenem antibiotics	% of antibiotics resistance of GNB obtained in the study																								
			CXM	CTX	CAZ	CFM	CPM	CPZ	IPM	MRP	ETP	DOR	CIP	OF	LE	AMP	AMC	P	A/S	Ak	COT	DO	NET	TGC	CL	AT
Klebsiella pneumoniae	667	326	48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8	48.8	49	48.8	49	100	100	100	98.3	75	100	31	31	7.1	5	2.9
Acinetobacter baumannii	340	118	34.7	34.7	34.7	34.7	34.7	34.7	34.7	34.7	34.7	34.7	35	34.7	35	100	100	100	56.3	89	89.3	79	79.1	3.6	3.6	3
Escherichia coli	158	36	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	23	22.7	23	100	100	100	100	89	86	47	47	23	22.7	1.8
Pseudomonas aeruginosa	115	50	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43.4	43	43.4	43	100	100	100	100	28	100	100	100	50	50	50
Proteus vulgaris	37	6	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16.2	16	16.2	16	100	100	100	100	67	50	83	83	3	0	0
Proteus providencia	33	8	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24.2	24	24.2	24	100	100	100	100	75	62.5	50	50	50	0	0
Citrobacter diversus	23	4	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17.3	17	17.3	17	100	100	100	78.2	100	100	100	100	0	0	0
Citrobacter freundii	4	4	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	19	100	98	98	0	0	0
Enterobacter	14	8	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57.1	57	57.1	57	100	100	100	100	75	100	50	50	0	0	0

aerogenes		
Total	1391	560

Note: CXM- Cefuroxime (30 mcg/disc); CTX- Cefotaxime (30 mcg/disc); CAZ- Ceftazidime (30 mcg/disc); CFM- Cefixime (5 mcg/disc); CPM- Cefepime (30 mcg/disc); CPZ- Cefoperozone (75 mcg/disc); IPM- Imipenem (10 mcg/disc); MRP- Meropenem (10 mcg/disc); ETP- Etrapenem (10 mcg/disc); DOR- Doripenem (10 mcg/disc); CIP- Ciprofloxacin (5 mcg/disc); OF- Ofloxacin (5 mcg/disc); LE- Levofloxacin (5 mcg/disc); AMP-Ampicillin (10 micg/disc); AMC- Amoxyclav (20/10 mcg/disc); P- Pencillin- G (10 units); A/S- Ampicillin/ sulbactum (10/10 mcg/disc); AK- Amikacin (30 mcg/disc); NET- Netillin (30 mcg/disc); DO- Doxycycline hydrochloride (30 mcg/disc); CO- Co.trimoxazole (25 mcg/disc); TGC- (15 mcg/disc); CL- Colistin (10 mcg/disc); AT- Aztreonam (30 mcg/disc)

Table 3. Comparative in-vitro antibacterial susceptibility and resistance pattern of carbapenem antibiotics to gram-negative bacterial isolates recovered from clinical specimens (Sputum/ other respiratory specimens, urine, blood, pus/ wound swabs, and body fluids)

Table 3. Comparative in-vitro antibacterial susceptibility and resistance pattern of carbapenem antibiotics to gram-negative bacterial isolates recovered from clinical specimens (Sputum/ other respiratory specimens, urine, blood, pus/ wound swabs, and body fluids)

Name of the GNB isolates	No. of isolates recov-ered	Sputum/ other respiratory specimen		Urine		Blood		Pus & Wound Swabs		Body Fluids	
		% of isolates showed susceptibility to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed resistance to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed susceptibility to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed resistance to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed susceptibility to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed resistance to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed susceptibility to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed resistance to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed susceptibility to carbapenem antibiotics/ Total No. of isolates tested	% of isolates showed resistance to carbapenem antibiotics/ Total No. of isolates tested
Klebsiella pneumoniae	667	50.9% (207/407)	49.1% (200/407)	53.1% (102/192)	46.9% (90/192)	55% (22/40)	45% (18/40)	30% (6/20)	70% (14/20)	50% (4/8)	50% (4/8)
Acinetobacter baumannii	340	61.1% (129/211)	39.9% (82/211)	66.7% (6/9)	33.3% (3/9)	76.2% (48/63)	23.8% (15/63)	74.5% (35/47)	25.5% (12/47)	40% (4/10)	60% (6/10)
Escherichia coli	158	85.7%(18/21)	14.2%(3/21)	69.4%(59/85)	30.5%(26/85)	76.9%(10/13)	23.0%(3/13)	89.7%(35/39)	10.2%(4/39)	0	0
Pseudomonas aeruginosa	115	66.6%(34/51)	33.3%(17/51)	100%(2/2)	0	75%(18/24)	25%(6/24)	29.1%(11/37)	70.2%(26/37)	0	100%(1/1)
Proteus vulgaris	37	89.4%(17 /19)	10.5%(2/19)	66.6 %(4/6)	33.3%(2/6)	100%(10/10)	0	0	100%(2/2)	0	0
Proteus providencia	33	85.1%(23/27)	14.8(4/27)	0	100%(1/1)	100%(2/2)	0	0	100%(3/3)	0	0
Citrobacter diversus	23	100%(15/15)	0	50%(4/8)	50%(4/8)	0	0	0	0	0	0
Citrobacter freundii	4	0	100%(2/2)	0	0	0	100%(2/2)	0	0	0	0

Enterobacter aerogenes	14	100%(2/2)	0	27%(3/11)	73%(8/11)	0	0	0	0	100%(1/1)	0
Total	1391										

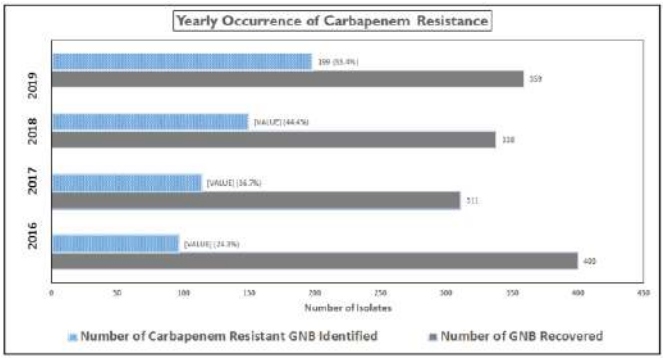

Fig 1. Depicts the yearly distribution of recovery of GNB and detection of carbapenem-resistant bacterial isolates

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Review On The Various Defect Detection Methods In Digital Image ProcessingFor Plants

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Abstract: Digital Image Processing is one of the important domains in Computer Science filed. Image processing is the discipline of manipulating an image (Hlavac et al 1999). It includes a huge number of methods which are present in several applications. These techniques can improve or distort an image, highlight specific features of a picture, develop a new image from sections of other images, reinstate an image that have been degraded throughout or after the image acquiring stage, and so on (Crane 1997). Digital image processing deals with the manipulation of digital images captured by digital devices. Defect detection using Digital Image Processing is highly recommended in automation defect detection system which works much better than manual defect detection. Using digital image defect detection, defects can be identified fast and accurate manner. This paper discusses the topic based on past research paper in defect deduction and also studies the image processing techniques to detect defects.

Keywords: Defect detection, Noise reduction, Image processing.

1. INTRODUCTION

Sight is the highly potent of the five senses – view, hear, touch, smell and taste – those humans apply to perceive their environment. Human beings who were sanctified with eyesight start obtaining the images around them instantaneously after their dawn. Executing, analyzing and perception of images then become more or less a routine (Chen 1998). In reality, more than 98% of the tasks of the human brain are equipped with processing images from the optical cortex (Dougherty 2009). Agriculture is avital source of income for Indian people. Farmers can produce variety of crops but diseases hinder the growth of crops. One ofthe main factors responsible for the crop obliteration is plant disease. Various plants suffer from dissimilar diseases (Sanjay et al 2013). The main component of plant to examine the disease is leaf. Image processing technique plays a vital role in identification of leaf diseases (Arti et al 2013).

2. Steps In Digital Image Processing

In all the purposes of image processing, image acquisition is the primary step. Several electromagnetic and few ultrasonic sensing devices are commonly arranged in the structure of a 2-D array. The retort of every sensor is proportional to the illumination energy deteriorating onto the plane of the sensor. Normally image acquisition stage includes preprocessing like scaling (Gonzaleset al 2005)[4]. The easiest and most appealing topic of digital image processing is the image enhancement. It is a subjective method. The objective is to process the image such that the result is highly suitable than the original picture for a specific usage. The word particular (specific) is important since the methods for enhancing one category of images might not be suitable for another category, eg., X-ray sheet and space craft picture.

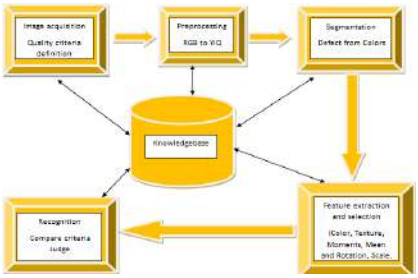

Figure 1 Steps in Image Processing

Image restoration aims to reconstruct or recover a picture that has been ruined by using former knowledge of degradation incident and is developed on the basis of mathematical and probabilistic methods of image degradation. This involves deblurring of images ruined by the limitations of a sensor or the environment, noise filter, and correcting geometric distortion or nonlinearitiesbecause of sensors (Jain 1989)[5]. Image analysis techniques need extraction of certain features that assists in the identification of the entity. Segmentation techniques are applied to isolate the required object from the scene such that measurements can bedone on it consequently. Segmentation partitions the image into its constituent parts or objects. The stage to which the subcategory is carried depends on the issue being solved. Representation & description almost pursue the output of a segmentation level, which is normally raw pixel data, comprising the boundary of the region, i.e. Collection of pixels separating

one area to another or all the connections in it. In both case, converting data to an appropriate form for computer handling is necessary. Description is also named as feature selection. It works upon extortion of the attributes that comes up in some quantitative detail of interest or is fundamental for differentiating one category of object from another category. Recognition is aprocedure that assigns a label to an entity, based on its descriptors.

3. DIGITAL IMAGES

A picture is described as a two-dimensional illustration of a 3D entity. A digital image consists of a fixed number of components, named as picture element or pixels, characterized by the mathematic function f(a,b), where a and b are the verticaland horizontal parameters. The significance of f(a,b) at any location characterize the pixel value of a picture at that location.

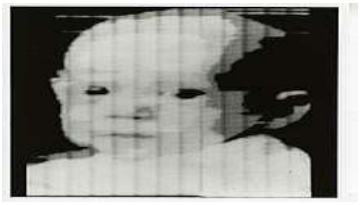

Figure 2 First Digital Photograph

4. IMAGE PROCESSING APPLICATIONS

The recent development in computer field has applied image processing techniques in several fields such as biological image assessment, disease identification, medical and industrial usages, astronomy, forensic medicine, automatic element recognition, military locations, quality verification, etc.,

5. CONVENTIONAL IMAGE PROCESSING APPLICATIONS

Region identification, quality checking and process verification are computer-assisted techniques designed for vision methods. In the military zones, image improvement and pattern identification procedures are included. Gesture and sign communication identification systems have been created for human machine interactions. In the areas such as forensic medications and law enforcements, image improvement, finger print identification, face recognizing, signature checking are performed by image processing methods (Savita et al 2014) [32,50].

Figure 3 Applications of Image Processing in Agriculture

In the field of medicine majority of the diseases are diagnosed through medical image processing. Pictures of blood vessels are produced by angiography. To study about a particular part a catheter is needled into a blood vessel and assisted. While the catheter nears the part to be investigated another element like an x-ray is sent through the catheter. Irregularities are detected in blood vessels using an image subtraction method over pre and post contrasted pictures.

6. LITERATURE REVIEW

The studies in the literature are chosen for review depending on the denoising and detection of defects in different plants whichhelps in Agriculture. Gupta et al 2013 prospounded in their research work, denoising of images applying several thresholding methods namely Sure Shrink, Visu Shrink and Bayes Shrink (Rekha&Shailja 2016). They show results of various approaches of wavelet oriented image denoising techniques and expanded the existing technique and presented a comprehensive assessment of the proposed method (Shokhan 2014). The results provided on a range of noise, namely: Gaussian, Poisson's, Salt and Pepper, andSpeckle have been obtained in their work. SNR and MSE are as a evaluate of the quality of denoising was chosen (Pooja&Yuvraj 2012). Wavelet algorithms are very useful tool for signal processing namely image compressing and image denoise. Boyat& Joshi (2013) explored a novel image denoising algorithm related to a joint effect of wavelet transformation and median filter. The method eliminates the noise from the picture and enhances the quality (Phakade et al 2017). The stage of wavelet decompositionis restricted to three. The familiar index Peak Signal to Noise Ratio and Root Mean Square Error reveal marked improvement ofimage denoising higher than other techniques[7]. Ruikar&Doye (2010) presented a new technique of threshold function designed for image denoising methods. This applies wavelet

transform in association with the threshold process to remove noise. Normally,Bayes Shrink, Visu Shrink, normal shrink and Sure Shrink are evaluated with this threshold function. Liwen Dong (2013) presented a method by presuming that the deviations of the noise and the actual wavelet coefficients of picture are not forever the identicalacross the scales. The presented technique involves not only the correlation of intra scale wavelet coefficients also involves theassumptions. The proposed denoise threshold method can adaptively change itself on the base of its position and decomposing scale and confirmed its effectiveness through replications with images grimed by additive white Gaussian noise and evaluate it with the classical threshold technique[9]. Li Hongqiao& Wang Shengqian (2009) exhibited that the decomposed noisy image in order to acquire different subband picture. The low-frequency wavelet coefficients unaffected, and then the association of horizontal, vertical wavelet coefficients and contrast them with Donoho. After this soft-threshold denoising technique is applied to obtain image denoising. Finally denoised image is obtained by inverse wavelet transformation. Experimental result proves that the proposed method compared with soft-threshold denoising technique has a higher PSNR and visual effects. Liu Fang & Biao Yang (2012) determined the decomposition structure the signal-to-noise ratio to approximate the distribution of the denoising in orderto find additional denoisingsubbands to decomposition. The adaptive decomposition structure of wavelet packets is worked outand with newer and low computational complexity than a previous computed optimal basis selection technique is designed. Toperform denoising the ADDWP coefficients, a statistical method is computed to exploit the association of the coefficients in order to differentiate the noise and the signal. This denoise technique gives better result than several state-of-the-art DDWT- based techniques for images with rich directional characteristics and the illustrative quality of images denoised by this technique is also superior[11]. Basvaraj& Rajesh (2011) created a novel multilayered back propagation neural network classification technique, which applies the combination of color and texture dependent recognition techniques to recognize uninfected and spoiled fruitsand vegetables(Al-Hiary et al 2011;|yotismita &Ranjan 2011). The digital pictures of normal and spoiled banana, chilli and tomato images are confined by high resolution digital camera. The hue, mean, median, standard deviation, saturation and intensity values are computed and training given to the back propagation neural network classifier. The results are computed between the healthy and infected picture of fruits and vegetables. The largest recognition and categorization accuracy is 88% for spoiled fruits, vegetables and 80% for healthy commercial crops. The entire classification accuracy is about 80%[12]. Qinghai et al (2013) developeda color and image enhancement evaluation to detect the pests and disease spoiled cotton leaves (Mahmood et al 2011). The pictures of uninfected and stained cotton leaves are acquired by high resolution digital camera and developed by digital image processing methods. The RGB color picture is converted into gray scale, HIS and YCbCr images. The histogram and histogram equalization methods are plotted for uninfected and infected gray scale cotton pictures. The comparisons of results showed very good accuracy in identifying the disease infected cotton leaves[38]. Sanjay (2011) designed an image segmentation method to identifydisease severity and spoiled area of the sugarcane leaves. The basic threshold segmentation techniques are taken to calculate infected area of the sugarcane leaves. The triangle threshold segmentation methods are considered to segment the infection region. Applying these techniques, accuracies of 98.60% are reported in recognition of the infected region in sugarcane leaves. Pokharkar&Thool (2012) designed a contemporary machine vision technique to notice tormentor infected rose leaves. The digital pictures of affected rose plant leaves square measure non inheritable by a high-resolution camera. The image space growingand image segmentation methodology square measure thought-about to calculate the proportion of the infected portion of the rose leaves. Mistreatment these strategies, accuracies of sixty seven square measure determined for recognitionof tormentor affected in rose leaves[24]. Sabah & Sharma (2012) identified a color and texture analyzes to detect healthy andinfected malus domestic leaves. The digital picture of healthy and affected leaves are acquired by high resolution digital camera. The RGB color pictures are converted into a gray scale picture and the histograms are plotted for all healthy and affected grayscale picture of malus domestic leaf. At last, the results are compared to detect disease affected malus domestic leaf. Manoj et al (2012) designed a modern histogram-based method to identify the blast and bacterial leaf blight diseases that are infected in paddy leaves. The digital picture of healthy and affected paddy leaves is acquired by high resolution digital camera. The RGB color pictures are changed into a gray scale image and the histograms are designed for healthy and affected gray scale paddy leaf pictures. Atlast, the results are compared to detect infected paddy leaves. Applying these methods, accuracy of 92% is identified in recognition of the affected region in the paddy leaf. Jagadeesh et al (2013) designed a segmentation technique and neural network classifier method to recognize strong and anthracnose disease that influence over mango, grape and pomegranate fruits. The thresholding, region developing and k means clustering method are applied to separate the anthracnose disease affected areas if the fruits and the percentage of anthracnose disease affected areas is computed. The texture features are extorted from the run- length matrix. These hauled features are loaded in neural network classifiers to categorize uninfected and anthracnose disease affected fruits. The accuracies of 84.65% and 76.6% are recorded in classification of unaffected and anthracnose disease affected the pomegranate, mango and grape. Piyush&Anand (2012) developed trendy color rework techniques for recognition of sickness spot on plant leaves. The digital pictures of infected leaves area unit captured by high resolution camera. The RGB color pictures area unitregenerate into CIELAB color model. The median filters techniques area unit applied on pictures of the sickness infected leaves for image smoothing method. Finally, OTSU threshold techniques area unit applied to section the sickness spots. During this technique, totally different sickness spots area unit detected accurately. Zhihua et al (2013) created modern histogram technique for detection of cotton mite disease. The digital pictures of healthy cotton leaves and cotton mite disease affected cotton leaves are acquired by a high resolution digital camera. The RGB color pictures are converted into gray scale pictures. Three main steps are involved in this method. In first stage, disease spots are perceived from green plants. In second stage, histograms are plotted for all strong and cotton mite disease affected cotton leaves. At last, the disease spotareas are computed and compared. Applying these techniques, accuracies of 94.79% are considered for the separation of the unaffected and cotton mite disease affected region of the cotton leaves. Sanjay &Nitin (2013) created a color transform basedmethod for detection of agricultural plant leaf infections. The digital images of strong and affected leaves are perceived by a high resolution digital camera. The RGB color pictures are changed into HSI images. The texture factors are calculated for healthy and affected leaves. Finally, texture factors are compared. The existence of diseases on the plant leaves is assessed[31]. Bindu & Toran (2013) designed a modern machine image and fuzzy logic scheme to recognize the location of the bacterial blight disease affected on pomegranate plant leaves. The digital pictures of infected leaves are obtained through high resolution digital camera. The color picture segmentation methods and K-means segmentation method are applied to identify the bacterial blight disease affected

portion. The locations of the disease infected leaves are computed applying fuzzy inference systems. The tests showed good accuracy when checked manually for recognizing the location of the Bacterial Blight disease that affected pomegranate plant leaves[22]. Fang &Huijie (2014) designed a image processing method and artificial neural network for identifying diseases early and precisely in pomegranate plants. The digital pictures of infected pomegranate leaves are obtained by a high-resolution digital camera. The Gabor filter method is applied to preprocess and partition the affected pomegranate leaves. The color and texturefactors are extracted from the outcomes of partition and back propagation neural network method are applied to train the factorvalues that could distinguish the uninfected and disease affected samples correctly. Applying these techniques, accuracies of 91% are described for the parting of the uninfected and affected leaves for the Pomegranate leaves[23]. Pokharkar and Thool (2012) built up a cutting edge machine vision framework to recognize bother tainted rose takes off. The advanced pictures of tainted roseplant leaves are caught by a high-goals computerized camera. The picture district developing and picture division strategies are considered to compute the level of the contaminated zone of the rose clears out. Utilizing these procedures, correctness of 67%are accounted for acknowledgment of nuisance tainted in rose clears out[24]. Arivazhagan et al (2013) designed an image analysis tool based technique to spot the diseases from the symptoms that become visible on the plant leaves. The digital picture of various leaves is obtained using a digital camera. The RGB color pictures of plant leaves are changed into HSI color image. The green pixels are covered and separated applying specific threshold value pursued by the partition process, the texture statisticsare calculated. At last, the extracted features are conceded through the support vector machine classifier. Applying these methods, accuracy of 94.74% is detected by identification of disease affection in plant leaves[25]. Anand&AshwinPatil (2012) created a modern segmentation dependent image processing method for automatic detection and categorization of plant leaf diseases. The digital picture of affected plant leaves are obtained by a high-resolution digital camera and saved in JPEG format. These acquired RGB color images are transformed into YCbCr, HSI and CIELAB color space forms. The color converted images are sent through median filtering method for removing unnecessary locations. The disease spot segmented pictures, obtained by all the three techniques are compared and identified as the good method for disease spot identification. Atlast, CIELAB color space scheme accurately identify the disease spots[26]. Das et al (2012) established a modern Bayes' and Support Vector Machine (SVM) classifier to perform automatic classification of unaffected paddy leaves and brown mark disease affected paddy leaves. Unaffected and affected paddy leaves pictures are taken from diverse plantations of south Bengal. The digital pictures of uninfected and affected paddy leaves are obtained using a digital camera and acquired RGB color images are transformed into gray scale images. The valueof the paddy leaves is improved by mean filtering method. The unaffected paddy leaves and brown mark disease infected paddy leaves are provided to the Bayes classification and support vector machine classification and the performance of the outputs ischecked. Applying these techniques, accuracies of 79.5% and 68.1% are obtained for Bayes' and SVM classifier in classifiers of paddy Leaves[27]. Sumathi&SenthilKumar (2014) designed a new image processing method for automatic identification and classification of plant leaves diseases. The digital images are obtained applying the digital camera. The red, green and blue elementsare separated from identified RGB color images. If the pixel intensity result of the green component are less than the thresholdassessment, then the red and blue components of the pixel values are allocated to zero since green colored pixels mostly standfor the healthy places of the leaf. The red, green and blue elements are completely separated for pixels with zero content and the remaining pixels are transformed into a binary picture and stored in the machine. The binary pictures are provided as input to the back propagation neural network and the performance of the outputs is checked. Finally, the affected plant leaves are identified[28]

.

7. CONCLUSION

The review of preceding research works has elucidated the different image processing methods and algorithms that are appliedfor identification of disease in various plant leaves, vegetables and fruits. In digital image processing techniques are applied to preprocess the image. It includes removal of noise from the acquired image and segment the image to identify the exact location and infected portion of the disease over the leaf.

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Nanorobots And Health Care

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Abstract: Nano-Robots are now becoming an emerging field that is going to bring a lot of changes in the current century. It is one part of Nano-Technology. Apart from its participation in all fields, the part of Nanos in human science and medicine is large. Ongoing developments in molecular fabrication, computation, sensors, and motors will enable the manufacturing of nanorobots. The present work constitutes a novel simulation approach, intended to be a platform for the design and research of nanorobots control[1]. The simulation approach involves a combined and multi-scale view of the scenario. Fluid dynamics numerical simulation is used to construct the nanorobotic environment, and an additional simulation models nanorobot sensing, control, and behavior. We discuss some of the most promising possibilities for nanorobotics applications in biomedical problems.

Keywords: Nanos, Nanorobots, Sensors

INTRODUCTION

This paper describes a study for developing nanorobotics control design to deal with many of the challenging problems in biomedical applications[2]. The problem we consider here is mainly focused on nanomedicine, where the biomedical interventions and manipulations are automatically performed by nanorobots. While these nanorobots cannot be fabricated yet, theoretical and simulation studies defining design strategies, capabilities and limitations, will supply better comprehension of nanorobots' behavior and the nanoworld. NANOMEDICINE is the process of diagnosing, treating, preventing disease and traumatic injury, relieving pain, and of preserving and improving human health, using molecular tools and molecular knowledge of the human body[4]. Most symptoms such as fever and itching have specific biochemical causes that can also be managed, reduced, and eliminated using the appropriate injected nanorobots.[4] Our paper mainly concentrated on implementing NANO ROBOTS in detecting human physiology.[5] This paper mainly concentrates on implementing nanorobots in the medical field.[6]

Components of Nanorobots

The various components in nanorobot include power supply, fuel buffer tank, sensors, motors, manipulators, onboard computers, pumps, pressure tanks and structural support. The substructures in a nanorobot include:

- Payload- This void section holds a small dose of drug/medicine. The nanorobots could transverse in the blood and release the drug to the site of infection/injury.
- Micro camera- The nanorobot may include a miniature camera. The operator can steer the nanorobot when navigating through the body manually[13,15].
- Electrodes- The electrode mounted on the nanorobot could form the battery using the electrolytes in the blood. These protruding electrodes could also kill the cancer cells by generating an electric current, and heating the cells up to death.
- Lasers- These lasers could burn the harmful material like arterial plaque, blood clots or cancer cells.
- Ultra sonic signal generators- These generators are used when the nanorobots are used to target and destroy kidney stones.
- Swimming tail- The nanorobot will require a means of propulsion to get into the body as they travel against the flow of blood in the body. The nanorobot will have motors for movement and manipulator arms or mechanical leg for mobility.

The two main approaches followed in construction of nanorobots are Positional assembly and Self assembly. In self assembly, the arm of a miniature robot or a microscopic set is used to pick the molecules and assemble manually. In positional assembly, the investigators will put billions of molecules together and let them automatically assemble based on their natural affinities into the desired configuration[16,17]. Nanorobot Control Design is the software developed for simulating nanorobots in environment with fluids which is dominated by Brownian motion[18]. The nanorobots have chemical sensors which can detect the target molecules. The nanorobots are provided with swarm intelligence for decentralization activity. Swarm intelligence techniques are the algorithms designed for artificial intelligence of the nanorobot. The swarm intelligence technique is been inspired by the behaviour of social animals such as ants, bees and termites which work collaboratively without a centralized control. The three main types of swarm intelligence techniques deigned are ant colony optimization (ACO), artificial bee colony (ABC) and particle swarm optimization (PSO)65

Respirocytes

Respirocytes are the nanorobots designed as artificial mechanical red blood cells which are blood borne spherical 1 µm diameter sized. The outer shell is made of diamondoid 1000 atm pressure vessel with reversible molecule-selective pumps[19,20]. Respirocytes carry oxygen and carbon dioxide molecules throughout the body. The respirocyte is constructed of 18 billion atoms which are precisely arranged in a diamondoid pressure tanks that can store up to 3 billion oxygen and carbon dioxide molecules[19]. The respirocyte would deliver 236 times more oxygen to the body tissues when compared to natural red blood cells. The respirocyte could manage the carbonic acidity which will be controlled by gas concentration sensors and an onboard nanocomputer[20].

Nanorobots medical device and its function:

The typical medical nanodevice will probably be a micron-scale robot assembled from nano-scale parts. These parts could range in size from 1-100 nm (1 nm = 10^{-9} meters), and might be fitted together to make a working machine measuring perhaps 0.5-3 microns (1 micron = 10^{-6} meters) in diameter. Three microns is about the maximum size for blood-borne medical nanorobots, due to the capillary passage requirement[7,8]. Carbon will likely be the principal element comprising the bulk of medical nanorobots, probably in the form of diamond or diamonded/fullerene nanocomposites largely because of the tremendous strength and chemical inertness of diamond. Many other light elements such as hydrogen, sulfur, oxygen, nitrogen, fluorine, silicon, etc. will be used for special purposes in nanoscale gears and other components.

Applications of nanorobots in medical sciences:

It is impossible to say exactly what a generic nanorobot would look like. Nanorobots intended to travel through the bloodstream to their target will probably be 500-3000 nanometers (1 nanometer = 10-9 meter) in characteristic dimension[9]. Non-blood-borne tissue-traversing Nanorobots might be as large as 50-100 microns, and alimentary or bronchial traveling nanorobots maybe even larger still. Each species of medical Nanorobots will be designed to accomplish a specific task, and many shapes and sizes are possible[10]. In most cases, a human patient who is undergoing a nanomedical treatment is going to look just like anyone else who is sick. The typical nanomedical treatment (e.g. to combat a bacterial or viral infection) will consist of an injection of perhaps a few cubic centimeters of micron-sized nanorobots suspended in a fluid (probably a water/saline suspension). The typical therapeutic dose may include up to 1-10 trillion (1 trillion = 10^{12}) individual nanorobots, although in some cases treatment may only require a few million or a few billion individual devices to be injected. Each Nanorobot will be on the order of perhaps 0.5 microns up to perhaps 3 microns in diameter. (The exact size depends on the design, and on exactly what the nanorobots are intended to do.) .

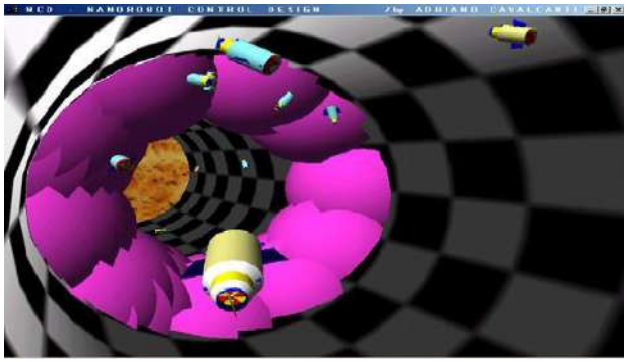

Figure.1 Vein inside view without the red blood cells.

By adding 1 liter of ventilation into our bloodstream, we could then hold our breath for nearly 4 hours if sitting quietly at the bottom of a swimming pool. Or if we were sprinting at top speed, we could run for at least 15 minutes before we had to take a breath! Very "simple" medical nanodevices can have extremely useful abilities, even when applied in relatively small doses. Other more complex devices will have a broader range of capabilities. Some devices may have mobility the ability to swim through the blood or crawl through body tissue or along the walls of arteries. Others will have different shapes, colors, and surface textures, depending on the functions they must perform. They will have different types of robotic manipulators, different sensor arrays, and so forth. Each medical nanorobot will be designed to do a particular job extremely well and will have a unique shape and behavior.

Figure.2 Ventilons in the bloodstream.

Nanosensors in Mobile phones

System demonstration:

- Our mobile system has small pins attached to the mobile phones.
- These pins help in taking samples of glucose.
- From these samples the corpuscles are read using the small specific nanorobots inside the mobile.
- Nano-chromatrons separate the glucose molecules which cause diabetes.

The molecules inhibited are read and compared with the other section and the approximation is made about the sugar level. These sugar levels are compared with compressed DB's and precautions are displayed. By having sound sensors it may be possible to calculate heartbeats &pulse rates thereby calculating the BP level.

Conclusion

Nanomedicine will eliminate virtually all common diseases of the 20th century, virtually all medical pain and suffering, and allow the extension of human capabilities most especially our mental abilities. A single nanocomputer CPU, also having the volume of just one tiny human cell, could compute at the rate of 10 teraflops (10^{13} floating-point operations per second), approximately equalling the computational output of the entire human brain. Nano computer might produce only about 0.001 watts of waste heat.

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SP-11

An Evaluation On MANET For Agriculture Using Ant Colony

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Abstract: Agriculture is vital area in India and most of the people be depending in our country on farming. Recent days a mobile Adhoc network (MANET) used for solving various every day problems. Particularly Agriculture is one of key bases for all current needs. But presently agriculture crops are affected due to many eco-friendly deviations. The mobile Adhoc network is an important technology in this era. A mobile Adhoc network (MANET) is a distributed network that contains enormous sensor nodes with a wide range of applications. It transmits limitless and vast data like video, image, data, and audio through end to end network. MANETs offer many solutions to remote real-time monitoring, recognition of physical occurrence, and target tracking applications. This network development is increasing quickly every day and made the research field in tough recovery. The extended network lifetime, effective load balancing, and scalability are essential for MANETs. The lifetime of the mobile Adhoc network can be extended by the concept of clustering. In this paper, mobile network has been used to detect the crops. This provision to increase the performance of agriculture. Labor is decreased by progression of automatic.The location of the farmhouse can be monitor by using Mobile ad-hoc network.

Keywords: Agriculture, Mobile ad-hoc network, Sensor nodes, Dynamic Routing, Protocols and application, Clustering algorithm.

INTRODUCTION

In India, where the budget is based on agriculture, the climatic environments are isotropic and are not able tomake the entire use of agricultural resources. The main aim is the shortage of rain and the large usage of land reservoir water. The continuous removal of water from the soil is reducing the water level due to which many lands is receiving gradually in the regions of irrigationless land. A Mobile Adhoc Network (MANET) is a collection of mobile nodes bounded by the Wireless medium and each mobile node is alert of only its neighbors. Due to the mobility of these mobile nodes, the topology shows modifications dynamically. Such a dynamic network topology makes the brief of routing a challenging one. Recently, a new class of routing algorithms based on Swarm Intelligence has appeared. These algorithms are enthused by nature's self-organizing systems like honey-bees,ant-colonies, school of fish,bird-flocks, fireflies, and spiders. The features of such algorithms are their ability of self-organization, adjustment to the changing states, self-healing, and local decision making. The bio-inspired approach is a developing field in problem-solving methods. Bio-inspired algorithms have the sole features of being flexible, backward, and easy-going, thus providing designed solutions to engineering problems that are constrained by firm limitations that established approaches pose. Several bio-inspired algorithms work as highly dispersed systems consisting of several sections.

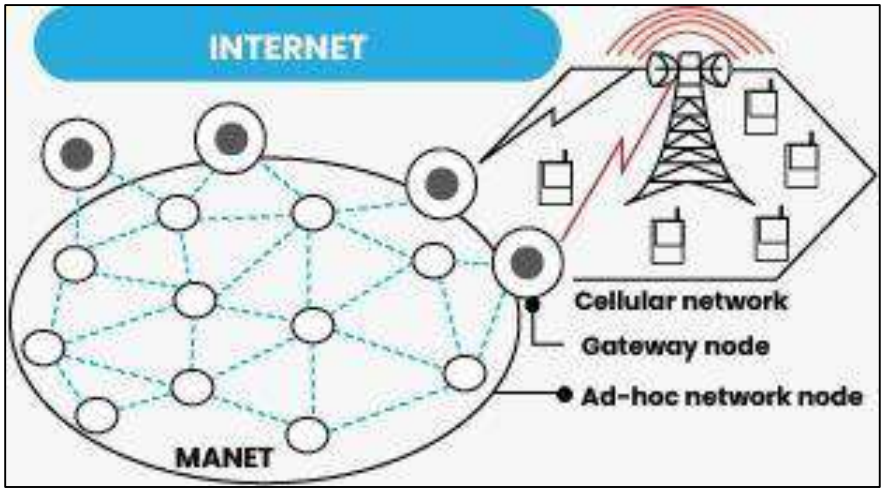

Figure 1: Architecture of MANET

Characteristic in Mobile AD-HOC Networks:

Dynamic Topologies

Nodes are free to go by chance with various speeds therefore the network topology may differ randomly at irregular times.

Energy Constrained Operation

Several or all of the nodes in an ad hoc network may depend on batteries or other finite means used for their energy. The mainly important system design optimization norms can be energy saving.

Limited Bandwidth

Wireless links repeat to have much lower ability than substructure networks. The realized amount of wireless communication - after accounting for the result of accessing multiple times and conditions interfering, etc, is often much less than a radio's maximum broadcast rate.

Security Threats

Mobile wireless networks are usually nearer to physical security threats than fixed-cable nets. The increased option of spoofingeavesdropping and detraction of denial-of-service type hits should be carefully measured.

Applications:

Agricultural

This is valuable and support to sharecroppers in numerous sides such as the conservation of wiring location, difficult, irrigation's techniques this cares additional proficient water use and tumbling of badlands.

Military Battlefield

This is the most widely used technology by the soldiers of the army to collect and maintain information.

Local Level

Ad hoc networks can spontaneously connect the multimedia network to separate information among different nodes.

Commercial Sector

Ad hoc network is also useful in profitable sectors for dangerous operations like a flood, fire, disaster, etc.

Personal Area Network

With an ad hoc network, one can simply scatter information between wireless devices sited in a personal area network.

Classification of MANET:

Classification Of MANET		
Vehicular Ad-Hoc Network (VANET)	**Internet-Based Mobile Ad-Hoc Network (iMANET)**	**Intelligent Vehicular Ad-Hoc Network (InVANET)**

1. Vehicular Ad-Hoc Network (VANET)

Vehicular ad-hoc network states to the technology in which moving cars are linked as nodes for travel messages to other moving cars in a node. This type of network is very beneficial on condition to the various information, like traffic information certain paths to the nodes connected. In VANET nodes are linked to communicate within the distance of 100m to 300m geographical area [1]. The communication in VANET is of three types.

Inter-Vehicle Communication (IVC)

In the inter-vehicle method of communication, it is done in between the vehicles straightly by several radio waves, wireless media, It does not use for long-range nodes [1].

Vehicle to Roadside Communication (VRC)

VRC is also named as a vehicle to arrange communication. In this method of communication, the vehicles are interconnected to roadside units (RSU). RSU's are the devices founded to provide the knowledge about the instant infrastructure to the vehicles that linked to it dynamically[1]. This type of communication is quite slow as compared to Inter-Vehicle Communication.

Inter-Roadside Communication (IRC)

This Communication is done in between the roadside units and base stations, to which these RSU's are linked. This type of communication is needed to offer various information about the traffic or extra information to the base station. This is mainly used in the traffic control system of maps like Google Maps uses to collect information about the load on a specific road [1].

2. Internet-Based Mobile Ad-Hoc Network (iMANET):

iMANET is a known technique in which mobile nodes are self-structured. This technology is very dependable for profitable applications and military aspects [2]. iMANET incorporates the network of mobile devices that are linked to fixed-internet entries to offer services.

3. Intelligent Vehicular Ad-Hoc Network (InVANET):

VANET uses vehicle2RSU communication and Vehicle2Vehicle communication. It offers very high security than others. It facilitates easy and applicable communication between vehicles with dynamic mobility.

Clustering in MANET:

Energy consumption and stability are major problems in mobile Adhoc networks. To choke these problems clustering methods are used. By using clustering of nodes within the network improved the use of resources by minimizing the amount of information growing inside the network [3]. The work of the clustering method is to combine some nodes into several overlapping clusters. Clustering is a method in which network is divided into interlocked substructures, called clusters [4]. Clustering in MANET offers many advantages when compared with predictable networks. Mainly there are three types of nodes in the cluster.

Cluster Head

It is a leader node that can connect sensor networks to the internet, directs all the nodes, keeps the records of nodes and paths [5].

Cluster Member

These ordinary nodes transfer information to their cluster head, which compresses this information, and forward it to other cluster head [5].

Cluster Gateway

Non cluster head node used to provide the connection between one cluster with another cluster [6].

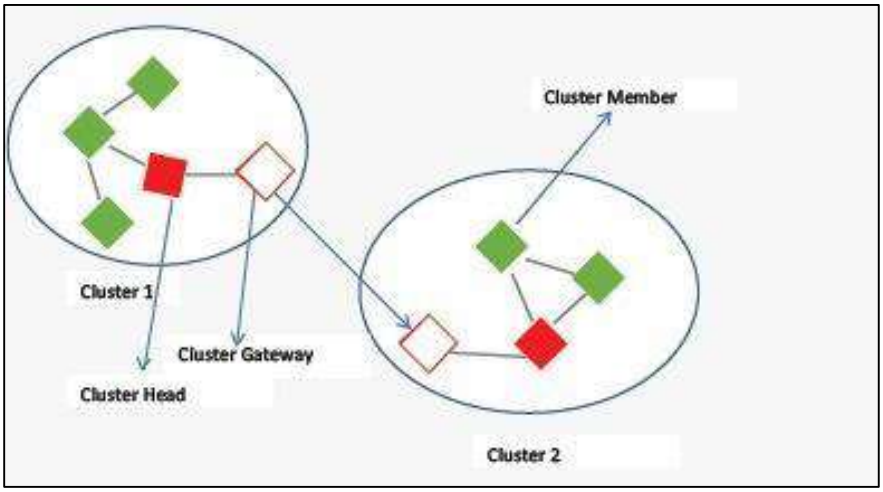

Figure 2: Cluster Sturcture

Routing in MANET:

In the ad hoc networks, each node should be efficient to forward data to other nodes. So different routing schemes have been offered to supply enough functioning of ad hoc networks. Ad hoc routing is classified into proactive routing and reactive routing and hybrid routing protocols [7].
As shown in Figure: 3

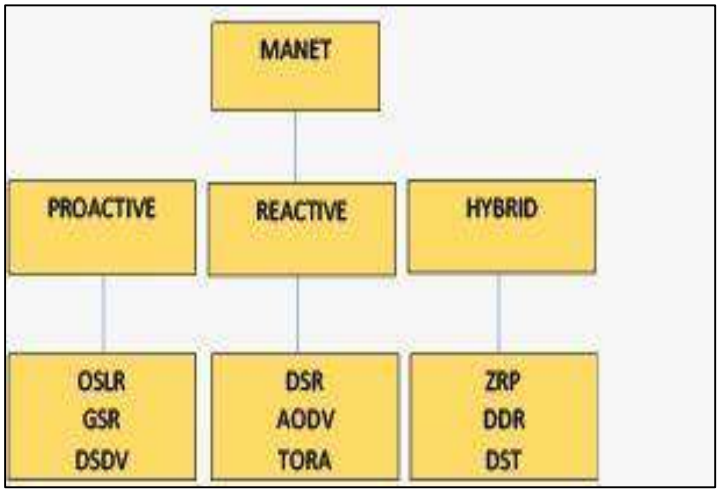

Figure 3 Routing Protocols

Proactive, Reactive, And Hybrid Routing Protocols:

Routing is the action of progressing data from a source to a destination in internetwork. Ad Hoc Routing protocols can be classified as proactive (table-driven) and reactive. We confer the most widely used traditional proactive and reactive routing protocols.

Destination Sequenced Distance Vector (DSDV):

DSDV is a proactive routing protocol that is a conversion of the conventional Bellman-Ford routing algorithm [8]. This protocol adds a sequence number, new attribute to each route table entry at each node. Each node in the network keeps a routing table for the transmission of packets and connectivity to various stations in the network.

Optimized Link State Routing (OLSR)

OLSR is an active protocol that is considered to be an adaptation to the ad hoc network world of the OSPF protocol is applied in wired internet AODV employs periodic swap over of messages to maintain topology information of the network at every node [9]. OLSR is an enhancement over a pure link state on Systems protocol improving the global transmitting operation or flooding. The

OLSR protocol states the multipoint relay concept to limit the number of messages relaying during the necessary flooding operations [10].

Temporally Ordered Routing Algorithm (TORA)

TORA is an extremely adaptive, loop-free, scattered routing algorithm based on the idea of link reversal [11]. TORA is featured to work in highly dynamic mobile networking surroundings.

Dynamic Source Routing (DSR)

The protocol is one of the most effective reacting routing protocols in mobile ad hoc networks[12]. The DSR protocol uses a method of route detection between two network nodes when it is mandatory for specific communication.

Ad Hoc On-Demand Distance Vector (AODV)

The protocol is a reactive protocol in which the routes are created only when needed [13]. It uses traditional routing tables, one access per destination, and sequence numbers to define whether routing information is up-to-date and to check routing hops. AODV tries to improve on DSR by continuing the routing tables at the nodes so that data packets do not have to include routes.

Zone Routing Protocol (ZRP)

ZRP supports a hybrid reactive/proactive routing framework to achieve scalability. In ZRP, the network is partitioned into zones[14]. A proactive table-driven approach is used for the maintenance and creation of routes between nodes of the same zone, and a reactive on-demand approach is used for interaction between nodes of different zones.

Table 1: Various Clustering Protocol using MANET for Agricultur

Clustering Protocol	Functionalities	Advantage	Disadvantage
AntColony Optimization (ACO)	❖ One of the bio-inspired mechanisms. ❖ Inspired by ants foraging behavior.	❖ It is used to search the population in parallel. ❖ It can give a good solution with rapid discovery. ❖ Easily adapts to changes.	❖ Complicate theoretical analysis. ❖ Undefined time to merge. ❖ More experimental
PACONET	❖ The ideas of ACO algorithm are used here. ❖ It uses two agents ANT,BANT.	❖ It focuses on effectiveness and efficiency ❖ It performers with different metrics. ❖ It helps in the failure of links.	❖ The operational mechanism takes a long interval of time. ❖ Delay exists.
Artificial Bee Colony	❖ It is called as ABC algorithm. ❖ It is based on the searching behavior of honey bee colonies.	❖ It uses several parameters. ❖ Exploitation and exploring are possible.	❖ Accuracy is not determined. ❖ It is a slow process.
Particle Swarm Optimization (PSO)	❖ It is used to solve complicated mathematical problems. ❖ First aligned to produce social behavior.	❖ It enhances the interactivity problem. ❖ It does not use the inclination of the optimized problem.	❖ Difficult to design initial parameters. ❖ Cannot work with scattering problems.

CONCLUSION

In this paper, a detailed study and collected works survey of some computerized irrigation systems have been offered. We have effectively planned a remote control and observing system for farmers that will clearly define the soil state of the crop remotely concerning to Ant Colony. Mobile Adhoc network (MANET) based on several hierarchical clustering and routing algorithms like ant colony optimization (ACO), improved ant colony optimization clustering and routing algorithm (PACONET), artificial bee colony

(ABC) algorithm, particle swarm optimization (PSO) algorithm with their merits and demerits, characteristics and applications. this paper tells about the survey made for improving the efficiency of MANET by routing and clustering algorithm.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-12

Improved Automatic Seed Selection Region Growing Algorithm For Segmentation (Iassrg)

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Abstract: The proposed Improved Automatic Seed Selection Region Growing algorithm (IASSRG) is based on seed selection segmentation method which facilitates the user to classify the visual difference of segmenting the infected region from the uterus surface. Fibroids are extracted from the image based on the density of the pixel. Four metrics, including the Specificity, Accuracy, F-Measure, and Sensitivity, are used for evaluating the performance efficiency of the proposed Improved Automatic Seed Selection Region Growing Algorithm (IASSRG) for segmentation with the existing methods. The proposed method achieved 98 per cent of accuracy, which is relatively performed better than other existing methods considered for this study.

Key Words: Segmentation, Seed Selection, Region Growing, Image Processing, Fibroids, Uterus, Ultrasound**.**

1. INTRODUCTION

Segmentation is the process of partitioning the image into several small meaningful segments. Partitioning of the image is carried based on the similarity of the pixel attributes. It is encouraged to partition the image with similar attributes as to concentrate on the accuracy of image processing techniques (Sharma et al,2008). A novel segmentation process is the building block for the lower order image processing technique of transforming the colour image or grey scale image into other higher-order images with features, and objects. Achieving batter results in processing an image and extracting necessary details is highly dependent on the efficiency of the segmentation task. However, defining a perfect segmentation for an image is a highly puzzling task.

2. Image Segmentation Types

Image Segmentation is classified into two as contextual and non-contextual [Sharma and Aggarwal, 2010]. Former technique groups the objects of an image based on the similarity of pixels. The level of similarity and the spatial closeness of pixel are concentrated while grouping the object. On the other hand, Non- contextual method ignores the spatial distance of the attributes, i.e. the pixels. It takes into account an attribute such as colour, i.e. either grey scale or colour to group the image.

3. Limitations of Existing Segmentation Methods

It is found that most of the existing segmentation methods work based manual selection of speed pixel to visit the neighbouring pixels in the region. In order to select the seed point edge base or intensity-based criteria is used. The selection is based on the reader's judgement. A mouse click mechanism selects the seed points. There are high chances for committing an error in choosing the seed pixel. Accuracy is another limitation in the existing method.

4. Proposed Segmentation Algorithm

Segmentation is the process of making subdivision of the image to form some meaningful divisions which help in analysing the image with ease. Segmentation can be carried out in either way as supervised and unsupervised applications. Segmentation of images is mostly carried by human experts who at times may lead to misinterpretation of data due to several reasons such as individual tissue distribution, and intensity. In order to overcome this problem, current research has proposed an efficient segmentation algorithm for ultrasound images.

Algorithm
Improved Automatic Seed Selection Region Growing Algorithm (IASSRG)
Output: Segmented region
Step: 1 Input the De-Noised image.
Step: 2 The images are initially resized into 256 x 256.
Step: 3 Region partitioning using OTSU method is applied to detect the uterus before detecting the fibroid.
Step: 4 Select high threshold Seed Point from the partitioned list.
Step: 5 Compare the selected pixel within the boundary of the region.

Step: 6 The selected region starts growing as it reaches the homogeneous pixels, Iterates to visit each pixel of the selected region.
Step: 7 Repeat step:4, to visit all pixels of the region.
Step: 8 Each visited part is added to the segmented region (SR1).
Step: 9 Stops when no more regions to grow.

The image is resized into 256x256. The resized image is partitioned into a region which determines the uterus region in the US image. The threshold value of the image determines the uterus region. The region with high-intensity value is determined to be the uterus region; other regions are ignored due to the low threshold value. The region partitioning starts with reading every coordinate of the image.The coordinates are K(i,j). The pixel range for a greyscale image falls between 0 to N-1. T. represents the threshold value of the image. The image is grouped into two categories as G_0 and G_1. Here, G_0 is formed when the threshold value is greater than the pixel of the image; otherwise, G_1 is formed.

$K(i,j)<=T \in G_0$ -
Else,
$K(i,j)>=T \in G_1$

The select seed point is compared within the boundary of the partitioned region to check for homogeneity of pixels. The seed point starts growing when there are similar pixels with a high threshold value. The process is repeated to ensure no pixel is unvisited in the image. The segmented parts of the image are added to the SR1 cluster, which has similar features. Moreover, heterogeneous pixels are added to the SR2 cluster. The SR2 cluster is a non-infected region, i.e. no fibroid growth is seen. These clusters are determined by applying the Euclidean distance metric. Euclidean distance metric works with simple logic as lesser the distance between the pixels, higher the similarity between the pixels. The metric gives higher the distance between the pixels, lesser the similarity between the pixels.

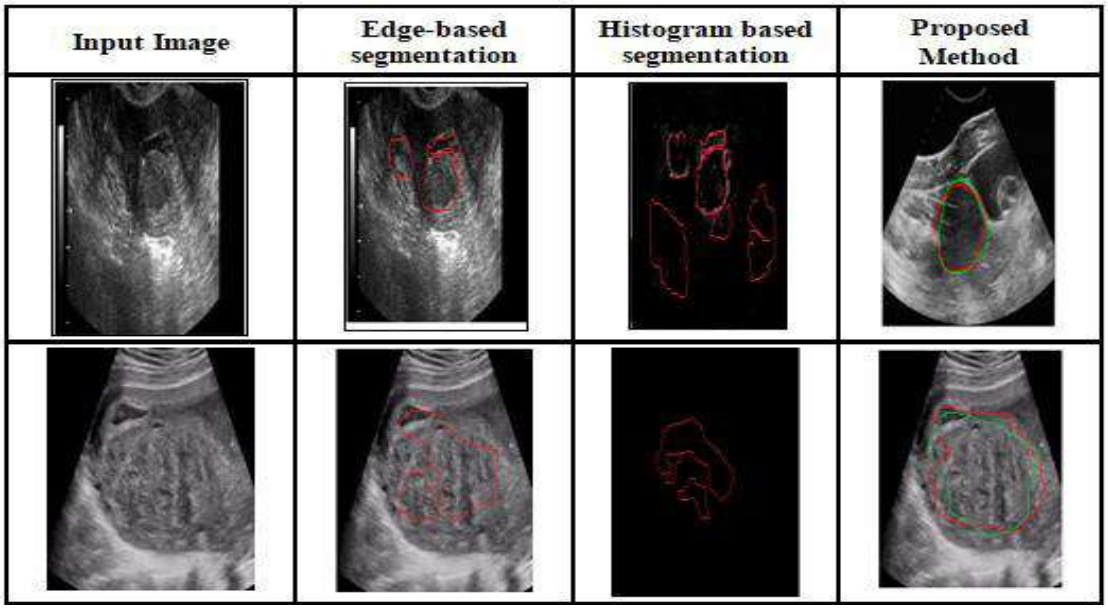

Figure 1.5: Proposed Segmentation Results

5. Performance Evaluation Metrics

In order to evaluate the performance of the proposed segmentation algorithm, the proposed method is measured or tested with performance analysis measures such as sensitivity, specificity, F-measure and accuracy. The result of the proposed method is related to the other existing segmentation algorithms such as Edge-based method and histogram-based method.

A. Accuracy

Accuracy metric is used to measure the proposed algorithm with its ability to accurately predicting the object. The following equation can calculate the accuracy metric.

$$\textbf{Accuracy=(TP+TN)/(TP+FP+TN+FN)}$$

Here, TN denotes True and negative, TP denotes True and positive, FN denotes False and negative, and FP represents False and positive. Assumption of the segmentation model proposed here is to detect the infected disease region from the uterus. TP, TN, FP, and FN are calculated using equations 1.2 to 1.5, respectively.

$$TP = \frac{pixels\ Correctly\ segmented\ as\ foreground}{Total\ number\ of\ images} \rightarrow (1.2)$$

$$TN = \frac{pixels\ correctly\ segmented\ as\ background}{Total\ number\ of\ images} \rightarrow (1.3)$$

$$FP = \frac{pixels\ falsely\ segmented\ as\ foreground}{Total\ number\ of\ images} \rightarrow (1.4)$$

$$FN = \frac{pixels\ \ falsely\ segmented\ as\ background}{Total\ number\ of\ images} \rightarrow (1.5)$$

B. Sensitivity and Specificity

The standard statistical metrics used to measure the performance of the model is Sensitivity and Specificity. It is also called as precision and recall respectively. Sensitivity (precision) is used to measure the ratio on the number of the infected region, which is correctly predicted as fibroid disease by the proposed model. Sensitivity is calculated by equation 1.6

$$Sensitivity = \frac{TP}{TP+FN} \rightarrow (1.6)$$

Specificity metric is used to correctly recognise the ratio on the number of the uninfected region in the image. The ratio shows the number of fibroid disease-free by the algorithm. Specificity is calculated by equation 1.7

$$Specificity = \frac{TN}{TP+FN} \rightarrow (1.7)$$

C. F-measure

F-Measure represents t harmonic mean of sensitivity and recall (sensitivity and specificity), respectively. F-Measure is to cross-validate the correctness of performance metrics. It is calculated by equation 1.8

$$F - Measure = 2 * \frac{Precision * recall}{Precision + recall} \rightarrow (1.8)$$

6. RESULTS AND DISCUSSIONS

The results that are obtained by experimenting three uterus images which are de-noised and passed as input to the proposed segmentation model is discussed in this section, shows the performance of the proposed model based on the performance metrics evaluation such as sensitivity, specificity, F-Measure and accuracy. The proposed method's performance is compared with existing methods such as Edge-based segmentation and histogram-based segmentation. At last, the accuracy rates for the uterus images are generated. It is observed that the UterusImg1 has 0.997 as sensitivity, 0.956 as specificity and 0.998 as F-Measure. Moreover, the accuracy rate as 98.37 for the proposed method. The proposed method shows better results when compared to the existing models with an accuracy rate as 78.47 for Edge-based method and 78.27 for histogram-based method. In UterusImg2, 0.923 as sensitivity, 0.903 as specificity and 0.982 as F-Measure and accuracy rate as 98.85 are acquired for the proposed method. The acquired result is comparatively higher than the Edge-based method with 0.857 as sensitivity, 0.841 as specificity, 0.865 as F-Measure and accuracy as 73.43. UterusImg3 has 0.927 as sensitivity, 0.975 as specificity and 0.984 as F-Measure. Moreover, the accuracy rate as 98.67 for the proposed method. The proposed method shows better results when compared to the existing models with an accuracy rate as 75.43 for Edge-based method and 75.21 for histogram-based method as shown in Table 1.1.

Table 1.1: Accuracy Comparison of Proposed Segmentation Method					
Image	**Method**	**Sensitivity**	**Specificity**	**F-measure**	**Accuracy**
UterusImg1.jpg	**Proposed**	0.997	0.956	0.998	**98.37**
	Edge-based	0.867	0.946	0.965	78.47
	Histogram -based	0.643	0.836	0.945	78.27
UterusImg2.jpg	**Proposed**	0.923	0.903	0.982	**98.85**
	Edge-based	0.857	0.841	0.865	73.43
	Histogram -based	0.778	0.731	0.885	74.21
UterusImg3.jpg	**Proposed**	0.927	0.975	0.984	**98.67**
	Edge-based	0.724	0.812	0.724	75.43
	Histogram -based	0.687	0.957	0.826	75.21

Sensitivity (precision) is used to measure the ratio on the number of the infected region, which is correctly predicted as fibroid disease by the proposed model. Comparison of specificity values obtained in segmenting the image by Edge-based, Histogram and IASSRG are shown in the Table 1.1. Specificity metric is used to correctly recognize the ratio on the number of the uninfected region in the image. Higher the specificity betters the performance. Comparison of sensitivity values obtained in segmenting the image by Edge-based, Histogram and IASSRG is shown in table 1.1 Similarly, the F-Measure and Accuracy values are obtained, and their values are compared in Table 1.1 and shown in Figure 1.6, respectively.

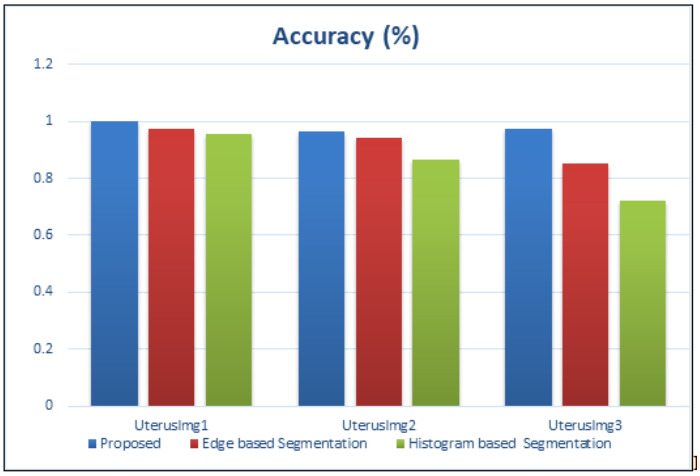

Figure 1.6 Segmentation Method - F-Measure Comparison

7. CONCLUSION

The proposed IASSRG segmentation algorithm gives better results by segmenting the fibroid region from the uterus. Performance of the proposed method is compared with existing segmentation methods, which shows 98% accuracy rate.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-13

The Futuristic Element

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Abstract: Hypothetically, graphene is certainly not another article. Be that as it may, before the disclosure of graphene, these was constantly a discussion about whether carbon could exist in a two-dimensional (2D) structure. Indeed, it was ordinarily perceived that no independent 2D precious stone is steady under specific temperatures in which layers or macromolecules of such material would not have the option to develop in a crystalline structure as per theoretic expectations. Along these lines, it is very abnormal that graphene shows up much of the time in our every day life yet nobody at any point discovered it until 2004. All the more strikingly, not at all like numerous other logical disclosures, the principal perception of graphene is profoundly emotional.

Keywords: Graphene – 2Dimensional – Carbon - Crystal

1. INTRODUCTION

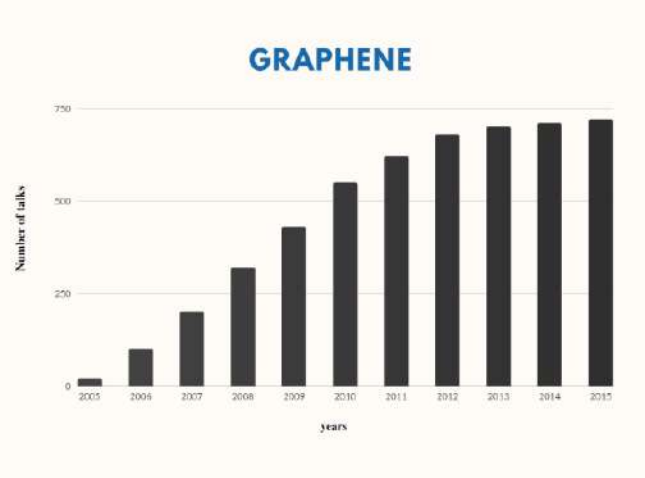
In the event that the twentieth century was the time of plastics, the 21st century appears to be set to turn into the period of graphene—an as of late found material produced using honeycomb sheets of carbon only one particle thick. Science diaries have been coming up short on superlatives for this wondrous stuff: it's just about the lightest, most grounded, most slender, best warmth and power leading material at any point found[1].Furthermore, in case we're to accept the promotion, it vows to upset everything from processing to vehicle tires and sun based cells to smoke alarms. What is this bizarre and wonderful new stuff? How about we investigate

2. GRAPHENE

Graphene is the name for a honeycomb sheet of carbon iotas. It is the structure obstruct for other graphitic materials (since an average carbon iota has a breadth of about 0.33 nanometers, there are around 3 million layers of graphene in 1 mm of graphite).[1] Harder than jewel yet more versatile than elastic; harder than steel yet lighter than aluminum. Graphene is the most grounded known material. To place this in context: if a sheet of stick film (like kitchen wrap film) had a similar quality as a perfect monolayer of graphene, it would require the power applied by a mass of 2000 kg, or a huge vehicle, to cut it with a pencil. Graphene has other astonishing qualities: Its high electron portability is 100x quicker than silicon; it conducts heat 2x superior to precious stone; its electrical conductivity is 13x superior to copper; it ingests just 2.3% of reflecting light; it is impenetrable so that even the littlest molecule (helium) can't go through a deformity free monolayer graphene sheet; and its high surface territory of 2630 square meters for each gram implies that with under 3 grams you could cover a whole soccer field.

3. GENERAL PROPERTIES

Graphene is an astonishingly pure substance, thanks largely to its simple, orderly structure grounded on tight, regular, infinitesimal cling, Carbon is a nonmetal, so you might anticipate graphene to be one too. In fact, it behaves much more like a essence (though the way it conducts electricity is veritably different), and that is led some scientists to describe it as a semimetal or a semiconductor (a materialmid-way between a captain and an insulator, similar as silicon and germanium). Indeed so, it's as well to remember that graphene is extraordinary — and relatively conceivably unique.



[2]

Figure 3.1

4. UNIQUE PROPERTIES

Atomic thickness – a solitary layer is just a single iota thick (thusly called "2D" or "two-dimensional"), about 0.335 nanometers.

Electron mobility – the most elevated electron portability of every electronic material with hypothetical point of confinement of 200,000 cm2/(V•s) (100x quicker than silicon).

Strength– sans defect, monolayer graphene is the most grounded material at any point tried with a quality of 42 N/m, which compares to an inherent quality of 130 GPa (>100x more grounded than the most grounded steel).

Toughness – Despite its quality, graphene is likewise moderately weak, with a deliberate break strength of 4.0 ±0.6 MPa√m.

Stiffness – Experiments on imperfection free graphene monolayer have yielded a Young's modulus of ~1.0 TPa – one of the most elevated estimation of any material; stiffer than jewel.

High surface area – 2630 m2/g.

Impermeability – even the littlest iota (helium particle) can't go through an unblemished sheet of graphene.

Electrical resistivity – 1x10-8 Ω •m among the most reduced of any known material at room temperature (~35% not as much as copper).

Warm conductivity-Graphene is the ideal warm conductor - it highlights record warm conductivity—higher than that of carbon nanotubes, graphite and precious stone (more than 5,000 W/m/K). Graphene conducts heat every which way - it is an isotropic conductor[1].

Transparency – retains just 2.3% of reflecting light; which is more prominent than ITO.

Optical properties- Graphene is incredibly meager, however it is as yet a noticeable material, as it ingests about 2.3% of white light (which is a considerable amount for a 2D material). Join this with graphene's astonishing electronic properties, and things being what they are, graphene can hypothetically be utilized to make productive sun powered cells.[3]

Chemical properties - Even however the entirety of graphene's iotas are presented to the earth, it is a dormant material and doesn't promptly respond with different molecules. Graphene can, be that as it may, "ingest" various particles and atoms. This can prompt changes in the electronic properties, and may likewise be utilized to make sensors or different applications.[4]

5. GRAPHENE'S STRUCTURE

Graphene is a level honeycomb cross section made of a solitary layer of carbon particles, which are held together by a spine of covering sp2 half breeds bonds. This nanocrystal is an essential structure obstruct for all other graphitic materials; it likewise speaks to a reasonably new class of materials that are just a single molecule thick, supposed two-dimensional (2D) materials (they are called 2D in light of the fact that they reached out in just two measurements: length and width; as the material is just a single iota thick, the third

measurement, tallness, is viewed as zero). The uncommon attributes of graphene begin from the 2p orbitals, which structure the π state groups that delocalize over the sheet of carbons that establish graphene.

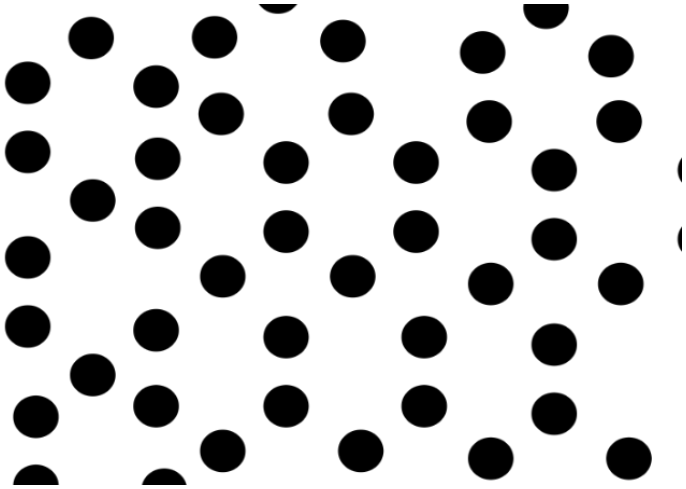


Figure 5.1

Graphene – 2Dimensional – Carbon – Crystal structure[5], [6]

Graphene has risen as one of the most encouraging nanomaterials as a result of its novel blend of eminent properties: it isn't just one of the most slender yet in addition most grounded materials; it conducts heat superior to every other material; it is an incredible channel of power; it is optically straightforward, yet so thick that it is impermeable to gases – not by any means helium, the littlest gas molecule, can go through it. These astounding parcels, and its multifunctionality, make graphene reasonable for a wide range of applications going from widgets to optics, detectors, and biodevices.

6. GRAPHENE'S DISCOVERY

Carbon comes in a wide range of structures (supposed allotropes), from the graphite found in pencils to the world's most costly precious stones. In 1980, we was aware of just three fundamental types of carbon, to be specific precious stone, graphite, and shapeless carbon. At that point, fullerenes and carbon nanotubes were plant and, in 2004, graphene joined the club. Before graphene was first shown by Andre Geim and Konstantin Novoselov, two physicists from the University of Manchester, in 2004 (for which they got the Nobel Prize in 2010) researchers contended that carefully 2D crystalline materials were thermodynamically unsteady and couldn't exist. Graphene had just been considered hypothetically in 1947 by P.R. Wallace as a common case for counts in strong state material science. He anticipated the electronic structure and noticed the straight scattering connection. The wave condition for excitations was recorded by J.W. McClure as of now in 1956, and the likeness to the Dirac condition was talked about by G.W. Semenoff in 1984. In their underlying trials, Geim and Novoselov removed graphene from a bit of graphite, for example, is found in standard pencils. Utilizing ordinary sticky tape they figured out how to acquire a chip of carbon with a thickness of only one particle. This mechanical shedding is the least difficult of the arrangement techniques and shockingly is the strategy that made independent graphene a reality.[7]

7. GRAPHENE USES AND APPLICATIONS

Energy storage and solar cells

Graphene- grounded nanomaterials have numerous promising operations in vitality related homes.Simply some ongoing models: Graphene improves both vitality limit and charge rate in battery-powered batteries; enacted graphene makes predominant supercapacitors for vitality stockpiling; graphene terminals may prompt a promising methodology for making sun powered cells that are reasonable, lightweight and adaptable; and multifunctional graphene mats are promising substrates for reactant frameworks. [1]

Sensor applications

Functionalized graphene holds remarkable guarantee for natural and substance sensors. As of now, analysts have indicated that the particular 2D structure of graphene oxide (GO), joined with its superpermeability to water particles, prompts detecting gadgets with an exceptional speed.[8],[9]

Electronic applications

Graphene has an exceptional blend of properties that is perfect for cutting edge hardware, including mechanical adaptability, high electrical conductivity, and compound soundness. Consolidate this with inkjet printing and you get a reasonable and versatile way for misusing these properties in true innovations.

Transistors and memory

The absolute most encouraging uses of graphene are in hardware (as transistors and interconnects), locators (as sensor components) and warm administration (as parallel warmth spreaders). The first graphene field-impact transistors (FETs) – with both base and top entryways – have just been illustrated. Simultaneously, for any transistor to be valuable for simple correspondence or computerized applications, the degree of the electronic low-recurrence clamor must be diminished to an adequate level. [10]

Adaptable, stretchable and foldable gadgets.

An adaptable gadget depends on bendable substrates and really foldable hardware requires a foldable substrate with an entirely steady conductor that can withstand collapsing (for example an edge in the substrate at the purpose of the overlap, which creates wrinkles, and the twisting stays considerably in the wake of unfurling). [1]

Photo detectors

Specialists have shown that graphene can be utilized for media communications applications and that its frail and all inclusive optical reaction may be transformed into preferences for ultrafast photonics applications. They additionally found that graphene could be conceivably misused as a saturable safeguard with wide optical reaction running from ultra-violet, obvious, infrared to terahertz. There is a solid research enthusiasm for utilizing graphene for applications in optoelectronics. Graphene-based photodetectors have been acknowledged previously and graphene's reasonableness for high transmission capacity photodetection has been shown in a 10 GBit/s optical information connects. [1],[11]

Coatings

Covering objects with graphene can fill various needs. For example, specialists have now demonstrated that it is conceivable to utilize graphene sheets to make a superhydrophobic covering material that shows stable superhydrophobicity under both static just as powerful (bead sway) conditions, in this way shaping very water repulsing structures.

Bio-medical

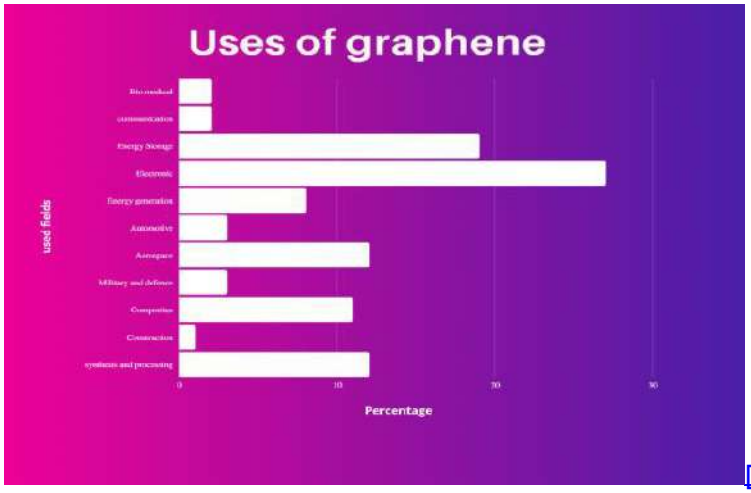
Using graphene as a biosensor as a passive medium, which monitors some external stimulus, usually by taking advantage of the fact that graphene's resistance depends strongly on nearby electric fields and signals see for case: "Graphene-DNA biosensor picky, simple to create".[12]

Loud speakers

Veritably less mass ensures good high frequency response, while high strength allows for fairly large free- standing diaphragms necessary for effective low frequency response. The speaker/ earphone has excellent frequency response across the entire audio frequency range (20 Hz – 20 kHz), with performance matching or surpassing commercially available audio earphones.[12],[1]

Lubrication

the tribological properties of graphene- family accoutrements, similar as graphene, graphene oxide, reduced graphene oxide, functionalized graphene, graphene decorated with nanoparticles, and mixes of graphene with other accoutrements. The abecedarian mechanisms enlightening the outstanding slicking actions of graphene- family accoutrements[13].



[14]

Figure 7.1

Other uses

Graphene can be utilized for [1]

- Bio Technology
- Radiation Shielding
- Thermal Management
- Cloaking
- Water filtration

8. CONCLUSION

Is it full- brume ahead to a future where graphene rules the world? Perhaps — or perhaps not[15]. It's important not to get carried down with the hype utmost of the instigative work on graphene has so far been done on a veritably small scale in chemical and drugs laboratories. Utmost of the exploration is still what we would describe as"blue sky"it could be numerous times or indeed decades before it can be developed virtually, let along cost-effectively. By the same commemorative, it's still veritably early days for introductory scientific exploration into graphene. Forgetting all the amazing operations for a moment, there is doubtless much more instigative wisdom to crop. For illustration, we do not yet know if graphene is the only material with a two-dimensional demitasse chassis — or if analogous but indeed more extraordinary accoutrements are just staying to be discovered. One thing we do know is that this is a veritably instigative time for accoutrements wisdom!

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-14

Blue Eyes Technology: The Emotion Sensor- A Review

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Abstract: The blue eyes technology works on Artificial Intelligence. It aims to give human abilities to a computer for performing necessary activities or abilities to understand the perceptual powers of the human being by recognizingtheir facial expressions and react accordingly to them. It aims for a mechanism that have perceptual and sensory abilities like those of human beings which enables the computer to gather facts about humans and interact with them. The emotion mouse obtains physiological data and emotional state of a person through the single touch of mouse having different sensors In this paper discussion of techniques known as processing of calculations with the help of sensory intuitive like those of human beings is made.

INTRODUCTION

The Blue Eyes technology focuses at developing calculation machines that have intuitive and sensory ability likethose of human beings. It uses non-noticeable sensing method, employing latest video cameras and microphonesto spot the utilization r's actions through the use of imparted sensory abilities. The machine can know what a user wants, where he's watching, and even realize his physical or emotional states. The Blue Eyes Technology developed is meant to be a posh solution for monitoring and recording the operator's conscious brain involvementalso as his/her physiological state.

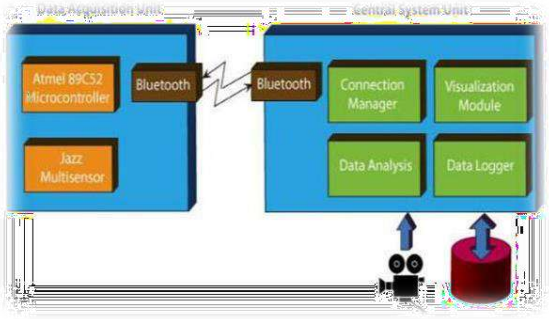


Fig: Over View Of Blue Eyes Systems

In blue eye technology blue stands for Bluetooth and eye stand for eye movements which enable to get the details.The idea after blue eye technology is to give the computer the human power.

What is the need for blue eyes technology?

1. Sometime a user may not notice changes of indication which can cause financial crisis. Hence a permanentsolution for this type of threat is needed.
2. To build a machine which can connect with human, which can
3. Understand emotions and feel our presence.
4. A computer which can talk, listen or even scream.Blue eyes technology consists of

- Mobile calculating device or Data Acquisition Unit (DAU)
- Central System Unit (CSU)
- The Hardware

Mobile calculating device or Data Acquisition Unit (DAU)

The DAU used in the Blue Eyes technology is the mobile factor of the system. The main function of DAU is to assemble the physiological details from sensors and forward to the CSU for processing and verification plan.The Bluetooth module, which is integrated with the mobile device (DAU), gives a wireless interface between theCentral System Unit (CSU) and therefore the user or operator having the sensors. PIN codes and ID cards are appointed to the whole operator's for authentication purposes. The tool uses 5-key keyboard,

beeper and LCD show for the transmission with the operators and if, any unacceptable situation occurs, the machine end uses these devices to tell the operators. The 'voice' information from the end user is transferred with the help of a headset, which is connect with the Data Acquisition Unit using a mini jack plug. DAU connect many hardware modules like system-core Bluetooth segment, Atmel 89C52 microcontroller, EEPROM, Beeper, LCD display (HD44780),LED indicator, voltage level monitors and 6 AA batteries.

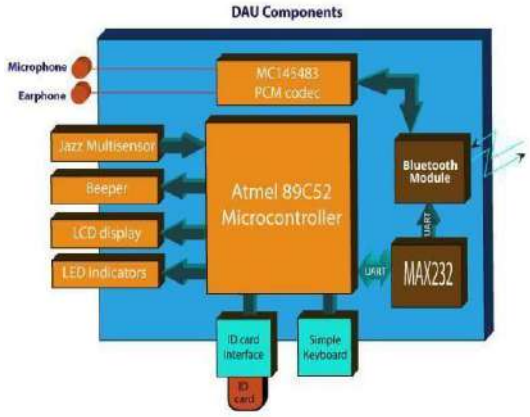


Fig: Data Acquisition Unit (DAU) Components

Central system unit (csu) of blue eyes technology:

CSU is the ensuring squint of wireless-network connection in the Blue Eyes technology. The CSU mainly have codec (PCM Codec commonly used for voice information transmission) and a wireless Bluetooth module. This CSU section is connected to a personal computer using USB, parallel and serial cable. The program consists of the operators personal ID is combine to the personal computer on the serial and power ports. The microcontroller(Atmel- 89C2051) inside the unit holds the I2C EEPROM- programming and UART transmission.

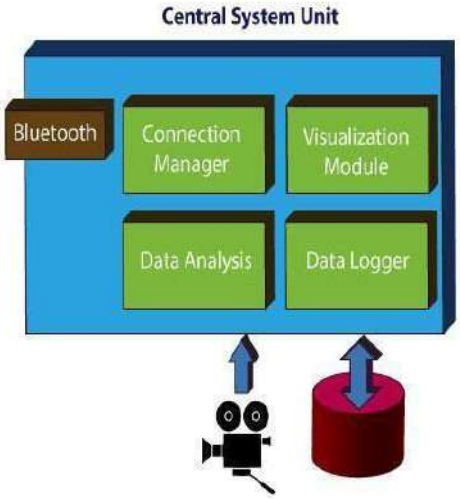


Fig: Central System Unit (CSU)Components

The software used in blue eyes technology
The blue eyes technology and its basic structure

1. Process of giving sensing capacity:

The objective of Blue Eyes technology is to blueprint a computational machine having sensory and perceptual capacity like human beings. Blue Eyes technology uses main modern cameras, microphones and advanced non- obtrusive sensing techniques to interconnection with humans and accepts the emotions of individuals. The machine has the ability to hold the eye movement of the user, the needs of the

end user and also can know the emotional and physical states of a end user in front of the machine. The process of building a computer having sensing and emotional capabilities is known as "Affective Computing".

2. Detecting human emotions/ Affect Detection

In Blue Eyes technology, the machines have the capacity to identify the minor difference in the moods of human beings. Tell a person may strike the keyboard hastily or softly depends on his mood like happy or in angry. The Blue Eyes authorize the machines to identify these minor emotional difference of human beings even by a singletouch on the mouse or key board and the machines started to react with the end users according to this emotionallevels. This is done with the advice of intelligent devices like "Emotion Mouse". Along with this Emotion Mouse,Simple End User Interest Tracker (SUITOR) and Artificial Intelligent Speech Recognition are provide with the Blue Eyes technology to understand the speech and know the interest of the person at that instance of time. For executing the effective computing we need motion Sensors

Types of emotion sensors used in blue eyes technology

1. For Hand - Emotion Mouse

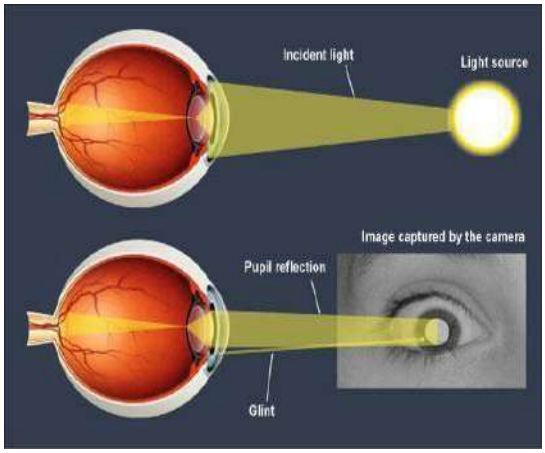
In Blue Eyes, the machines have the capacity to know the minor difference in the moods of human beings. tell a person may strike the keyboard hastily or softly depends on his mood like joy or in angry. The Blue Eyes technology provide the machines to know these minor emotional difference of human beings even by a single touch on the mouse or key board and the machines started to react with the end users according to this emotionallevels. This is done with the advice of intelligent tool like "Emotion Mouse". Actually this Emotion Mouse is aninput device to track the emotions of a end user by a simple touch on it. The Emotion Mouse is created to evaluate and identify the user's emotions such as fear, surprise, anger, sadness, happiness, disgust etc. when he/she is interact with computer. The main objective of the Emotion Mouse is to combine the user's physical and physiological information by a simple touch

2. For Eye - Expression Glass:

Expression Glass is another for the normally available machine vision face or eye recognition methods. By analyzing pattern recognition methods and facial muscle variations, the glass senses and recognizes the expressions such as important or confusion of the end user. The instruction used for this glass uses piezoelectric sensors.

The simple user interest tracker (suitor)

The Simple User Interest Tracker is entire approaches towards the blueprint of machine having the capacity to maintain an intimate relationship between the humans and the computers. The SUTOR continuously consider theuser that where his eye focus on the personal computer screen. The SUITOR has the capacity to certain the topicof concern of the user and also according to this it can able to bring the appropriate data to a handheld device.



Artificial intelligent speech recognition used in blue eyes technology

For achieve the Artificial Intelligent Speech Recognition system in Blue Eyes technology, the working surrounding should be very necessary. The way of the user's speech, grammar, noise type, noise level and the stand of the microphone are some necessary factors that may impact the appearance of speech recognition system.In Artificial Intelligent Speech Recognition system, an automatic call handling step is achieve without any telephonic operator.

Two basic ideas are included in the Artificial intelligence (AI),

- Examine the thought of human beings.
- Perform the thought process of human beings through robots, computers etc.

Actually Artificial intelligence (AI) denotes the act of a computer or any machines but it is carried out by the humans is called as 'intelligent'. This AI makes machines more strong, useful, and smarter and also it is less expensive compared to natural intelligence. Natural language processing (NLP) makes artificial intelligence systems to communicate English. The main goal of the Natural language processing (NLP) is to understand the users input and react according to these inputs. The input data or words are frequently scanned and finds matchesagainst inside stored known data or words. After identifying the key words, the corresponding actions are carriedout by the machine. In this way the Blue Eyes technology implement the end users to implement with the machineswith their own languages.

The Benefits of Blue Eyes Technology:

1. In eye monitoring by recording and interpreting customer's movement.
2. In video games, to make them more interactive and exciting.
3. Physiological and behavioral condition monitoring.
4. In power plant control room, captain bridges, flight control center.

CONCLUSION

It is the way to simplify life by providing user-000 friendly facilities. It also helps in reducing the gap between thecomputer and human. Also in the planned, it is quite possible to build a computer with which we can entirely interact like a true buddy. BLUE EYES technological access a convenient technique that clarifies the life by supporting more delicate and end user friendly arrangement in computing devices. The day is very nearby, that this Blue Eyes technology will more advance its way towards your house hold devices and makes you tired. In future, even this Blue Eyes will as your hand held mobile device.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-15

Grahical User Interface Process Using Skinput Through Human Body

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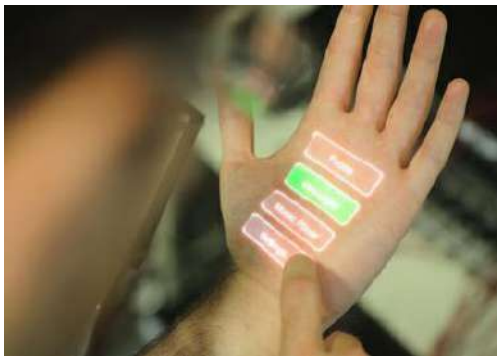
Abstract: Appropriating the human body as an info gadget is engaging not just on the grounds that we have around two square meters of outside surface territory, yet additionally on the grounds that a lot of it is effectively open by our hands (e.g., arms, upper legs, middle). Besides, proprioception (our feeling of how our body is designed in three-dimensional space) permits us to precisely cooperate with our bodies in a without eyes way. For instance, we can promptly flick every one of our fingers, contact the tip of our nose, and applaud together without visual help. Not many outside information gadgets can guarantee this exact, sans eyes input trademark and give a particularly enormous connection territory. Skinput is the technology that allows the human body to act as a graphical user interface. It uses bio-acoustic sensing to localize finger taps on the skin. Skinput was first developed by Chris Harrison, Desney Tan, and Dan Morris, at Microsoft Research's Computational User Experiences Group. It has a ton of features. This technology can be used on any area of the skin.[1]

What is SKINPUT?

Nowadays we carry a lot of electronic devices with ourselves. This new technology helps turn in the skin into an input surface. Convertion of the human body into an input device is appealing not only because we have approximately two square meters of external surface area, but also because much of it is easily accessible. This work of technology enhances the human body for sensory transmission, which allows the skin to be used as an input surface. The location of finger taps on the skin is analyzing by mechanical vibrations that propagate throughout the body.



INTRODUCTION

Gadgets with critical computational force and abilities would now be able to be handily carried on our bodies. In any case, their little size normally prompts restricted collaboration space (for example little screens, fastens, and run haggles) reduces their ease of use and usefulness. Since it can't just make fastens and screens bigger without losing the essential advantage of little size, consider elective methodologies that improve cooperation's with little versatile frameworks. One choice is to shrewdly fitting surface zone from the climate for intelligent purposes. For instance, portrays a strategy that permits a little cell phone to transform tables on which it rests into a gestural finger input canvas. Nonetheless, tables are not generally present, and in a portable setting, clients are probably not going to need to convey appropriated surfaces with them (now, one should simply have a bigger gadget). Nonetheless, there is one surface that has been past ignored as an information canvas, and one that happens to consistently go with us: our skin. Appropriating the human body as an information gadget is engaging not just on the grounds that we have approximately two square meters of outer surface territory, yet additionally in light of the fact that a lot of it is effectively open by our hands (e.g., arms, upper legs, middle). Besides, proprioception our feeling of how our body is designed in three-dimensional space permits us to precisely communicate with our bodies in a sans eyes way. For instance, we can promptly flick every one of our fingers, contact the tip of our nose, and applaud together without visual help. Not many outside info gadgets can guarantee this exact, sans eyes input trademark and give a particularly

enormous association territory. In this paper, we present our work on Skinput a technique that permits the body to be appropriated for finger input utilizing a novel non-obtrusive wearable bio-acoustic sensor (Harrison, Chris; Tan, Desney; Morris, Dan).

Bioacoustic Sensing

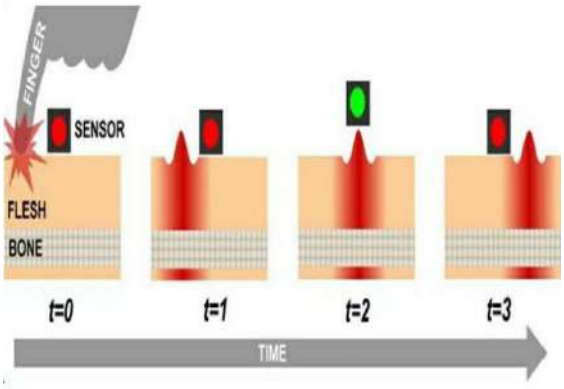
Bioacoustics is a cross-disciplinary science which integrates both biology and acoustics. Usually it refers to the examination of sound production, dispersion and reception in animals (including humans). This involves neurophysiological and anatomical basis of sound production and recognition, and relation of acoustic signals to the channel they disperse through. The findings yield clues about the evolution of acoustic systems, and from that, the evolution of animals that engage them. Bio acoustic sensing combines sensing technology, machine learning, biology and acoustics. This technology uses digital technology like software to record and analyze different sounds. Listening is an important part of bio-acoustical research. Bioacoustic sensing has been used to locate, identify animals and their conditions. In healthcare it is used to monitor and evaluate vitals. One alternative is to artfully fitting surface territory from the climate for intelligent purposes. For instance, Scratch Input is procedure that permits a little cell phone to transform tables on which it rests into a gestural finger input canvas. Be that as it may, tables are not generally present, and in a versatile setting, clients are probably not going to need to convey appropriated surfaces with them (now, one should simply have a bigger gadget). Notwithstanding, there is one surface that has been past disregarded as an information canvas, and one that happens to consistently go with us: our skin. (Microsoft Research Computational User Experiences Group).

Working

The concept of bio-acoustics plays a very important role in the working of the technology. The taps on the skin by finger causes acoustic energies to be formed. Two forms of waves are created traverse and longitudinal. The sensors are activated by the moving waves. The formed traverse waves move outward from the point of contact. Whereas the traverse waves formed at soft part of the skin is of higher amplitude when compared to the bony part of the skin. The longitudinal waves travel inward towards the skeleton. The longitudinal waves excite the bane which vibrates the soft tissues surrounding the entire length of the bone. The sensors are activated when these waves hit underneath. An array of highly tuned vibration sensors are used instead of a single sensing element with a flat response curve. The Bio-acoustic sensor is fitted with small and cantilevered piezo films. The cantilever is adjusted according to the resonance. The adjustment is done by adding weight. (Harrison, C., Tan, D. Morris)

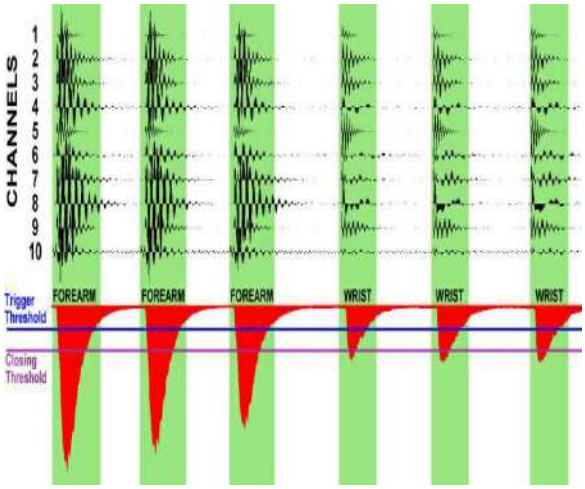
Requirements

- An Acoustic detector to detect the sound vibrations resonated.
- Microchip sized pico projector to display.
- Bluetooth or Wifi connection.



Design & Prototype

A prototype in the form of an armband is created with a PICO projector. It has two arrays consisting of five sensing elements forming the armband. Each of the sensor arrays is sensible to two set of frequencies upper part with lower frequencies for fleshy part and the lower part with high frequencies for the denser bone part. A Mackie onyx 1200f audio interface is used to digitally capture data from the sensors. Each channel samples 5.5 khz. The whole setup is connected to a conventional desktop computer. A thin client written in C programming is interfaced with the device using ASLO protocol. This setup helps to give a live visualization of the data from the ten sensors. The data stream is inputted into different instances using the segments. It also classifies the input instances. With the help of the absolute exponential average of all the ten available channels, the audio stream is segmented into individual taps. This particular prototype is made in the form of an armband. It can also be a wristband, a watch or even a bracelet. The design can be improvised creatively.(Harrison, C., Tan, D. Morris)



Features

The Skinput technology is gesture-based and it also is a wearable computer. It acts as a body-borne computer which is a mini computer worn on body. It also is a development in mobile computing. Just like wearable technology, this can be worn on the wrist, hung from the neck, strapped to the arm or leg or even on the head. Gesture recognition technology helps to elucidate human gestures with the help of mathematical algorithms. Gestures can be hovered upon the device that activates the sensor. The gesture can originate from any bodily motion. The portability of computing is one of the main features in this technology. Skinput is a new and creative way to approach mobile computing. There are two types of gestures online and offline. Offline gestures are operated after the user communication with the object. Whereas, online gestures are direct manipulation used to scale or rotate. It can be used for gaming, I-pods, mobile devices, computing, etc.

Advantages

Skinput is a modern take on the idea of computer input. From the beginning of computers, starting from Charles Babbage's analytical engine and the first ENIAC mainframe in the middle of the 20th century, input and output became a vital part of how computing systems are supposed to be operated. Skinput helps interfaces to move from traditional designs like plastic computer keyboards to the human body. Skinput also have applications to other kinds of technologies like biometrics. The need to interact with the gadgets directly is zero. It is a new way of interacting with the mobile devices. It is easy to access when your phone is not nearby. It allows users to interact more personally with their device. With the help of proprioception, the user learns the locations on the skin where the touch surface is, they will no longer have to look down to use Skinput which reduces the number of people looking down at their phone while driving or riding. It can be used for a better interactive gaming experience overall.

Disadvantages

The easy accessibility of the technology will cause people to be more socially distracted than they already are. If the user has more than a 30% Body Mass Index Skinput reduces it to 80% accuracy. The visibility of the projection of the keys on the skin can be minimised if the user has a tattoo located on their arm. It is a bit expensive as it a new technology in the market.

Applications

The reason of the exploration was prodded from the contentions between the scaling down of compact gadgets and the remaining requirement for an agreeable method of connecting with said items. As the gadgets gets more modest, so does the zone to control them, for example, fastens and contact screens. The look for an outside surface zeroed in on the a certain something each individual consistently hefts around with them, their skin. With the utilization of the sensors, one can handle an electronic gadget essentially by tapping their skin in predestinated places. The most evident use of this innovation is compact customer hardware, for example, cell phones or music players.

Future Enhancements

Research is going to make the device much smaller for easy portability and usage. The user can enter their home and just tap their palm to unlock the door and tap some virtual buttons on their hand to turn the AC and TV. All these are possible in a virtual taps on then skin. Another enhancement is increasing the accuracy of the technology with the BMI not being an obstacle.

CONCLUSION

In this paper, we have introduced our way to deal with appropriating the human body as an info surface. It depicted a novel, wearable bio-acoustic detecting exhibit fabricated into an armband to identify and confine finger taps on the lower arm and hand. Our examination shows that the framework performs very well for a progression of motions, even at the point when the body is moving. Moreover, it have introduced introductory outcomes exhibiting other likely employments of our approach, which we desire to additionally investigate in future work. In this paper we likewise examined the significant segments through which the Skinput Technology works that are: Bioacoustic detecting, Pico-projector, Bluetooth. This innovation has an incredible future extension as it utilizes our body as the information gadgets

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-16

Review On Bioactive Compounds On Plants

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Abstract: The human diet mainly consists of plants and animals which may naturally contain thousands of different bioactive compounds. The vegetarian food with nutritional seeds dominates the agricultural world with the power of medicinal components for its rejuvenating property. Most of the secondary metabolites of herbs and medicinal plants are commercially important and find use in a number of pharmaceutical compounds. The medicinal compound produced from the plants generally be economically accessible or easily available for the development of new drugs. The metabolic compounds are currently of great interest due to their resistance towards microbes, bacteria, viruses, oxidation and possible carcinogenic activities.

INTRODUCTION

Plants are the main source of medicines which were practiced in many parts of the world and well recognized for its healing property. Plants are vital source of energy as food, spices, aromas, medicine, and other essential materials for various purposes. Plants produce substances which are not directly involved in the primary metabolic process like growth and development. These substances have low molecular weight with more complex compounds and are termed as secondary metabolites. The secondary metabolites produced are unique in nature, and is not really seen in microbes and animals. The bioactive compounds are ubiquitous in the nature of plants which can be easily available to the human beings. Plant material consist of multi-component mixtures, secondary metabolites which can be isolated, purified and utilized for development of new drugs which relies on the pharmocognosy. Bioactive compounds are the secondary metabolites in the herbal plants which depends on many pharmacological, anticancer, antimicrobial, antioxidant, antidiarrheal, analgesic and wound healing activity (Sasidharan et al. (2011). The medicinal plants with the wide range of compounds can be utilized for the treatment of Chronic and infectious diseases (Duraipandiyan et al., 2006). Herbal medicine, or phytomedicine is generally cheaper, accessible or readily available and more culturally acceptable to many, that they cause less side effects than some synthetic drugs (Carlson, 2002; Dey and De, 2015).Versatility of different developmental techniques leads to the new drugs through various researches from the medicinal plants (Balunas and Kinghorn, 2005). The objective of this paper is to provide a review of phytochemical studies that have addressed bioactive compounds of plants.

Biodiversity Of Plants

In India, Ayurveda, Unani and Siddha are the different medical systems which accumulates the knowledge of medicinal plants as the traditional remedies. Merely 5 -10% of the higher plants were detected for their secondary metabolites in 250,000 species. The methods like specific in vitro bio assays, chromatographic methods, spectroscopic techniques made it easier to screen, isolate and identify the developing compounds quickly and precisely. FTIR proved to be the effective technique to identify and determine the characters of the compounds from the mixture (Eberhardt et al ;2007). The traditional healers examine the patients with external appearance such as eye, skin, tonque, urine, feces, blood, body temperature, etc and use medicinal plants for their recovery (Ambu et al ;2020). Indian Sandol wood oil and its constituents were widely used in traditional method for treating viral diseases, diarrhea, nausea, gastric problems and used as the skin nourishing agent (soundarrajan et al. 2017). Some of the secondary metabolites are produced in Industries by cell culturing method to develop both quality and quantity of the product. Culture of *Lithospermum erythrorhizon* produce shikonin, *Papaver somniferum* produce sanquinarine and *Coptis japonica* produce berberine a secondary metabolite in cell culture techniques. The association of medicinal plants (ginseng, black cohosh, goldenseal), high valuable products such as mushrooms (morels, matsutake, truffles) are cultivated for the economic and cultural reasons in the developed countries (Jones et al. 2002). The traditional remedies depends on medicinal plants for the common problems which relies mainly on the home gardens for the plant propagation (Agelet *et al.,* 2000). The role of active biomolecules from the antidiabetic plants *Allium cepa, Allium sativum, Aloe vera, Azadirachta indica, Gymnema sylvestre, Syzygium cumini* and *Pterocarpus marsupium* provide the compounds to rectify the antihyper – glycemic effect. These plants were mainly used as traditional medicine. *Geranium robertianum L* and *Uncaria tomentosa* produce compounds which resist inflammation and oxidation activity. The seasonal changes in the climatic conditions can alter the micro or macro mineral level in the species *Spondias mombin* (Aregheore and Singh;2003). Ragasa et al stated that oil produced from the flowers of teak wood is used to treat scabies and act as a hair promotor in unani medicine.

High yield of secondary products			
Product	Plant species	Yield (%D/W)	Reference
Rosmarinic acid	*Sa.officinalis*	36.0	Hipolyte et al(1992)
Rosmarinic acid	*Col.bluemei*	21.4	Ulbrich et al(1985)
Anthraquinones	*M.citrifolia*	18.0	Zenk et al (1975)
Shikonine	*l.erythrorizon*	12.4	Fujita(1988)
Berberine	*Th.minus*	10.6	Kobayashi et al(1988)
Iatrorhizine	*Berberlis wilsonae*	10.0	Breuling et al (1985)
Antho cyanine	*Pe.frutisence*	8.9	Zong et al (1994)
Berberine	*C.japonica*	7.5	Matsubara et al(1989)
Diosgenine	*Diosc.Deltoidea*	3.8	Sahai and knuth(1985)
Sanguinarine	*P.somniferum*	2.5	Park et al(1992)
serpentine	*Cath.roseus*	2.2	Zenk et al (1977)

Adapted from Ravishankar and Ramachandra Rao (2000)

Bioactive Natural Compounds from Plants

Bioactive compounds are the secondary metabolite which shows pharmacological or toxicological effects in humans and animals and are the products of biochemical "side tracks" in the plant cells and not necessary for daily functioning of the plant. Plants are the natural integral source for the development of the emerging pharmaceutical and pharmaceutical lead products which supply the structural models for the creation of synthetic analogues. The compounds present in the wide variety of leaves, roots, flowers, grains, fruits and vegetables provide a range of nutrients and different bioactive compounds including phytochemicals (phenolics, flavonoids, and carotenoids), vitamins (vitamin C, folate, and pro vitamin A), minerals (potassium, calcium, and magnesium), and fibers. Dietary phytochemicals can be classified into broad categories as phenolics, alkaloids, nitrogen-containing compounds, organosulfur compounds, phytosterols, and carotenoids (Liu 2004). Of these phytochemical groups, the phenolics are the most studied and well known for its rejuvenating property. Plant secondary molecules are mainly of three major chemical classes; terpenes (hydrogen and carbon), phenolics (sugars with benzene ring) and alkaloids (Bourgaud et al. 2001) Phenolics exhibit antimutagenic, anticarcinogenic, antiglycemic, anticholesterol and antimicrobial properties (Friedman & Levin 2009; Im et al. 2008) that avoid neurodegenerative and cardiovascular diseases (Bao, Ren, Endo, Takagi, & Hayashi 2004; Nandutu, Clifford, & Howell 2007). Cardiovascular disease, cancer, diabetes, Alzheimer's disease, cataracts, and age-related functional decline is inversely proportional to the regular consumption of fruits and vegetables (Liu 2004). The bioactive compounds are multi complex in nature and morehard to separate needs combination of chromatographic and purification techniques for their isolation (sasidaran etal;2011). Phenolic content and triterpenic compounds are the bioactive compounds which are widely seen in apple pomace and can be recovered by microwave assisted extraction with ethanol or ethyl acetate as solvent (Grigoras, Destandau, Fougere & Elfakir, 2013). The components such as carotenoids, alpha carotene, alpha-trans-beta –carotene, zeinoxanthin, beta – cryoxanthin and leutin can be extracted through high performance liquid chromatography (HPLC) (Hamano, Macadante;2001).

Anti-Microbial Activity

The compound anthraquinone aloe emodin from the aloe vera juice and gel shows prominent resistance towards microbial activity (Wu et al., 2006). The crude extracts (hexane, ethyl acetate and ethanol) of *Pseuduvaria macrophylla* exhibits the antimicrobial and antioxidant activities (M. Othman et al. (2009). Ehsan et al reported the high anti-microbial activity against staphylococcus aureus using methanol and ethanol extracts for *Hopea pariviflora* beddome. The compounds from *Hibiscus sabdariffa L.* creates resistance towards viral Activity against HSV-2 and suppresses the urease in it. (Sheriff et al;2017) .4-N-methyl benzoic acid was utilized to synthesise the nano particle with high antibacterial, antioxidant and antitumor activity to produce a lead compound for biomedical applications (MS AL salhi et al;2009). The extract of *Spondias mombin* reduces the inflammatory responses and suppresses the mediators and cytokinine. The species proved to have vitamin A and vitamin C with more nutritious value which act as a control for the oxidative stress (Wright;2005). The *Peltophorum pterocarpum* and *Punica granatum* proved to be the most potential towards the antimicrobial activity in the tribal region of Palani hills in Tamilnadu. (Duraipandian, Ayyanar, Ignacimuthu;2006).

Antiviral Activity

Plants have been used as the traditional medicine to reverse the viral activity with more therapeutic effects. The medicinal plants contain the compounds which resist the viruses naturally. The compound rutin present in many plants resist the viruses such as HSV1; HSV2; Avian Influenza virus and Para Influenza viruses. The seed extracts of *Solanum nigrum* exhibit the antiviral activity with more than 50% inhibition towards the HCV with NS3 protease in the liver cells (Javed et al;2011). The plant species *Bergenia ligulata* and *Nerium indicum* exhibit the resistance towards the influenza viruses with the dosage of about 10μ□/□1.*Holoptelia integrifolia* and

N.indicum proved to be effective towards the antiviral activity (Rajbhandari et al; 2001). On January 2020 WHO has announced the pandemic outbreak of the SARS-coV2.The Covid 19 affects the human respiratory system and the leading cause of death throughout the world. It is transmitted through direct contact of the infectious patient, droplets from nose or when they sneeze.

Antibacterial Activity

The plant extracts of Hexane, chloroform of all five plant species shows least effective in inhibiting the bacterial growth when compared with Methanol extract. B. subtilis with inhibition range 8.66 ± 0.57 to 12 ± 1 shows the most susceptible range with the plant extract while p. aeruginosa shows the least susceptible (Pavithra et al;2009).The phenolic acid components observed in the spondias mombin leads to the resistance towards the bacterial activity and molluscicidal activity(Corthout et al 1994).The *Cinnamomum verum* possess the strong hydrophobic bond which diffuses the biofilms and inhibits the growth and metabolism of the bacterial cell.(Kothiwale, Patwardhan ,Gandhi, sohoni & kumar;2014). *S. album* leaf extract derived PdNPs showed more resistance towards Gram negative bacteria than Gram positive bacteria which can be utilized in medical and pharmaceutical applications.

Antifungal Activity

The chloroform dilution of D.metel dominates the acetone, hexane and methanol dilutions with its resistance towards fungal activity. When the chloroform dilution is compared with amphotericin B, the chloroform dilution shows 9.2 times lower activity. (Rajesh,G.L.sharma;2002). Zhang et al proved that the enzymes which are altered through biochemical engineering protects biotic and abiotic stresses in Santalum album tree

Anti-Inflammation and Anti Oxidation Activity

Spondias mombin is detected by the analytical method in which HPLC-diode array detector analysis is used to detect and evaluate the ellagic and chlorogenic acid in hydro ethanolic extract (Cabral et al. 2016). The anti-oxidative molecules present in the plant *Cinnamomum vernum* are Phenols or poly phenols with different biological activities and combination of functional properties (Gulcin et al;2019). The spices are rich potential in bioactive compounds with the resistance towards the microbes, inflammation, oxidation, and possible carcinogenic activity (Abeysekara, Premakumara & Ratnasurya; 2013)

Anticarcinogenic Activity

The cancer cell lines such as p388, Hep G2, Molt4 and lung carcinoma cells are deactivated or cell death occurs due to cytotoxic effect of ethanolic extract of *Nigeria sativa* (Swamy and Tan ;2000). Thymoquinone is the compound eluted in the ethanolic extract of the N.sativa seed whereas the aqeous solution possess more cell death or cytotoxicity than the ethanolic extract(Samarakoon et al;2010)

Nano Particles Technology In Plants

A technique used by the modern world to transfer and modify the molecules is the nanotechnology. Nanotechnology has combined with many other fields to create nano models and carry the researches on it. Apart from agriculture Nanotech combined with biotechnology to produce nano capsules, nanoparticles, nanofibers which carries the foreign DNA and chemicals that alters the target genes. During the delivery of genetic materials, viral gene delivery vectors face numerous challenges, such as limited host range, limited size of inserted genetic material, transportation across the cell membrane and also trafficking problem of the nucleus Apo plastic transport occurs outside the plasma membrane which allows the nanomaterials, to move the nanoparticles upwards to the central root and vascular tissues (Gonzalez-melendi et al.,2008; larue et al., 2012; zhao et al., 2012; sun et al., 2014). The cell wall act as a physical barrier which complicates the entry of NPs, creating a porous milie; act as a narrow selective filter (Carpita et al., 2001). The NP of different types and carbon nanotubes can easily penetrate in to the cell wall with the diameter of 3- 50nm (Chang et al. 2010, Liu et al.2009, Kurepa et al.2010). Nano fertilizers like Fe,Mn,Zn,Cu,Mo can be used to enhance the delivery system and improves the conventional fertilizers (R.Liu and Lal 2015). Engineered nanomaterials (ENMS) act as elicitors which enhance the quality and quantity of the induced secondary metabolite with active bio molecules (Mehernaz et al.2016). The plants grown in the nutrient medium absorbs ENMs easily, demonstrated with the advanced techniques (Irin et al., 2012; Khodakovskaya et al., 2012).The diet, lifestyle and hormones suggests that nutritional and lifestyle factors may directly influence the breast cancer (BC).Silver Nanoparticles synthesized using sesame oil cake exhibited a good antibacterial and antitumor activity with the size range 100 nm are reported to be effective in biomedical applications (Devanesan et al., 2018, Alfuraydi et al., 2019). The major risk factors for breast cancer include family history, reproductive functional changes, food and nutrition and hormonal changes (Gerber et al., 2003) The major challenge to overpower breast cancer is the heterogeneity of breast cancer tissues and non-availability of right medicine (Ali et al., 2019).

CONCLUSION

In India traditional medicines play a major role in the health care of the human beings. Priority should be given to develop the medicinal plants for its future use to the human welfare. The drug discovery from the medicinal plants leads to the development of many natural compounds which have less side effects and easily accessible. A careful use of these plants can bring dramatic changes in the history of medicine, regains the culture of our ancestors and develop eco-friendly environments. The emerging use of plant derived medicines

should have an extensive research, proper quality control and through strict vigilance.The latest development and ongoing projects draw attention and incorporates the biomolecules in various fields such as nanotech, pharmaceutical, food, cosmetics etc. plant cell culture method provide a drastic change in the development, commercial processing of rare species in a controlled environment. Advantage of this technique produces a continuous reliable natural product. The alternative method for the large production of many medicinal plants leads to the development of metabolic engineering and biotechnological approaches. cryo preservation and micro propagation methods are adopted to increase the quantity and conserve the medicinal plants.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-17

Security Of Mobile Wireless Sensor Networks Against Node Replication Attack In Healthcare Applications

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Abstract: Security of mobile Wireless Sensor Networks (WSN) is a crucial task especially in healthcare applications as it is present in an unattended distributed environment that is prone to attacks and the data is also sensitive. One such attack is the node replication attack. In the MWSN, only the packets that are transmitted are encrypted using the Elliptic Curve digital signature algorithm. In the existing algorithm, only the packets are secured but not the nodes in the network. The identity of the nodes can be stolen and replicated thereby causing a node replication attack. The proposed EiAIS method detects the replica node attack by enhancing the XED method and combining it with is an algorithm. The proposed method improves the detection accuracy with an improved packet delivery ratio.

Keywords: Healthcare applications, Security, Identity theft, Node Replication attack, Artificial Immune System

1. INTRODUCTION

In recent years, the tremendous growth of mobile wireless sensor networks has set a path for various applications. The applications include transportation and logistics, healthcare, surveillance and security, office and home monitoring environment, and so on. In recent years, monitoring human activities has grabbed the attention of researchers. One such activity is the healthcare application where the sensor devices can be implanted or wearable to monitor human activities. The activities that are monitored by wearable devices include such as monitoring blood pressure, heart rate, respiration, pulse, oxygen, temperature, and so on[1,2]. The activities that are monitored by implanted devices include endoscopic capsules, monitoring cardiac arrhythmia, the sensor for monitoring brain liquid pressure, and so on. Apart from all these typical applications, there are also certain applications to monitor the patients from home. The applications of mobile WSN have created a vast impact in healthcare as it monitors continuously and alerts the status of the patient immediately. Hence, human lives are involved directly in these applications. Moreover, the sensors deployed in humans are unattended. So they are vulnerable to various kinds of security attacks. Of all the attacks, impersonation is crucial because it causes the nodes in the network to be replicated which leads to node replication attacks[3]. The node replication attack is occurred by compromising the nodes in the network and replicating as many copies of the nodes and deploying it in the network. The adversary using the replica nodes injects false data, authenticates the communication, and behaves like a genuine node in the network. In healthcare, the nodes are authenticated only by their private keys that are transmitted by the nodes that are encrypted using an elliptic curve digital signature algorithm. To provide security the XED method used to detect replicas in the mobile Wireless Sensor Networks is applied and enhanced. To further improve the detection accuracy even in a resource-constrained environment, an Artificial Immune System is used. Artificial Immune System [5,6,7,8] is a branch of Computational Intelligence derivative of the human immune system is applied to identify the replicated node in the environment. The organization of the paper is as follows: In Section 2, applications of sensor networks in healthcare. Section 3 discusses the security issues of the healthcare system. In Section 4,classification of attacks in healthcare, followed by the proposed EiAIS method is discussed in Section 5.

2. Healthcare Applications of Sensor Networks

According to Ameen et. al., the mobile WSN has applied for various healthcare applications [1]. The applications are tabulated as follows.

Table 1: Healthcare Applications

Applications	Uses
Healthcare	Monitors and analyzes physiological signals in healthcare
MobiHealth	Continuously monitors the health using GPRS and UMTS networks
Ubimon	Monitors the patient's postoperative and manages arrhythmic heart diseases.
CodeBlue	Provides disaster responses.
eWatch	Provides notification when recording the sensed information
Vital jacket	Wearable devices monitor fitness, sports, and cardiac activities

Since it has been used for various applications, security is a crucial task.

3. Security Issues of Sensor Networks in the healthcare system

In healthcare, the communication between the devices is wireless. Hence, it is susceptible to various kinds of threats. These threats are crucial as they directly have an impact on an individual's social life. So, security is always a crucial task.

4. Classification of attacks in healthcare

The attacks in healthcare applications are classified as passive and active attacks [1,2] as shown in Figure 1. The passive attack is the one where the attackers silently listen to the communication in the network whereas, in active attacks, attackers may modify the data, eavesdrop and even replay and also impersonate the communication and attack the target network.

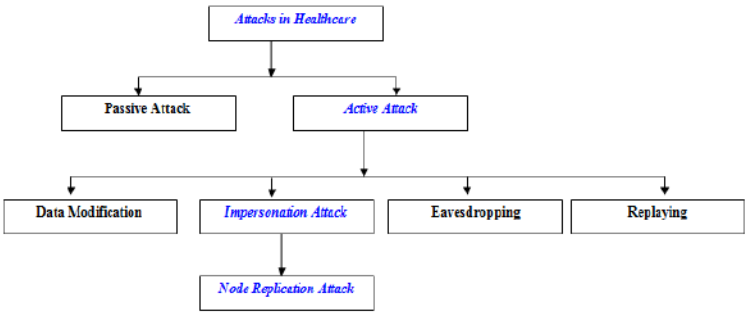

Figure 1: Classification of attacks in healthcare

Of all these attacks, the impersonation attack [3] is crucial as the attacker impersonates an authenticated node and steals the identity of the node. Moreover, when the identity is stolen, nodes can be replicated [11] thereby creating the vulnerable attack namely the node replication attack. The detection of node replication attacks is of two types namely, centralized and distributed detection methods. As the nodes in healthcare are distributed in nature, the node replication attack detection uses distributed detection method rather than a centralized detection method. The distributed node replication attack node detection methods are of various types [10] namely, node meeting-based method, information exchanged based method, and the mobility assisted based detection method. The information exchange-based detection method is used in the proposed method. The information that is transmitted mutually by the replicated node is detected in the proposed method. The same process can be applied for detecting replicated nodes in healthcare also as it is present in a distributed and unattended environment. In the proposed method, the detection of replica nodes is made by improving the detection of the XED method using an integrated Artificial Immune System (iAIS) algorithm. The integrated Artificial Immune System is one of the algorithms in the Artificial Immune System. Artificial Immune System is a branch of Computational Intelligence that can be used for the optimization of results and also for solving complex problems even in a resource-constrained environment [5,6,7]. The above method is named iXED. To improve the accuracy of detection thereby increasing the packet delivery ratio is the key objective of the proposed method.

5. PROPOSED EiAIS METHOD

The proposed EiAIS method is a combination of the Elliptic Curve Digital Signature algorithm with the enhanced XED method and the iAIS algorithm. The proposed EiAIS algorithm is explained as follows:

5.1. Encrypting the transmitted packet

When a packet is transferred from source to destination, the Elliptic Curve digital signature algorithm is used to encrypt the packet loss. The elliptic curve digital signature algorithm provides security to the transmitted packets even in a resource-constrained environment with the minimum key size. In the above algorithm, for a finite field Fx , upon transmission of packets between nodes p and q an elliptic curve E has been formed and it is defined[4] as,

$$p^2 = q^3 + cx + d \quad (1)$$

where (c, d) ϵ Fx and x is the prime number Upon receiving the value of the elliptic curve E, the node n encrypts the packet. The packet can be decrypted only by node y. To find whether the packet is received from or delivered to the genuine node, the nodes will

generate and exchange the random number using the enhanced eXtremely Efficient Detection (XED) method that is used in mobile wireless sensor networks. To know the enhanced XED method, the existing XED method is discussed in the next section.

5.2. eXtremely Efficient Detection (XED) Method

The eXtremely Efficient Distribution (XED) [9] is a piece of information exchanged based detection method. To identify the replicas that are colliding and exchanging the information shared, the XED method was proposed. Based on the challenge and response strategy XED method was developed. The online and offline steps are performed in the XED method.

5.2.1 Offline Step

The offline step is executed in the network before the arrangement of the nodes as follows. All the nodes in the network save the security parameter *x* and the cryptographic hash function *h (.)*. Upon communication of the nodes p and q, the accepted random numbers are stored by each other. Furthermore, the authenticity needed to be received by the node q is also stored to identify the random number. Therefore, the two arrays A_s^p and A_r^p are employed. Every node in the network can detect the replicated node. In addition, blacklisted nodes that are identified by the node p are stored by a set B(p). To begin with, every array is assigned to zero. The algorithm of the offline method is as follows.

```
// XED- offline method
// Node p executes the algorithm
Save x, h(.) in node p
Assign A_r^p, B(p) and A_s^p to ϕ
```

The next section explains the online method is performed after the offline method.

5.2.2. Online Step

Each node performs the online step after the deployment of sensor nodes. Initially, when the nodes *p* and q meet, they both communicate with each other with the help of the received random number $r_{p\to q}$ and $r_{q\to p}$ and is defined as,

$$p = r_{p\to q} \qquad (2)$$

$$q = r_{q\to p} \qquad (3)$$

The node *g* generates randomly a value $\delta \in [1, 2^x - 1]$ and calculates h(δ) and stores it in an array $A_s(p)$ which is the random number set and sends it to *q*. Initially, $A_s(p)$ =0. The exchanged number $r_{p\to q}$ is demanded when the nodes happen to meet again. When the node *d* responds to the accurate random number, the nodes are communicated and the random numbers $nr_{p\to q}$ and $nr_{q\to p}$ are updated as follows.

$$A_r^{(p)}[q] = nr_{p\to q} \qquad (4)$$

$$\mathrm{A_r^{(q)}[p] = nr_{q\to p}} \qquad (5)$$

The random number updated $nr_{p\to q}$ and $nr_{q\to p}$ is analyzed with the hash function h(δ). Or else q is updated in the blacklist *B(p)* as the replica node. The blacklisted nodes are broadcasted through a message in the network to revoke the node q. The pseudo-code of the online step is as follows.

```
// XED- Online Method
// the node g at time t performs the algorithm
// {d1,....dj} ∈ B(p)
Send A_r^(p)[q_1], ... ... . A_r^(p)[q_j]  to q1,....qj respectively
Receive A_r^(q1)[p], ... ... ... A_r^(qj)[p]
For a=1 to d
If h(A_s^p[q_a]) = A_r^(q_a)[p]
      Choose δ ∈ [1, 2^x-1] and set A_s^p[q_a]= δ
       Calculate h(δ ) and send h(δ ) to q_a
Else
       Set B(p)= B(p) ∪ {q_a}
End if
End
```

5.3. Limitations of XED method

The limitations of the XED method are If every node has to exchange random numbers and interrogate each other in the network, it requires O(N) entries to be stored, where 'N' is the number of nodes. This memory requirement may, however, become prohibitive for WSNs with a large number of sensor nodes. The effectiveness of the XED method is assured only if the replicas are not communicated as they can communicate the random number that is shared recently. Hence, there is a possibility to suppress the ability of detection because several replicas can reply with the exact random number during communication in the network. Therefore, an effort to enhance the XED method attempt is made to solve the limitations. The XED method is enhanced with an integrated Artificial Immune System (iAIS) algorithm. The proposed method is explained in the next section.

5.4. Proposed enhanced XED Method

The proposed Enhanced XED method is a two-step process namely the enhancement of XED and then the application of iAIS for the enhanced XED method. The following is the explanation of the proposed enhanced XED method is explained as follows.

Step 1: Application of the XED method

Both the offline step and the online step of the XED method are applied to the network. In the online step, the initial sets of replica nodes and the self-node are collected. The XED method obtains these sets by verifying the random number generated by each node.

Step 2: Calculation of Packet Loss

To perform the malfunctions the adversary usually replicates the compromised node. The defects include deleting messages, delaying messages, dropping messages, and also inserting fake messages. By calculating the packet loss, the replica nodes are that drop messages and delete the messages are detected. Additionally, packet loss (PL) is also calculated. Each node calculates the PL as,

$$Packet\ Loss = \sum_{i=1}^{n}(S_i - R_i) \qquad (6)$$

where n is the number of nodes, R_i is the number of received packets, S_i is the number of transmitted packets The node is considered as a genuine node or self-node when the PL has not occurred.

Step 3: Computation of Average Efficiency

If there is a PL, it might occur due to some physical problems in the node. Hence average efficiency for each node is calculated. Furthermore, during the communication in the network, the replica nodes will have minimum forwarding capability. The Average Efficiency is,

$$\text{Average Efficiency} = \sum_{i=1}^{n}\frac{(R_i - D_i)}{N_i} \qquad (7)$$

where n is the number of nodes, Ri is the number of received packets, Di is the number of delivered packets and Ni is the total packets The threshold value is dynamically assigned to denote the data forwarding capability. If the threshold value of the node is greater, then the existing random number set is compared with the average efficiency. If the nodes are identical, then the nodes are updated in the

self-node set. Else the nodes in the replica node-set are compared. When there is a match, the nodes are stored as the replica node-set. To minimize the false detection rate, the deduced replica nodes are further confirmed by combining with iAIS algorithm. Further, the enhancement is done using the iAIS algorithm as it reduces the false positive rate. The obtained replica node-set and the self-node-set are employed to identify the replicas that are rigid against collusive replicas with minimum control overheads.

Step 4: Applying iAIS algorithm

The idea of immune system Cells is merged in iAIS algorithm [8] to detect the replica nodes. To launch an attack, the antigens are removed by the adaptive immunity present in the model of the B-Cell. The concept of differentiating self-nodes from non-self nodes is used. In this model, the two phases are the learning phase and the operational phase. The benign behavior of the system is performed in the learning phase. Whereas, the antigens received are classified as self and non-self nodes in the operational phase. The innate immune system inspires the basic model of the DCS. The antigens are defended by the innate immune system. To identify the pathogens antigens that are present on the surface of the pathogen are used. The primary defense was performed by DCs in which the behavior of Ag that is sampled is determined as dangerous or safe. The level of co-stimulation is found out when the signals are processed. If there is an excess in the co-stimulation, the context that is found to be dangerous is transmitted to the non-self(mature) state and the context that is identified as safe is transferred to the self (semi-mature) state. To mature/ activate the T-cells and also to present the examined Ags in the thymus basic Dendritic Cell model is used. The packet loss and the average efficiency are used to find the co-stimulation threshold. The packet loss is directly proportional to the co-stimulation threshold and indirectly proportional to the average efficiency. Based on the co-stimulation the self and the non-self nodes are identified. Due to the enhancement of the XED method, the classified non-self nodes are recognized as mature states and the self-nodes are recognized as semi-mature states.

Step 5: Node replication attack Detection

In the thymus, the self and the non-self nodes are transmitted. Moreover, the antigens that create damage to the self nodes are removed. It further verifies the examined Ags with the T-cells using the enhanced XED method. If there is a matching between the examined Ags and the T-cells, they are it is further verified to identify the mature DC. The corresponding T-Cells are recognized as T-helper cells if it is mature DC and store in the detector set of T-helper cell. The detector set of the T-helper cell is verified with the incoming Ags. When there is a match between the incoming Ags and T-helper detector set, the Ags are declared as replica nodes else it is detected as the self-node and marks the B-Cell detector set unchanged. Hence, to categorize the self and the replica nodes, B-cells are co-stimulated by the T-cell detector set to attain higher detection accuracy. The replicated nodes that share the exchanged information are detected using the proposed EiAIS method. With the increase in the packet delivery ratio, replicas are detected.

6. Experimental Setup and Results

Mobility-based sensor networks are present in an unattended and distributed nature. The mobile-based sensor networks' performance and behavior are analyzed using the proposed EiAIS method. The simulated environment NS-2 was used to conduct the experiments. At the time of simulation, at different times from 500 seconds to 1000 seconds, the information was collected. During the simulation time, the statistics are collected by varying the time from 500 seconds to 1000 seconds. The information includes consumption of energy, received data packets, generated control packets, packets sent, packets delayed, total delayed packets, and the sum of received packets. The following metrics are calculated from the above information.

- Packet Delivery Ratio
- Message Drop
- Average Delay
- Control Overhead
- False Alarm Rate
- Detection Ratio
- Throughput

Based on the above parameters, the performance of the proposed method is calculated.

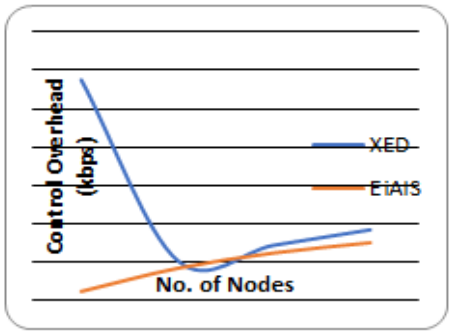

Figure 2: Results for Control Overhead

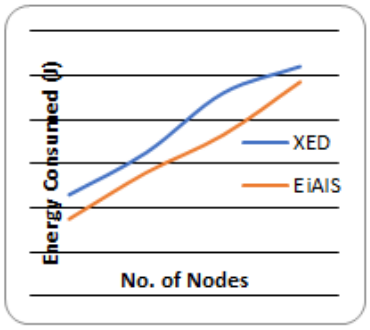

Figure 3: Results for Energy Consumed

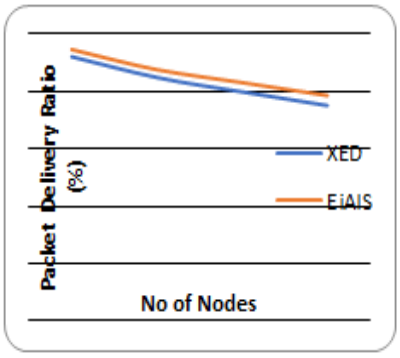

Fig 4: Results for Packet Delivery Ratio

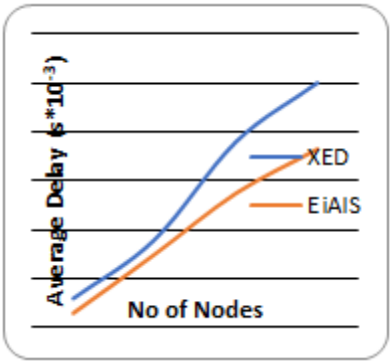

Fig 5: Results for Average Delay

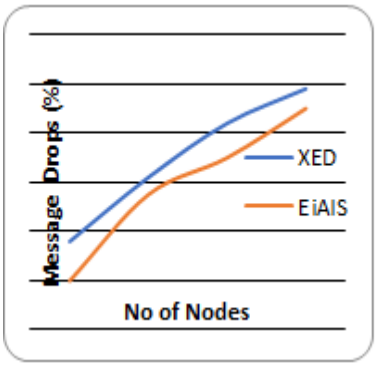

Fig 6: Results for Message Drops

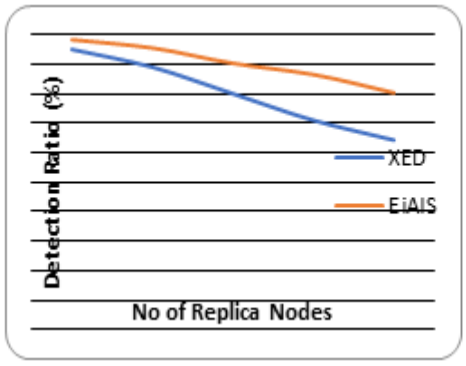

Figure 7: Results for Detection Ratio

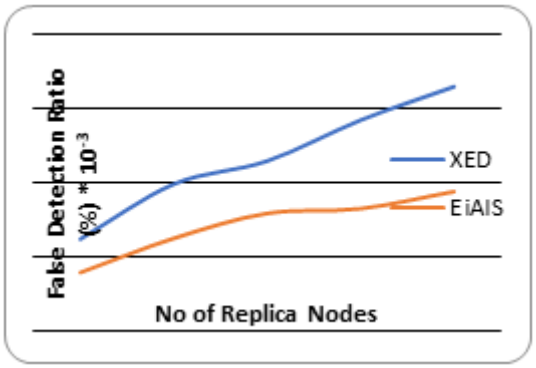

Figure 8: Results for False Detection Ratio

By differing the number of nodes, the performance of the proposed EiAIS method is compared as shown in Table 2.

Table 2: Comparative results of XED and EiAIS methods for different node sizes

No of Nodes	Control Overhead (kbps)		Energy Consumed (J)		Packet Delivery Ratio (%)		Average Delay (s * 10^{-3})		Message Drops (%)	
	XED	EiAIS	XED	EiAIS	XED	EiAIS	XED	EiAIS	XED	EiAIS
50	5750	2500	1150	8750	92	94.5	3000	1500	9	5
100	1050	8500	1625	14000	84.75	87.5	9000	7500	15.5	13.75
150	1450	12500	2300	18250	79.75	83	1900	13750	21	17.5
200	1850	15150	2600	24250	75	78.5	2500	18250	24.5	22.5
Average	**2525**	**9662.5**	**1918**	**1425**	**82.87**	**86.37**	**1400**	**10250**	**17.5**	**14.69**

From the above Table 2, it is observed that the proposed EiAIS method improves the performance in terms of overheads, consumed energy, average delay, message drops, and Packet Delivery Ratio. By varying the replica nodes, the comparison of the proposed method with that of the existing method is given in Table 3.

Table 3: Performance of EiAIS method for various sizes of the replica node

No of Replica Nodes	Detection Ratio (%)		False Alarm Rate (%) * 10^{-3}	
	XED	EiAIS	XED	EiAIS
5	97	100	6.25	4
10	94	98	9.95	6
15	90	95	11.5	8
20	85	93	14.25	8.3
25	82	90	16.5	9.5
Average	**89.6**	**95.2**	**11.69**	**7.16**

Table 3, shows the performance of the proposed EiAIS method in which the detection accuracy has been improved with the reduction of the false detection ratio. The table below shows the overall comparison of results of the prosed EiAIs method.

Table 4: Enhancement of EiAIS method

Metrics	Existing XED Method (Kbps)	Proposed EiAIS Method (Kbps)	Enhancement (%)
Detection Rate	89.6	95.2	5.6
False Detection Ratio	11.69	7.16	4.53
Bandwidth	28,00	33,00	17.8
Message drop	17.50	14.69	2.81
Energy	1918	1425	4.93
Control Overhead	25250	96625	71.37
Average Delay	14000	10250	37.5
Packet Delivery Ratio	82.87	86.37	3.5

From the above results, it is clear that the proposed EiAIS improves the detection accuracy when compared with the existing method. Moreover, the proposed method shows a better result in terms of other metrics also.

6. Achievements of the Proposed EiAIS Method

The achievements of the EiAIS method are

- The replicated nodes that share the information are detected.
- The detection rate is increased.
- Energy consumption is low.
- Packet Delivery Ratio (PDR) is high.
- Control overhead is minimized.

7. Conclusion

In healthcare applications, an impersonation attack is a crucial one as it creates various attacks. One of them is a node replication attack. The detection of node replication attacks is a challenging one. The proposed EiAIS method enhances the XED method and combines it with the iAIS algorithm. The proposed method detects the replica node with improved detection accuracy with improved packet delivery ratio.

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SP-18

Soil Nutrient Mining: A Hand-Held Device For On-Farm Soil Analysis And Crop Fertility Prediction

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Abstract: In India, farming is performed by ancient methods, farmers plant crops traditionally without knowing the content of soil and quality of that soil. As result farmers will not gain sufficient profit from their farming. The existing method of soil testing is manual the soil samples are sent to laboratories for testing. This manual process is time-consuming and not feasible. In the proposed work implement an automated soil testing method using a handheld device where the soil is tested on-farm and determine the pH of that soil immediately without sending them to research laboratories. Based on pH and permeability values of macronutrients i.e. N, P, K, Ca, Mg, and S present in the soil, suitable crops and fertilizers are analyzed. This will overcome the drawbacks of the manual soil testing process by replacing the process with our model which gives real-time results. The proposed method will also suggest soil regeneration techniques by mixing different layers of soils and adding suitable fertilizers at the right proportion to make infertile soil fertile. And suitable seeds cultivated according to seasons are also predicted. The proposed method is very efficient to use and also to cultivate new fruits and vegetables which are exclusively available in native lands are can be made possible to grow in our land by making soil analysis.

Keywords: Soil testing, crop prediction, Soil permeability, MachineLearningClassification Algorithm.

INTRODUCTION

In the present occupied world, individuals use up all available time and innovation is enabling them in all divisions. Right now, is likewise creating in its specialized viewpoint the essential area which is India's spine. Farmers are in the need of brilliant facilities to conquer their troubles, for example, water shortage, pesticide control, water system, soil. This venture depends on IoT gadgets utilizing sensors constrained by versatile applications[13]. The significant nourishment required for the development of the plant in the dirt is nitrogen, potassium, and phosphorous utilizing NPK sensors which can recognize measures of composts to be accommodated in the dirt. Temperature and mugginess sensors will screen the climate and soil reports utilizing past information. Hence, every one of these sensors is associated with the Arduino board and the information gathered from sensors is sent to the interface of the portable application. This application will give the UI to screen composts, water system, and mugginess control. This likewise gives a proposal for the best yield to be developed in the best time and the necessary pesticide for the harvest utilizing AI strategy. On the off chance that the harvest has danger in a specific zone is recognized and furnished with the adequate need as it is associated with each sprinkler and dribble in the field. This application would be useful for the farmers who are thinking of smart execution in the agricultural segment. The current framework helps in acquiring the data about the nature of the dirt to discover the right harvest for their yield with the help of Raspberry pi board alongside scarcely any sensors like pH sensor, humidity sensor, and temperature sensor to gather the information from those sensors and sends to distributed storage to store the estimations of a particular sensor. It gives the android application office to the end client to get their sensor esteems. It very well may be gotten to through entering the IP address of their gadget. However, this framework can't anticipate the climate condition earlier and won't propose the best harvest to yield. It neglects to tell in regards to the water system at the necessary time. To break down the dirt quality, the proposed framework utilizes a moistness sensor, temperature sensor, and NPK sensor to get insights concerning the dampness content in the dirt, temperature of the encompassing and Nitrogen, phosphorous, potassium substance in the dirt. These sensors are associated with the Arduino UNO board. A devoted Wi-Fi module is associated with the board that assists with sending information to the cloud to process the information accumulated by various sensors. The accumulated information is Temperature, Humidity, and NPK values. The information from the sensors is stored in My SQL server cloud which is high accessibility open-source distributed storage. Information is updated to the server as often as possible.
Advantages:

- The Crop is predicted systematically.
- Time consumption is reduced
- Multiple tests can be performed throughout the land.
- The accuracy of prediction is increased

- The chemical process is neglected which is riskier
- The soil test process is provided to the farmers at their doorstep
- Farmers get huge awareness on suitable crop cultivation and fertilizers to be suggested

Due to human intervention, there are chances of human errors so farmers may not receive an accurate report [5]. So there is necessary for an automated process for soil testing and crop prediction. Soil testing is important which helps to determine the fertility of the soil and thus crop prediction can be done. In the proposed system a handheld device that gives the pH value of the macronutrients which include Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), and Sulfur (S) is estimated. With pH value, the measures ofacidity or alkalinity in soils are found out. The proposed system tries to change the soil pH value by increasing the pH of acidic soil or by decreasing the pH of alkaline soil, to make the soil suitable for cultivation. Measurement of soil permeability in the field is then carried out; Soil permeability is an important property of the soil to transmit water and air and is to be considered. Soils are normally made up of layers and soil quality usually varies greatly from one layer to another. In our work, samples from different layers are collected and according to pH value and permeability measurement, the soils are classified. The actual pH value of soil is stored in the MySQL server. In the proposed work, MachineLearningClassification Algorithm is used to classify and predict suitable crops, based on the values generated from our device and also provide suitable fertilizers required for that land. Crop prediction is important to increase yield production. The basis of macronutrients and pH value prediction will help the farmers to overcome the drawbacks.

Literature Review

In India, agriculture is one of the important sectors as 50% workforce is involved in agricultural activities. India accounts for 7.68% of total global agricultural output. GDP of Industry sector is $495.62 billion and world rank is 12. In the Services sector, India's world rank is 11 and its GDP is $1185.79 billion. The contribution of the Agriculture sector in the Indian economy is much higher than the world's average (6.1%). But Traditional farms in India still have some of the lowest per capita productivity and farmer incomes[12]. This sector also requires a lot of human effort to do different kinds of tasks like watering crops, cultivating the crop, spreading pesticides, etc. Soil analysis is an important methodology as it gives nutrients present in the soil such as NPK values and pH values[10]. An automated soil testing human efforts will be reduced by monitoring the quality of soil using soil sensors. Depending on the values obtained from the device suitable list of crops is predicted. Crop prediction is also an important parameter to increase yield production. Henceforth based on NPK and pH values predict the appropriate crop along with the required fertilizers so that farmers will overcome the exiting method drawback. Dharesh Vadaliaet al, proposed a system that determined the basic constituents of soil like pH and electrical conductivity which majorly affect the quality of the soil. This system includes a portable device that is made up using pH and EC sensors and an Arduino board along with the analog to digital converter. Sensors sensed the pH and EC of a particular soil sample give the value to the Arduino board in real-time. Analog to Digital Converter is used to convert analog ph value to digital value. Arduino board requires a 9V power supply which is given by an adapter and sensors require 3.3V-5V power. With the help of Arduino, pH value is converted into Nitrogen, Phosphorus, and potassium which determines the soil quality. Arduino displayed NPK values on the display screen and the farmer have to manually enter NPK values in his remote device application. The application will give a digitally generated fertility report which contains suitable crops and required fertilizer[6]. Hemageetha et al, data mining algorithms are used on agriculture data. They collected the dataset from agriculture university which contains various attributes like sample no., block no., soil type, pH value, EC, NPK. Initially, datasets were in excel sheets are converted in .CSV file format to be accessed in WEKA. They used the WEKA tool which is open source software for data mining. Data sets contain instances with missing attribute value, noisy data, and miss-match therefore they used WEKA filter techniques. Now the soil sample will be classified into two classes either suitable soil or non-suitable soil. The major condition for this classification is if the value of pH is greater than 8.5 then the soil is non-suitable otherwise it is suitable for crop cultivation. Now they apply four different classification algorithms to the pre-processed dataset and compare all the results and choose one classifier which gives the best result. According to their system, the J48 classifier gives the best result with the highest accuracy. Data mining plays a major role to improve crop prediction in agriculture[9]. Baskar et al.,[16]examine the soil information exploitation distinctive algorithms and statement technique. A report is exhibited exploitation completely. Jay Gholap[11] predicts soil extravagance abuse call tree equation. In [8], the creator determined soil qualities and inspected soil data abuse characterization strategies. Soil properties, for instance, pH esteem, Electrical Conductivity (EC), Potassium, Iron, Copper, and so forth ordered utilizing arrangement calculations[19] use KNN, Naïve Bayes and J48 for breaking down soil information. This examination recommends the manure dependent on the dimension of supplements found in the dirt test set. Bhuyar [3] concentrate on order of soil extravagance rate utilizing J48, Naïve Bayes, and Random timberland calculation. J48 calculation gives an ideal result over different calculations. Choice tree structure by J48 calculation helps the cultivator and leaders to distinguish the dirt lavishness rate and on the reason of supplements found in the dirt example, diverse manures can be recommended. Bhargavi et al.,[2] contended GATree, Fuzzy Classification rules, and Fuzzy C-Means calculation for ordering soil surface in cultivation soil information. Characterization dependent on Fuzzy principles gives much more execution than GATree[15], and calculations are analyzed. Characterization calculation improved it is proficiently grouped into a most extreme number of cases contrasting and the other two. Ramesh et al., [20]clarifythe correlation of various classifiers and the result of this examination could improve the administration and frameworks of soil clients, all through huge fields that incorporate farming, cultivation, natural and land use the executives. Dildarkhan et al.,[7]give an examination of the dirt information utilizing diverse arrangement calculations and estimating techniques. Soil testing research focuses on the examination the dirt and gives the example of informational collection. It will require an extensive proportion of time to describe the dirt datasets physically. Shivnath et al.,[18] an examination of soil properties utilizing Back Propagation Network.

Proposed Work

The main aim of our system is to atomize the current manual soil testing technique. The proposed work architecture is as shown in Fig.1. This framework builds a handheld gadget utilizing a pH meter which will give the pH value of soil as in Fig.2. pH is the negative log of hydronium particle mole per liter pH = - log [H3O+] [14]with the assistance of this pH esteem will assess NPK of that dirt, which are vital Macronutrients of soil.

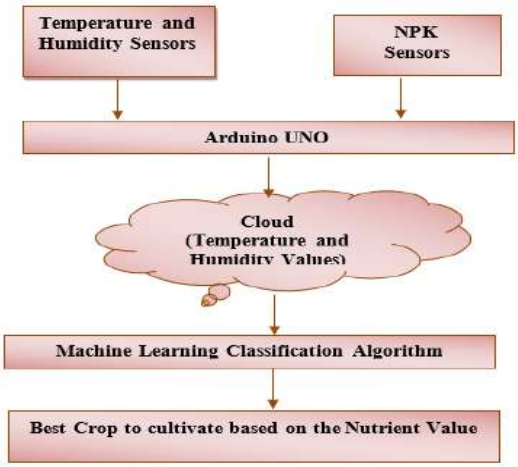

Figure.1. Proposed Frame Work

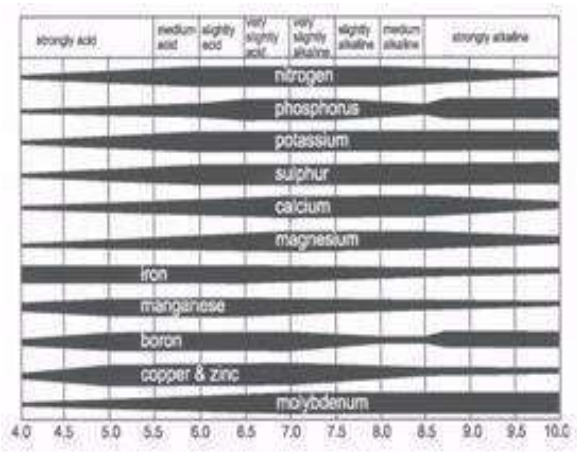

Figure.2:pHvalue in Nutrients

These will decide the fertility of the soil. For the proposed software model, therewill be training a crop database and we will classify that particular soil sample into a particular class using a classification algorithm. Depending on the class determined by our system we will give a list of crops suitable for that particular soil sample. Also, provide a suggestion of fertilizer for a particular crop.

Working Principles

The proposed System includes a pHmeter,Arduinoboard,ESP8266, MySQL server. Arduino board requires 9V power and ESP8266 also requires 5V power which is provided using an adapter. This system consists of a handheld device that is built using a pH meter whose one wire is connected to the ground and another to the A0 pin of the Arduino board. Initially insert pH meter into the soil then it senses value and sends to Arduino, where analog pH range is converted into actual pH range. Now this actual pH value of soil is sent to the server using a Wi-fimodule(ESP8266) as in Fig.3. The sample dataset of List of Crop is depicted in Fig.4.

Figure3:Soil AnalysisModel

At server side will convert pH to NPK and depending on these values decide the fertility level of soil and classify into either LOW, MEDIUM, HIGH class.

Chart-1:CropDataset

	List of crops	N	P	K
3	amla	400	400	250
4	baby corn	100	50	50
5	bajra	60	30	0
6	banana	400	150	480
7	beans	30	60	30
8	bitter gourd	120	60	30
9	black gram	25	50	0
10	bottle gourd	100	50	50
11	brinjal	150	50	50
12	cabbage	120	60	60
13	castor	60	40	0
14	cheak pea	25	50	0
15	chily	150	50	50
16	cinnamon	20	20	20
17	cloves	20	20	50
18	corn(maiz)	120	60	60
19	cotton	80	40	40
20	cow pea	60	50	50
21	cucumber	135	60	30
22	drumstick	75	50	75
23	french bean	660	60	60
24	great millet	120	60	60
25	green gram	39	14.8	44.4

This fertility class is decided by Machine Learning Classification Algorithm. Now the list of crops suitable for that fertility class will be displayed. This will also provide a module where a farmer can enter the crop he wants to grow and depend on that will suggest fertilizer to improve the yield of that crop in his soil.

Classification

Classification is a process of assigning objects to previously defined categories. It aims at predicting accurately the destination class for each object of data. Machine learning is the core logic of the proposed system. In general, a dataset is needed to train the machine to find patterns in the data to decide whether to irrigate or not[12]. For better precision, an Openweathermap.com API is included to know when the water pump needs to be opened. In machine learning, everything is about modules, that is, machine learning works through a chain of module[1,4,15,17,20]. The best algorithm for soil classification is Support vector Classification. For machine learning to work, it should be trained through data and patterns. In the proposed machine learning system, a "training experiment" has been used. SVM regression algorithms find a model that deviates from the measured data by value no greater than a small amount with parameter values that minimizes sensitivity to error. The goal is to fit a linear function of the form $y = w.x + b$ to optimize the cost function. Since w and x are vectors, $w.x$ represents a dot product. By replacing the dot product with a nonlinear kernel, the data can be transformed into a higher-dimensional space. By doing this, the model can learn higher-order functions.The soil humidity is being measured using DHT11 (Digital Humidity and Temperature) and NPK sensor, which measures both humidity and temperature. DHT11 gives RH % which helps in determining the current state of irrigation as well as the exact need for more water resources. DHT11 RH % generally ranges from 20% to 90%. To save and use energy, resources more efficient machine learning algorithms were applied to the previously collected humidity states, to optimize the crop irrigation. The classification accuracy of the proposed system achieves 98.52 %.

RESULTS AND DISCUSSIONS

An automated farm monitoring system is developed which is a sustainable solution to various existing and un-for-seen epidemics such as starvation due to food shortages and economic crisis. IoT and Machine learning algorithms such as SVM (Support Vector Machine with Radial basis function kernel helps in classification and quantitative predictions of soil type, crop type, and amount of irrigation required by the crops. The analysis of the "Agriculture Production in India" dataset gives information about the agriculture industry in different regions of India. A smart farming approach is that could help everyone from a large-scale farming industry to a small-scale farmer to even household garden owners. The inter-connectivity of various devices ensures a smooth flow of all activities at an ease. The proposed system involves two phases the training and testing phase. It uses two databases the soil database and crop database. The soil database includes the chemical features and geographical features of the soil. Table 1 shows the chemical features of the soil.

The proposed model is based on a soil and crop database. Several machine learning algorithms are used to classify the soil type. For a particular soil type suitable crop is suggested. From the experimental result, SVM has obtained the maximum accuracy. The classification accuracy is presented in Table.2.

Table 1. Chemical attributes

Attribute	Details
pH	pH value of soil
Salinity	Ds/meter
Organic Matter%	Percentage
Potassium	mili-equivalent /100 grams soil
Sulfur	microgram/per gram soil
Zinc	microgram/per gram soil
Boron	microgram/per gram soil
Calcium	mili-equivalent /100 grams soil
Magnesium	mili-equivalent /100 grams soil
Copper	microgram/per gram soil
Iron	microgram/per gram soil
Manganese	microgram/per gram soil

Table. 2. Performance comparison of a proposed SVM classification model

Model	Precision (%)	Recall (%)	Accuracy (%)
SVM	98.6	98.5	98.52

Conclusion

This paper proposed an automated soil testing method using a handheld device that will determine the pH of that soil. Then on basis of pH provides values of nutrients i.e. NPK exists in the soil. Based on the obtained values from the device are assisted to predict a list of suitable crops and fertilizers. The existing drawback of the manual soil testing process overcomes by the process of the proposed model which gives real-time results. The proposed method is very efficient to use.

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SP-19

Anticancer Potential Activity Of Indian Medicinal Plant (VITEX NEGUNDO)

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Abstract: The present study evaluated the anticancer potential activity of Indian medicinal plant (*Vitex negundo*). Isolation of bioactive compounds involved liquid-liquid extraction using hexane, ethyl acetate and ethanol, The extracts from the leaf were tested for anticancer property, phytochemical analysis, nitric oxide radical inhibition assay, MTT assay using A549 human lung cancer cell lines. It was observed that the ethanolic extract of *Vitex negundo* showed better results. This study shows that the ethanolic extract has both the antioxidant and anticancer property.

Key Words: *Vitex negundo,* antioxidant, anticancer property, Phytochemical Analysis, MTT assay

INTRODUCTION

Cancer is a class of diseases which is characterized by the uncontrolled proliferation of cells. Where most cancers are originated from a single cell that has experienced an initial mutation of which the progeny must undergo further changes, requiring numerous additional mutations. Studies on the analysis of cancer it is medically known as a malignant neoplasm .A complex disease occurring as a result of a progressive accumulation of genetic aberration and epigenetic changes which enables to escape from the normal cellular and environment controls.The A549 lung cancer cell line was initiated and established in 1972 by (Giard *et al*.,1973), through explants culture of lung carcinomatous tissue from a 58-year- old Caucasian male the result shows that their morphological characteristics and epithelial like shape are compatible to human lung cancer biopsies (Lieber *et al*.,1976). Indian medicinal plants also have major role for the production of new drugs for uncured diseases also. Based on many natural products various experimental models for anticancer activity resulted in the availability of nearly 30 effective anticancer drugs. *Vitex negundo* Linn. (Family: Verbenaceae) known as Nocchi in Tamil. Although all parts *V.negundo* has its own medicinal value which is mostly used as medicine in the indigenous system of medicine. Leaves as considered as the most potent for medicinal use. (Shrinivas Sharma *et al*., 2009, Zargar *et al.,* 2011). The leaf extract using different solvents also provide a source of new compound as many synthetic drugs can be originated as herbal source. Studies are undertaken to investigate the effect of *Vitex negundo* (VN) on cognitive function, brain acetyl cholinesterase activity in scopolamine (Rahmat,2009). Hence the motto is to identify and analyze the cytotoxicity, anticancer property in *Vitex negundo* with three major solvents Hexane, Ethyl Acetate, Ethanol using A549 cell line.

MATERIALS & METHODS

Quantitative Phytochemical Analysis

Determination Of Flavonoids Content

Total Flavanoid content in the extracts (Ethyl acetate) was determined using the method described by (Sankanaka *et al*., 2005). The absorbance was measured immediately at 510 nm using a spectrophotometer. A calibration curve was generated using various concentrations of Quercetin and the Quercetin equivalence (QE) of the sample was expressed in µg/mg of the extract.

Determination Of Total Phenolic Content

The number of phenolic compounds in the extracts was determined by the Folin Ciocalteu colorimetric method and calculated from a calibration curve obtained with Gallic Acid as standard(10mg/10ml). The absorbance was measured at 765nm in a UV-Visible Spectrophotometer. The results were expressed in Gallic acid equivalence of the samples (GE) µg/mg of the extract.

Nitric Oxide Radical Inhibition Assay

Nitric oxide can be estimated by the use of GriessIllosvoy reaction (Garratt, 1964). The absorbance of these solutions was measured at 540 nm against the corresponding blank. Vitamin C was used as positive control. The scavenging activity was calculated using the formula.

MTT Assay

The MTT assay (Mossman, 1983) is based on the ability of live cells to reduce a yellow tetrazolium dye to a purple formazan product. Cells were maintained in DMEM medium, supplemented with 10% Fetal Bovine Serum, at 37°C in humidified atmosphere with 5% CO_2. A549 cells were plated in 96 well flat bottom tissue culture plate with 1.2X 10^4 cells/well and allowed to attach overnight at 37°C. The medium was then discarded and cells were incubated with different concentrations of the samples (100µg,200µg,300µg) for 24 hours. After the incubation, medium was discarded and 100µl fresh medium was added with 10µl of MTT (5mg/ml). After 4 hours, the medium was discarded and 100µl of DMSO was added to dissolve the formazan crystals. Then, the absorbance was read at 570nm in a microtitre plate reader. Cyclophosphamide was used as positive control.

Cell survival was calculated by the following formula:
Viability % = (Test OD/ Control OD) X 100

DNA Fragmentation

DNA fragmentation is the separation or breaking of DNA strands into pieces. It can be done intentionally by laboratory personnel or by cells, or can occur spontaneously. In this study the protocol provides a method for DNA separation of fragmented and intact DNA fractions and for their analysis by agarose gel electrophoresis. In apoptotic cells specific DNA cleavage becomes evident in electrophoresis analysis as a typical ladder pattern due to multiple DNA fragments.

RESULTS AND DISCUSSION

The present study was aimed to determine the cytotoxicity and anticancer activity in human lung cancer cell line (A549) from the extracts of *V. Negundo* leaves. It is said that compounds present in the natural product always possess an important role in the treatment of health issues. The process of sequential extraction was done using three solvents namely hexane, ethyl acetate, ethanol with the ratio of 1:3. The ethanolic extract of the leaf had higher yield (i.e.: 2.089gm/300ml) than ethyl acetate and hexane. The phytochemicals present in medicinal plants has a great way of attention, where it concentrates in its role in preventing diseases. The content of phenol and flavonoids in the different part of the plant has anti-oxidant property Pulido (2000). By the phytochemical analysis, using Gallic acid as the standard with the standard volume of 20-100µl for the identification of total phenol content. The test is done with the extract volume (100µl) and absorbed at 765nm using spectrophotometer. The concentration of phenol content in hexane = 25.2µg, ethyl acetate = 78.2µg, ethanol = 9.2µg. By the same way using quercetin as standard, the total flavonoid content was absorbed at 510nm.Where flavonoid content was absent in hexane and present only in ethyl acetate and ethanol with the concentration of 14µg and 7µg. (Palombo 2006). Radical scavenging activity by NO Assay was conducted ascertain to identify the antioxidant in the extracts of *Vitex negundo.* The capability of the radicals was determined by the absorbance of 540nm. The % of inhibition was evaluated with the control values of hexane = 1.32µg, ethyl acetate = 1.38µg and ethanol = 1.43µg with a properly optimized protocol, MTT Assay was performed with the seeding A549 cells followed by the drug treatment in three different concentration i.e: 100µg, 200µg ,300µg using ethyl acetate and ethanol with the control to check the cell viability. It was then incubated and the values were absorbed 570nm. DNA fragmentation is often necessary prior to library construction or sub cloning for DNA sequences. A variety of methods involving the mechanical breakage of DNA have been employed to find the stability of DNA. In this study no DNA fragmentation were observed in ethanol extract when compared to ethyl acetate.

Table: I: Qualitative Analysis of *Vitex negundo* of Various solvents

EXTRACT & TESTS	HEXANE	ETHYL ACETATE	ETHANOL
Carbohydrates	-	-	-
Tannis	-	-	-
Saponins	-	-	-
Flavonoids	-	+	+
Alkaloids	-	+	+
Glycosides	-	-	-
Quinones	-	-	-
Cardiac glycoside	-	-	-
Terpenoids	-	-	-
Phenols	+	+	+
Coumarins	+	+	+
Steriods & Phytosteriods	-	-	-
Phlobatannins	-	-	-
Anthraquinones	-	-	-

- ***+ indicates the presence.***
- ***- indicates the absence.***

Table 2 Quantitative Analysis Of Phenol					
SAMPLE	ETHYL ACETATE (OD)	ETHANOL (OD)	CONCENTARTION(µg)		
			Hexane	Ethyl Acetate	Ethanol
Vitex Negundo	0.7116	0.7811	25.2	78.2	94.2

Table 3 Quantitative Analysis of Flavonoid				
SAMPLE	ETHYL ACETATE (OD)	ETHANOL (OD)	CONCENTARTION(µg)	
	0.1688	0.1952	Ethyl acetate	Ethanol
Vitex negundo			14	7

% Of Inhibition = (1-Abs Extract / Abs Control) x 100
For Hexane Control = 1.32µg

Table 4 Nitric Oxide Assay:		
S.NO	Concentration (µg)	% INHIBITION
1.	200	36.54%
2.	400	35.78%
3.	600	36.54%
4.	800	33.51%
5.	1000	32.75%

For Ethyl Acetate Control = 1.38µg

S.NO	CONCENTATION (µg)	% INHIBITION
1.	200	42
2.	400	40
3.	600	41
4.	800	43
5.	1000	42

For Ethanol Control = 1.43µg

S.NO	CONCENTARTION(µg)	%INHIBITION
1.	200	49.29
2.	400	54.18
3.	600	54.88
4.	800	61.18
5.	1000	61.88

5.Tabulation of MTT Assay

CONCENTRATION(µg)	ETHYL ACETATE VIABLITY	ETHANOL VIABLITY
100	50%	53.3%
200	62.5%	70.6%
300	92.5%	96.3%

DNA FRAGMENTATION

Marker – DNA 1kb ladder

L1- ethanol (100 µg/ml)
L2 - ethanol (200 µg/ml)
L3- ethanol (300 µg/ml)
L4- ethyl acetate (100 µg/ml)
L5- ethyl acetate (200 µg/ml)
L6- ethyl acetate (300 µg/ml

CONCLUSION

The present study was aimed to determine the cytotoxicity and anticancer activity in human lung cancer cell line (A549) from the extracts of *V.Negundo* leaves. The process of sequential extraction was done using three solvents namely hexane, ethyl acetate, ethanol with the ratio of 1:3. The ethanolic extract of the leaf had higher yield (i.e:2.089gm/300ml) than ethyl acetate and hexane. By the phytochemical analysis, using Gallic acid as the standard total phenol content were observed. The test is done with extract volume (100µl) and absorbed at 765nm using spectrophotometer. The concentration of phenol content in hexane = 25.2µg, ethyl acetate = 78.2µg, ethanol = 94.2µg. By the same way using quercetin as standard, the total flavonoid content was absorbed at 510nm.Where flavonoid content was absent in hexane and present only in ethyl acetate and ethanol with the concentration of 14µg and 7µg. Radical scavenging activity by NO assay was conducted ascertain to identify the antioxidant in the extracts of *Vitex negundo*. The capability of the radicals was determined by the absorbance of 540nm. The % of inhibition was evaluated with the control values of hexane = 1.32µg, ethyl acetate = 1.38µg and ethanol = 1.43µg. MTT assay was performed with the seeding A549 cells followed by the drug treatment in three different concentration i.e: 100µg, 200µg, 300µg using ethyl acetate and ethanol with the control to check the cell viability. It was then incubated and the values were absorbed 570nm. DNA fragmentation were not observed in ethanol extract when compared to ethyl acetate. It was observed that the ethanolic extract of *Vitex negundo* showed the higher activity. This study shows that the ethanolic extract has both the antioxidant and anticancer property.

Acknowledgement

The authors express their gratitude towards the host institution and Biozone, Chennai.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-20

Predictive Analysis For Brain Detoxifying – A Mental Fitness Approach

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Abstract : The word Detox is the most frequently used word in present days among the people competing with their routine works. Even in social media this term Detox has become the most exploring term. The right need for Detox is the Brain. Yes, though the Brain is a physical organ, it does a major role in maintaining our mental strength. Brain Detox is extremely important for every human. Perhaps, most of us do not care about Brain detoxing. Even the people looking for a well good physical transformation are more focused on their weight balancing nor an energy gaining process. They seldom turn their thought towards Brain detoxing. In this paper, I have emphasized the various aspects of Brain detoxing methods. My study on people habits with different living environments and their routine habits that are directly or indirectly influence their mental strength. Importantly, portrayed the results that are reflected in people after following the brain detox methods. Especially to the people who are engaged in a knowledge-based industry is the primary focus get benefited from this research outcome. Speaking about the computation methods used in this research, predictive analysis is the prominent approach or technique that I have used to bring some certainty about the uncertainty with a pattern that helps to forecast the future results.

Keywords— *HCT, MAM, HDDF, MYNT-MM.*

I. ***INTRODUCTION***

The present medical science facing the challenge of mental illness raising among people of age between 20 to 40 which were considered as the high energized age range once over a while. Many approaches were taken and are in place in the form of counseling and medications for mental illness. Before getting into the solution for a problem, it is important that a depth of understanding about the causes of the problem. Considering that subline, my research paper intended to help the physicians and medical university scholars to bring the causes in limelight for better solution predictions. To enhance the decision-making at this level, the need of the hour is to generalize the necessary information from these local models. Specific classification and prediction techniques can be used to achieve a common generalized mechanism that makes the system scalable to a distributive environment.

II. ***Problem Definition***

The common challenge that is associated with mental illness is identifying the root cause of every individual. Though one common understanding was that people involved in the job oriented to knowledge industry are facing this problem, it is unfair to write that as the baseline root cause. Hence there comes a necessity to dig further to know the exact cause. Living in a kind of different environment and food habits, considering the common work nature alone will not be the determining factor. This pays way to analyze people of different ages living in a different environment but collides with one common illness. Out of the issues, dealing with the heterogeneous nature of the data and knowledge integration is vital as far as the health science data is considered. There will be a contradiction between the attributes if the data are heterogeneous and the data management of the local and global model have to be synchronized. In the case of knowledge integration, all the local results have to be integrated for obtaining a global result. It is also very important that these local models and results should not lose their value on a global front and hence it must be preserved.

III. ***Proposed Methodologies***

A. **Linear Regression Model**

This is a base evaluation technique used to define the standard metric to evaluate the people living style, their food habits, and other routine activities. This works with a matrix factorization approach. The result of this method aims to predict people's grades for futuristic courses.

B. **Convolutional Graph Network Model:**

This method is far ahead of addressing the weakness noticed in the previous model. This helps in predicting the risk of the fail and drop-out. However, based on the people's willingness and out of interest factors, this model performance is seen varying for each case.

C. ***Bayesian Deep Learning:***

This method aims at uncertainty estimation in predicting the performance. This method helps to predict the possibility of a broad field a student can choose based on his interpersonal skills metric. This is achievable based on the personalized factors that are defined as a part of the Bayesian classification algorithm.

IV. ***Complexity & Gaps In Existence***

Prediction of people's routine habits both physically and mentally in accurate involves a complex process that requires more intelligent approaches which are capable of considering also the evolving facts and circumstances. There are research gaps that exist in the present data mining models which are

- There are only a few hybrid methods that combine the benefits of both supervised and unsupervised learning for automating the prediction and optimizing the accuracy of prediction in people from different environments.
- The present models are inflexible for analyzing the major academic and personal features which greatly influence the result collected from different people.
- Although there are few hybrid approaches available, these cannot dynamically adjust their potential by predicting the performance based on personal and external features.
- Many of the existing models use a single data set and hence there is a question of performance when applied in distributive multi-data.

V. ***Implementation Approach***

The implementation approach first starts with a trial and error method and finally gets to a CONCLUSION with a straight-through process. The most prominent objective that I am more focused on during the implementation process is as below.

- To develop a Heterogeneous Classifier Technique (HCT) for distributed data mining using collective Bayesian learning.
- To efficiently integrate the knowledge obtained from local results to be scalable globally using the Multi-Agent Model (MAM) thus forming dimensions with a person's habit.
- To develop a Predictive- Hybrid Distributive Datamining Framework (P-HDDF) by combining these techniques and applying the same for predicting the person's health concerns that he/she may face in the future.
- To compare the results obtained with that of other state of the art algorithms

A. **Data Collection**

My data collection is in the terminologies Evaluation Dimension, Metrics, Frequency, and the classification for the results.
Evaluation Dimensions are Age Range, Residing Place, Work Environment, Family, Food Habits, Academic Qualification & background. Evaluation Metrics are Exceptional Results, Mostly Satisfied, Seldom Satisfied, Forcing to the Situation, Frustration, Disorder State. The frequency of collecting & evaluation is Periodical, Statistical, Mid-Term, Seasonal. The classifications of root causes are Heredity, By Environment, Food Habits, Routine Works.

B. **Pre-Processing**

The "dark distributed "tool kit is used for pre-processing. it is the latest and best in the industry to handle distributed data across domains. It is an open-source tool through which pre-processing can be accomplished in a parallel, scalable and distributive environment.This results in Matrix formation with two and three dimensions.

2-dimensional Matrix Cos x Sin

Evaluation Dimensions	Age Range	Residing Place	Work Environment	Food
Exceptional Results	x1	x2	x3	x4
Mostly Satisfied	y1	y2	y3	
Often/Seldom Satisfied	z1			
Forcing to Situation				
Frustration				
Disorder State				
...				
...				

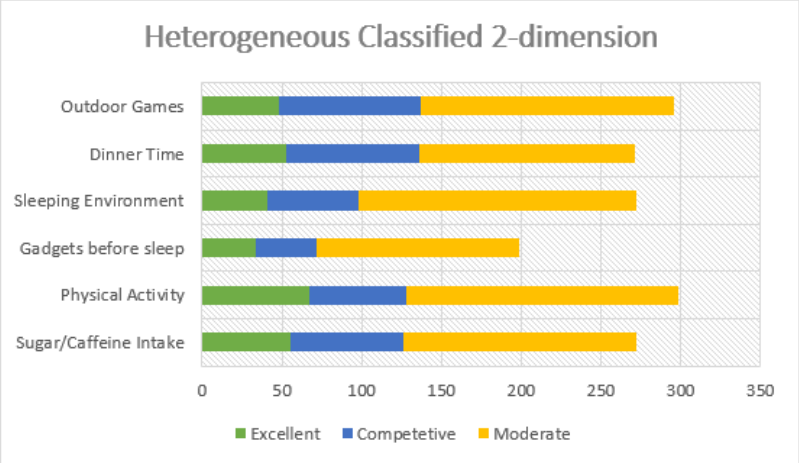
C. **Heterogeneous Classifier HCT**

The collective Bayesian model unfolds the traditional model at the local data site. The global level classifier is developed using the local learning methods and thereby the data are classified heterogeneously. The Bayes Net Toolbox for Medical Modelling (BYNT-MM) is an open-source tool that is used for this purpose.

3 dimensional data set Nx Matrix	Feel Tired while wake-up	Lethargic	Absent Mindedness	Sleeplessness	Headache	Hypertension	Feel Tired while wake-up	Lethargic	Absent Mindedness	Sleeplessness	Headache	Hypertension	Feel Tired while wake-up	Lethargic	Absent Mindedness	Sleeplessness	Headache	Hypertension
Evaluation Metrics	Age Range 20 to 27						Age Range 28 to 34						Age Range 35 & above					
Exceptional	12	18	34	21	7	3	7	13	36	18	18	12	3	11	41	51	14	26
Mostly	45	51	14	11	9	5	9	11	5	14	51	45	5	18	31	36	45	35
Often/Seldom	23	36	41	18	11	37	11	18	37	41	36	23	37	4	13	9	23	41
In Forcing to Situation	46	9	31	4	16	35	16	4	35	31	9	46	35	28	47	38	10	16
Frustration	25	38	13	28	47	35	47	28	35	13	38	25	35	4	34	5	9	8
Disorder State	11	30	47	4	7	10	7	4	10	47	30	11	10	12	14	18	32	4
…	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
…	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
…	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

D. **Multi-Agent Model (MAM)**

A set of data mining agents that follows a divide and conquer rule approach shall be used for the task of mining the data in each local site. That is people of different ages with different symptoms for the same metrics. The results will have N number of knowledge obtained from different data sites locally. The data sites here refers to the environment we choose for different age of people.



E. **Predictive Hybrid Distributive Datamining Framework**

A prototype is to be developed by combining the HCT and MAM models and to be tested with the real-time data taken as a survey and not on the existing data from the repository. Once the results are found to be satisfactory, the same is proposed to implement in a live environment where the rate of acquisition of data will be high. The results will be interpreted using both the cost and accuracy functions and also compared with other state-of-the-art methods available in the literature.

VI. **Expected Outcome Of My Research**

The research is intended to solve one of the burning issues in health science in reading the mental illness. Performance by using a Distributed data mining framework that operates efficiently when both cost and accuracy functions are considered. The proposed model using HCT and MAM for knowledge integration is expected to work with great efficiency. The important advantages of the proposed system would be

- Using the benefits of both supervised and unsupervised learning will give more efficiency in terms of accuracy.
- Protection of locally arrived results' weight in a global level.
- The hybrid model shall bring more optimized results which reduce the complexity which in turn reduces the computational cost.

In linear algebra, a rotation matrix R performs the rotation of the points in the Euclidean space. In the rotation process, vector V contains the coordinates of the point known in advance. In a two-dimensional plane, coordinates pair (x, y) represents a point, and in a three-dimensional plane, coordinates (x, y, z) represents a point. The coordinate x, y, and z correspond to the x-axis, y-axis and z-axis respectively. Similarly, in four-dimension, coordinates (x, y, z, w) represents a point in the Euclidean space. By using the matrix multiplication [R][V], as shown in Eq. (1) below, we obtain the rotation matrix [V']:

[V'] = [R] x [V]---------Equation-1

Equations (2), (3) represents the rotation matrix used for simple rotation (with only one plane of rotation) in four-dimensional rotational transformation. The given matrix fixes the xy-plane, and zw-plane becomes the plane of rotation, points in zw-plane are rotated by an angle as shown in Eq. (2):

Probability[F] factors on people = $[X]^{frequency}$ times the Y * ZW/R[V] number of attempts symptoms are noticed..----------Equation-2
The given matrix fixes the zw-plane, and xy-plane becomes the plane of rotation, points in xy-plane are rotated by an

$$[R] = \begin{Bmatrix} \text{Fact-1} & \text{Symptomps-1} & \text{Frequency} \\ \text{Fact-2} & \text{Symptomps-2} & \\ \text{Fact-3} & \text{Symptomps-3} & \end{Bmatrix}$$

angle shown below in the Equation. (3): ----------Equation-3

In double rotation, we rotate the points along both the axis. For each plane, the angle of rotation is different. The plane of rotation and angles for double rotation is unique.

$$[R]=\begin{bmatrix} cos\beta & -\sin\beta & 0 & 0 \\ \sin\beta & \cos\beta & 0 & 0 \\ 0 & 0 & cos\alpha & -\sin\alpha \\ 0 & 0 & \sin\alpha & \cos\alpha \end{bmatrix}$$ ----------Equation-4

The given matrix performs the double rotation along xy-plane and zw-plane with the angles of rotation and as shown in Eq. (4).
The below Algorithm presents the detailed steps for transforming different evaluation metrics for a student as attributes using four-dimensional rotation transformation (4DRT) Input: Dataset M, M- here refers to the different evaluation metrics that an institution

offers. This may be food habits, sleeping hours, work environment, residing place etc. Output: Perturbed Dataset M_P. The M_P here refers to the scorings in each metric that a student performs and the prediction factor for an individual.

Begin
Read the data attributes from .csv file M (since the evaluation metric differs with each institution, it can be maintained in an excel file of CSV format)
Normalize (attribute)
Divide data into sets containing four elements each
Select the security threshold for each set V.
For each set
For values of
and
running from 0o to 360o

1. Compute: M'

[V' (Au', Av', Aw', Ax')] = [R][V(Au, Av, Aw, Ax)]*
2. Compute Variance = M – M'
3. Plot a 3D graph between Variance and angles alpha and beta.
End for
End for
Select the angles alpha and beeta such that variance at alpha and beta is maximum.
Compute perturbed data set MP at these angles obtained in the above step using the equation.
[V' (Au', Av', Aw', Ax')] = [R][V(Au, Av, Aw, Ax)]*
End

People with sleep disorder holds the symptoms probability greater than 60%
Persons with Absent Mindedness in the work environment and personal life are below average than the defined metric.
Food habits along with sleeping time play a major role in the results when changed. Applying the Predictive Hybrid Distribution over the Evaluation Dimensions with the three defined metrics, the Sin X Cos alpha on n x n matrix lets the gap reduced even further. With these findings and the results, I conclude my implementation of L1 evaluation and performance prediction. The expected achievement is to indicate the focus area to the institution where it necessarily requires.

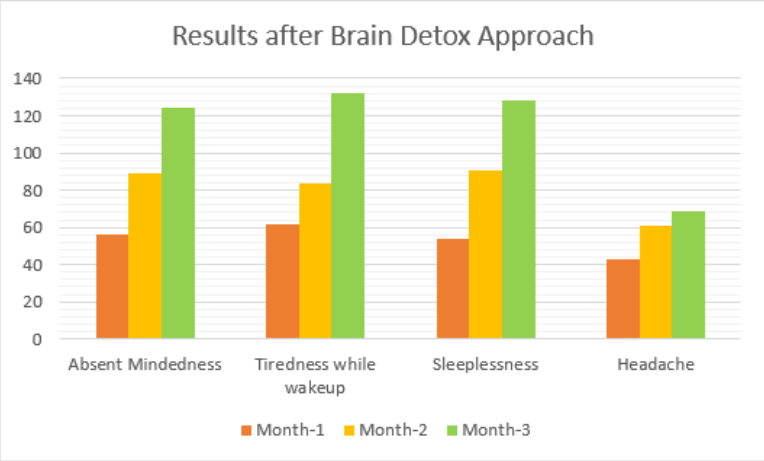
	Absent Mindedness	Sleeplessness	Hypertension
Sugar/Caffeine Intake	45	32	69
Physical Activity	67	64	75
Gadgets before sleep	23	71	71
Sleeping Environment	89	25	79
Dinner Time	52	36	64
Outdoor Games	68	14	49
	344	242	407

Recommendation from my Research

With the kind of data that was captured in real-time among different people, and applying the predictive analysis approach with different methods on the data, it is clear for the medical/health science physician or a medical scholar can observe the below findings that will be the resolution for mental illness.
Eventually, these approaches shall also be recommended as a part of brain detoxifying.

1. Avoid Sugar and Caffeine intake in routine food
2. Stay away from gadgets 2 hours before sleep and keep more than 5 meters distance while sleeping.
3. Have dinner 3 hours before sleep
4. Get involved in any activity that is not a part of routine works on weekdays.
5. Maintain 7 to 8 hours of sleep.

Fortunately, a similar analysis was performed after 3 months duration on the people aligning to the above-said approaches. The results were amazing and prone to easy recovery from mental illness.



CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-21

Garbage Sensing To Avoid Cytotoxic And Cytostatic Waste To Portend The Warning For Endorsement By Applying Arduino System

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Abstract: In the current scenario, numerous areas are perceived that the garbage containers or dust bins are positioned at municipal engaged locations in the cities are surfeit due to intensification in the surplus amount of waste collected at every single diurnal. It generates germ-infested ailment for the individuals and generates depraved odor around the environments. This primes in diffusion with some terminal ailments and anthropological infections. To circumvent such a diminution, the proposed effort is attempted to forecasting the strategy "GSM created garbage intensive care system for smart cities". In this projected structure there are manifold litterbins situated throughout the city or the campus, these litterbins are provided with low cost implanted expedient which assistances in tracking level of garbage bins. When the level grasps the said threshold confines, the device will transmit the level along with the unique ID provided. These specifics can be retrieved by the apprehension establishments from their dwelling with the benefit of GSM and an instantaneous achievement can be complete to clean the litterbins.

Keywords: Garbage Sensing, Arduino

1.INTRODUCTION

Every human realizes the impact of Garbage process to lead a healthy life. In everyday lifespan, the waste disposal demand increases enormously due to increase in the ratio of population and also industries. It is a great challenge to the municipal sectors to incorporate tired-less planning and execution of disposing unused materials on daily routine to ensure the cleanliness of the city [2]. Then it results in numerals of ailments due to flies and mosquitoes breed on it. An immense aspect up to the smart cities is solid waste management in India. This mission gives the most resourceful behaviors to preserve the atmosphere hygienic and green.

2.Problem Statement

2.1 Prospective Utilizations

Smart litterbins are an inventive impression of execution which varieties a typical litterbin shrewd exploitation sensor for garbage level finding and sending memorandum to the manipulator informing the status of the bin. The functional requirements are, First, Waste Level detection inside the garbage bins and Transmission of the information wirelessly to the concerned officials. Second, the system can be accessed anytime and from anywhere [5]. Third, Real-time data transmission and access. Fourth, avoids the overflows of garbage bins. Fifth, authorization and administrative rights given only to the municipal authorities [4]. Sixth, the system has no individual use, but can be used by a city, state or a country. Seventh, Waste collection would become efficient and also reduction in transportation costs can be witnessed.

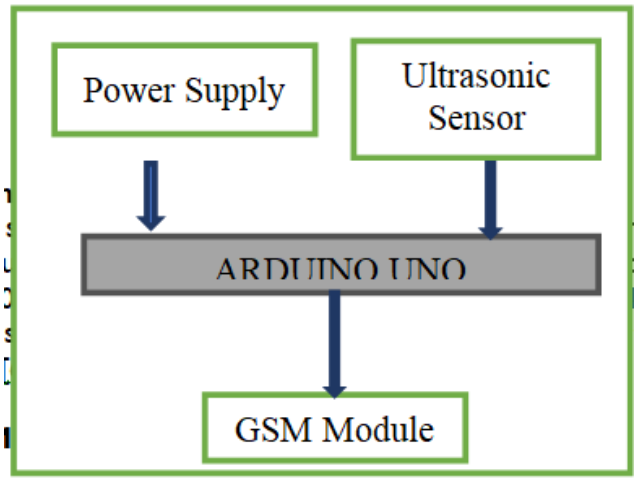

Fig 1 Schematic Of The Garbage Sensing Framework

2.2 Working conception

The Ultrasonic sensor offers a 2cm - 400cm non-contact measurement function, the ranging accuracy could reach up to 3mm [3]. The building modules includes ultrasonic transmitters, receiver and control circuit. The basic principles are making use of IO trigger for at least 10us high level signal, Unit inevitably sends eight 40 kHz and detects whether there is any pulse signal back and if any of a signal is received back in a high level, time of high output IO duration is the time from sending ultrasonic signal and receiving it back.[6]

Test distance (TD_i) =(Max Level (ML_i)× velocity(V)/ 2)

Here, the electrical energy is transmitted into sound to send the pulse. The sound that is acknowledged back is transformed into electricity. Thus, the time lag between the sent and conventional sound signal is used to estimate the distance to the object. Layout flanked by sensors is dogged by their beam angles [3]. The sensors essential be set apart so that they do not inhibit with each other. The system is designed in such a way that it avoids the overflow of the dustbin by sending alerts to the borough with help of a microcontroller linked with a web server using GSM module.[5]

Cytotoxic and Cytostatic Waste

Cytotoxic drugs are medications which encompass chemicals that are toxic to cells, averting reproduction or progress. They are used extensively diagonally hospitals, hospices, overhaul homes and domestic homes. Here we analyze the cytotoxic and Cytostatic waste using Arduino system which sense the waste overflow and produce an alert system which make us to avoid the skin disease dysuria Myelosuppression etc., The association among the severity and possibility of a hazard surveys a universal equation [6] **R=F(S,P)** where risk (*R*) is a function (*f*) of the severity (*S*) and the probability (*P*) of impairment. The hazard equation can be shortened to be a merchandise of cruelty and prospect. R=S * P The traditional biological hazard calculation architype is a step-wise progression. It instigates with the credentials of a hazard, which is embraced of a instantaneous of an agent's physicochemical possessions and directions and decorations of acquaintance and a assessment of toxic effects.

2.3 Arduino UNO

Arduino is an open-source microchip technology podium created on easy-to-use hardware and software. Arduino panes are able to rehearse inputs - light on a sensor, a extremity on a button, or a Twitter message - and turn it into an output - actuating a motor, turning on an LED, propagation relatively online [4]. Currently, as it strained a common community, the Arduino board started varying to familiarize to advanced requirements and contests, judicious its intention from unpretentious 8-bit boards to products for IOT bids, wearable, 3D printing, and embedded atmospheres. We apply this source to sense the waste

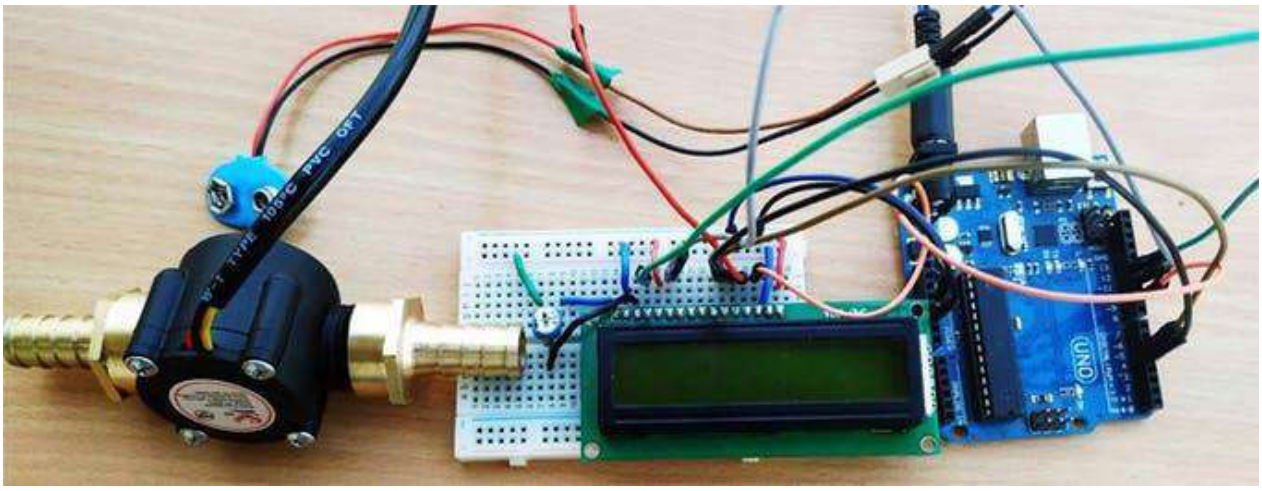

Fig. 2 ARDUINO UNO

The connection of the garbage flow sensor and LCD (16x2) with the Arduino that is coupled in between 5V and GND and pin 2 is coupled with the V0 pin of the LCD.

2.4 ATMEGA 328P – Microcontroller

It is high recital, low power organizer from Microchip. It is an 8-bit microcontroller stranded on AVR RISC planning [3]. It is the farthest prevalent of all AVR regulators as it is recycled in ARDUINO boards. It consumes several controllers to attain the goal. The controller only outfits the program on user specified condition.

- With the program storage of 32 Kbytes the architecture takes many controllers to submissions are numerous.
- With several power saving methods, it can effort on mobile entrenched systems.
- With the support of timer to rearrange the below error with minimal human interruption.
- With the unconventional RISC architecture, the controller finalizes programs promptly.
- Within the chip temperature sensor, the controller can be recycled at high temperatures.
- **VCC -** Digital supply voltage for MCU.
- **GND -** Ground for MCU.

Port B

Port B is an 8-bit bi-directional I/O port with center pull-up resistors. As inputs, port B pins that are rapidly drew low will source existing, if the pull-up resistors are generated. The Port B pins are tri-stated to rearrange the disorder converts active, even if the clock is not running.

Port C: Port C is a 7-bit bi-directional I/O port per core pull-up controllers. The PC5 output buffers partake symmetrical drive characteristics with mutually high sink and source capability.
PC6: If the RSTDISBL fuse is automated, PC6 is secondary as an input pin. If the RSTDISBL fuse is not-automated, PC6 is used as a re-tuned input. A low-slung level on this pin for lengthier than the deepest pulse length will produce a readjust for determining the efficient settings.
Port D: Port D is an 8-bit bi-directional I/O port with internal pull-up resistors. Its productivity buffers contribute symmetrical drive features with both high descend and source fitness.

AVCC: AVCC is the base voltage pin for the A/D converter.

AREF: It is the equivalent point pin for the A/D converter.

2.5 Architecture Design

The ATmega 328P is a low-power CMOS 8-bit microcontroller based on the AVR upgraded RISC design of architecture. By employing powerful directives in a single clock series, this architecture achieves quantities approaching the said target that permitting the system deliberated to enhance power ingestion versus processing rapidity[2]. These added drive registers are the 16-bit X, Y and Z registers, defined advanced in this design. The arithmetic and logic operations are supported with these registers

Fig.2.2 Arithmetic operation

X Register	15	XH	XL	0
	7	0	7	0
	R27(0 X 1B)		R26(0 X 1A)	
Y Register	15	YH	YL	0
	7	0	7	0
	R29(0 X 1D)		R28(0 X 1C)	
Z Register	15	ZH	ZL	0
	7	0	7	0
	R31(0 X 1F)		R30(0 X 1E)	

The database flow is based on condition denoted by the user and results in conditional/ unconditional jump and call instructions. The interjects have priority in arrangement with them interpolate vector position. The lower the interfere vector address, the upper the priority. The I/O memory space contains 64 addresses for CPU peripheral functions as control registers, SPI, and other I/O functions.

2.6 Wide-Ranging Determination Input and Output

Each of the 14 digital pins on the Uno can be rummage-sale as an input or output, using pin Mode (), digital Write (), and digital Read () functions [5]. They function at 5 volts. Each pin can provide or accept a maximum of 40 mA and has a core pull-up resistor of 20-50 KO hms. In accumulation, from place-to-place pins have specialized functions

- Serial 0 (RX) and 1 (TX). Used to receive (RX) and communicate (TX) TTL serial data. These pins are associated to the conforming pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts 2 and 3. These pins can be constructed to trigger an interrupt on a low value, a rising or falling edge, or a change in value. See the assign Interrupt () function for details.
- PWM 3, 5, 6, 9, 10, and 11. Provide 8-bit PWM output with the analog Write () function. SPI 10 (SS), 11 (MOSI), 12 (MISO), 13 (SCK). These pins sustenance SPI announcement, which, although on condition that by the underlying hardware, is not presently included in the Arduino language.

- LED 13. There is a built-in LED associated to numerical pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- The Uno has 6 analog inputs, apiece of which provides 10 bits of resolution [5]. By defaulting, they measure from ground to 5 volts, though is it conceivable to modification the upper end of their assortment using the AREF pin and the analog Reference () function. As well, some pins partake specialized functionality

- I 2C 4 (SDA) and 5 (SCL). Support I2C (TWI) announcement by means of the Wire library.

1. Design Flexibility

The inexpensive benefits of Arduino boards when re compared to other microcontroller platforms supports to design the proposed system with minimal cost that is capable to produce high performance. The Integrated Development Environment is integrated with editor, linker and compiler that provides open space to the designer to brand the skill with the enriched computing solutions. The model is designed by using simple, pure programming environment, open source and extensible software. Open source and extensible hardware. The designer can edit, compile and upload Arduino sketches to the Arduino boards with the support of integrated development environment.

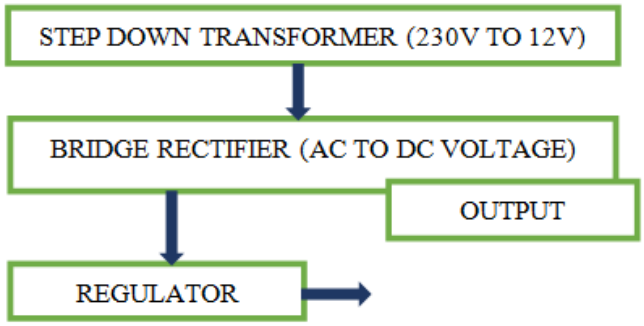

Fig: 3 Block Diagram

Primarily, minor step-down transformer is used to decrease the voltage level 230V AC into 12V AC. The production of the transformer is an energetic sinusoidal AC voltage, which is converted to pulsating DC with the support of a rectifier. 7812 regulator is used to translate 12V DC study voltage. Finally, 7805 regulator converts constant 5V DC voltage.

2. Proposed Model Design

When the module retunes, set low the trig and echo (output) port by transmitting at least 10us high level pulse to the Trig pin and then wait to capture the rising edge output by echo port, at the same time, open the timer to begin [8]. The following are the electrical parameters that defines the performance, (i.e.) Voltage DC 5 V, Current 15mA, Frequency 40Hz, Max Range 400cm, Min Range 2cm, Measuring Angle 15-degree, Trigger Input Signal 10uS TTL pulse, Echo Output Signal Input TTL lever signal, range and Dimension 45*20*15mm. The sensor evaluations the time taken from when the signal is directed to when it is acknowledged. It then analyses the distance D in cm using equation

$$D = \frac{S * T}{T} * \frac{1}{100} = \frac{340 * T}{2} * \frac{1}{100} cm$$

Where S is the speed of sound in air in meters per second, it is time in seconds taken for the indicator to transportable from the transmitter to the earpiece of the sensor. The division by 100 translates the restrained remoteness from metres into centimetres

Fig: 4. Design Of The Garbage Sensing System

GSM Module

The module provisions with the communication in 900MHz band. The Indian mobile network providers are operating in the 900Mhz band. GSM modules are factory-made by diverse corporations. The input required specifications are vendor specific and it is always suggestible to have peer review the specification before the module is chosen for implementation. In this model, our gsm module requires a 12 volts input. So, it is essential to feed it using a 12V,1A DC power supply.

Fig: 5. Assembled System Powered By The Computer

5 Result

The work carried out with the objective of designing GSM based Garbage wastage monitoring system. The system detects garbage to dustbin based on the defined threshold and send a message through GSM module to the authorized source. The message is delivered to the control admin who is responsible for the decision support system and approve the process to execute. The respective authority gets the status of the dustbin and track the location details using the sensor Id. The idea behind this effort surely enhances the research aspirants to involve in this domain to produce expected solution to the community.

6 Deductions

In the past few years, the growth of cities is rapidly going high in all the perspective like population, vehicles, industries, educational institutions that results in unmeasurable amount of waste produced on daily basis. It is a great challenge to the government to handle this scenario to keep the city clean and green. But the smart city is incomplete without a smart garbage management system. So, it is essential to have a system for proper management of garbage. In this proposed model, surveyed the need, technical aspects and implemented the concept of Smart City with the help of GSM. This system assures the cleaning of dustbin soon when the garbage level reaches its maximum threshold.

CONCLUSION

There is a great scope for the modifications of the Garbage monitoring system in future. The system can be improved by adding new functionalities like line follower robot to it, when the bin is full directly it is dumping on tipper.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-22

Bionic Eye Technology

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1.Abstract: "We can reconstruct him… we have the innovation." Innovation has made several pathways for the human race. Now innovation has stepped forward to that diploma in which the whole human body may be controlled utilizing a solitary electronic chip. Human Eye is like a digital camera. Macula offers the most elevated desires of the photograph which we see. The macula is contained various layers of cells which method the underlying "simple" light power getting into the attention into "automated" electrochemical motivations. on this entire international for the ones a large wide variety of people whose imaginative and prescient is debilitated they have eye gears for the amendment but for the truly visually impaired individuals whose vision is obscured we don't have any therapeutics so any other biomedical innovation is designed to defeat the eye sickness problems. We usually have visible prosthetics that helped in beating handicappers. Bi-restorative designers anticipate a substantial activity in melding the path of the professionals-the-tics. Now it is the duty of synthetic vision through Bionic Eyes. So, the continued development in innovation has pushed humankind toward one-of-a-kind methodologies like fake inserts for those visually impaired topics and the bionic eye with retinal, visible, subretinal embed processes. The Chips are deliberate explicitly to mimic the characteristics of the harmed retina, cones, and bars of the organ of sight which can be embedded with microsurgery. there may be a promise for the visually impaired as Bionic Eyes. This innovation can add existence to their vision-less eyes. (Liu et al. 2000)

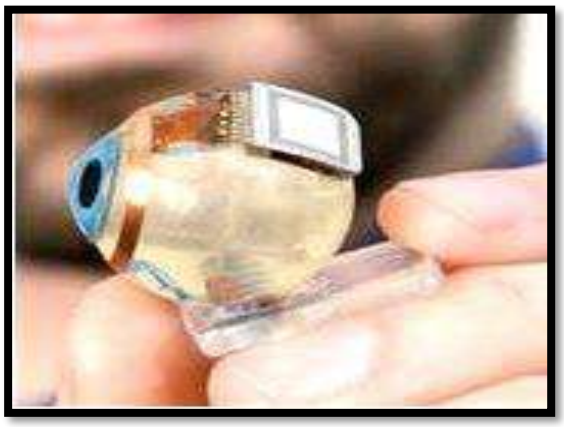
1.1Key words: Bionic Eye, Retina, Artificial Eye, Implant: Epi-Retinal, Retinal, Sub Retinal.

2. INTRODUCTION

These days, we discuss guy-made reasoning that has made influxes of enthusiasm for the field of mechanical generation. at the point whilst this has been doable, at that factor there is a likelihood for faux vision. 'Bionic eye' additionally called a Bio digital eye, is the digital device that replaces the usefulness of a segment or entire of the eye. it's far nonetheless at a starting period in its development, however at the off hazard that fruitful, it could re-establish imagination and prescient to people who've misplaced sight all through their lifetime. This innovation can add lifestyles to their visionless eyes. A bionic eye works via animating nerves, which might be initiated via electrical motivations. For this case, the patient has a touch machine embedded into the frame which could get a radio flag and transmit the symptoms to the mind thru nerves and can decipher the photograph. one of the maximum emotional utilizations of bionics is the formation of fake eyes. Early endeavours applied silicon-based totally photograph finders, yet silicon is deadly to the human frame and responds negatively with drinks in the attention. currently, researchers at the distance Vacuum Epitaxy Centre (SVEC) primarily based at the college of Houston, Texas, are utilizing another fabric they have created, minor creative photocells that would distinguish coming near light hence restore failing human eyes. (Jeffrey et al.2020).

3. What are bionic eyes?

It is a faux eye that offers visible sensations to the mind. It accommodates digital frameworks having photograph sensors, microchips, beneficiaries, radio transmitters, and retinal chips. Innovation gave through this assistance the visually impaired individuals to get imaginative and prescient over again. It incorporates a pc chip this is stored within the rear of the affected man or woman eye and connected with a smaller than normal camcorder incorporated with glasses that they put on. At that factor, a photograph caught by way of the camera is engaged to the chip which adjustments over it into an electronic signal that thoughts can decipher. The snap shots created by the Bionic eye have been not an extra of amazing but they could be sufficiently clear to perceive. The embed sidesteps the unwell cells inside the retina and reports the staying capability cells.



3.1. Working of Bionic eye:

- The digital camera hooked up on glasses to see the picture
- The Signals are sent to the hand-held gadget
- Handled data is sent back to installed glasses and remotely transmitted back to the recipient Under the outside of the eye
- The recipient sends data to anodes in retinal embed
- Terminals animate the retina to send data to the mind. (Luo et al. 2016)
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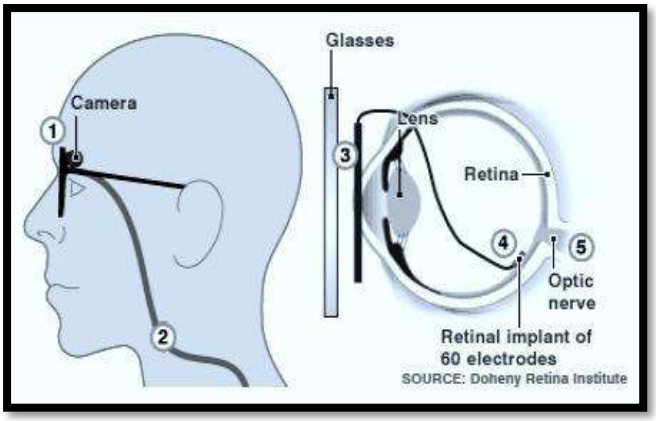
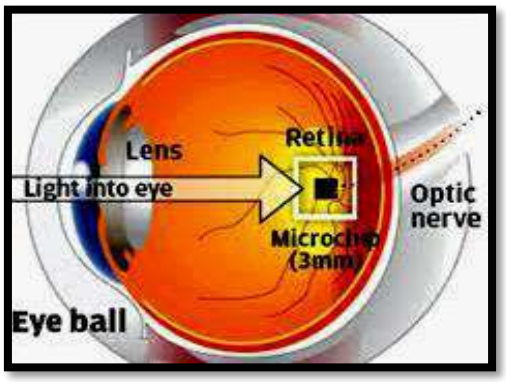


The embed depends on a little chip this is cautiously embedded in the back of the retina, on the rear of the eyeball. An ultra-slender wire fortifies the harmed optic nerve; its motivation is to transmit mild and pictures to the cerebrum's vision framework, in which it is usually organized. aside from the embedded chip and cord, a massive portion of the machine sits out of doors the attention. [Neelima Sharad Vatkar and Yogesh Sharad Vatkar *IJESC*, vol. 6, no. 8.]. The customers might want to wear awesome eyeglasses containing a bit battery-fuelled digicam and a transmitter, which might ship photographs to the chip embedded in the back of the retina. the brand-new machine is relied upon to be very stable, because the chip is encased in titanium packaging, making it each water-proof and intake verification. The scientists gauge that the system will hold going for at any charge 10 years interior the attention. The hobby protected the implantation into the eye of a smaller than regular Galilean telescope containing extensive-part miniaturized scale optical focal points. The smaller than regular telescope is embedded into one eyeball, supplanting the focal point, that's expelled at some stage in a medical manner. operating alongside the cornea, the telescope can make bigger photographs to kind of 2.2 to 2.7 events their ordinary length. This amplification allows the pix to increase onto the sound pieces of the retina, bypassing the harmed vulnerable facet and re-organizing a part of the patient's imagination and prescient. [Asher,A.;Segal,W.A.;Baccus,S.A.;Yaroslavsky,L.P.;Palanker,D.V., IEEE transactions on Biomedical Engineering, vol. 54, no. 6,pp. 993-1004, June 2007.]



3.2. Advantages:

- The innovation will ideally help individuals experiencing AMD and individuals experiencing RP.
- The thing is to fundamentally improve the personal satisfaction of daze patients.
- Can be effectively embedded with no muddled surgery
- No Batteries embedded inside the body.
- Early in the visual pathway.

3.3. Disadvantages:

- This innovation won't be useful for glaucoma patients.
- Not valuable for patients who are visually impaired by birth.
- The two eyes have explored cost in a huge number of dollars.
- Additional hardware is required for downstream electrical info.

3.4. Challenges:

- There are bunches of obstacles to be overwhelmed by Bionic Eyes to turn into an example of overcoming adversity. Human eyes are maybe the touchiest of all organs in the body. A Nano-sized copy can make ruin in the eye.(Mayuresh.et al. 2011)
- There are around 120 million poles and 6 million cones in the retina of each solid human eye. Making a counterfeit swap for these cells isn't a simple undertaking.
- Silicon-based photograph indicators have been tested before endeavors. In any case, Silicon is harmful to the human body and responds ominously with visual eye liquids.
- Perhaps the hardest test is by all accounts guaranteeing the embed to stay in the eye for a considerable length of time without causing scarring, insusceptible framework reactions, and general corruption from everyday natural mileage.
- These counterfeit retinas are still years from turning out to be boundless because they are excessively costly, excessively inconvenient, and too delicate to even think about withstanding many years of typical mileage. (Praveenkumar et al. 2011)

4. CONCLUSION

The bionic eye (Bio-Electronic Eye) is another development in the biomedical designing field to offer a vision to those experiencing a fractional or absolute visual deficiency. Scientists all through the world have searched for approaches to improve individuals' lives with counterfeit, bionic devices. This imaginative innovation can transform people. Bionic Eye is unrest in the therapeutic field. It is uplifting news for daze patients who experience the ill effects of retinal ailments. Bionic eye embeds could help in re-establishing seeing a huge number of visually impaired individuals within two years. Retinal inserts can incompletely re-establish the vision of individuals with specific types of visual deficiency brought about by sicknesses like macular degeneration. About 55 have age-related macular degeneration.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-23

Secure Energy Efficient Cluster Head Selection Framework To Optimize Packet Transferring Using Clustering And Routing Protocols In Agriculture

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Abstract: Agriculture is important area in India and most of the people be contingent in our country on agriculture. Recent days Wireless Sensor Network (WSN) used for solving many day to day issues. Especially Agriculture is one of main foundations for all existing things.. But currently agriculture crops are affected due to many environmental changes. To overcome this WSN takes important role in the field of agriculture.. A wireless sensor network (WSN) comprises number of devices working individually and communicating with each and every one through short-range radio transmissions. Key task in Wireless Sensor Network (WSN) is the lack of energy efficiency in the network and inadequate network period due to failure of the sensors as they have restricted energy, providing security to the path in wireless sensor network is an important issue to be addressed, considering the frequent change of topology in wireless sensor networks, Challenging to identify malicious node. Hence, In this analysis has been used for selecting secure cluster Head ,malicious nodes are predicted and removed by Replication Attack Detection Protocol and Replay Attack Protocol, Trust value is calculated to find secure route, Finally, Route is optimized by considering energy and trust values .we propose to reduce energy ingestion and improve security framework to handle most important issues of an energy and security within WSN. In this study sensor nodes can be used to observe the crops. The humidity and temperature can be prepared using sensors. This supports to rise up the throughput of agriculture. The human work is minimized by process of automatic and it boost the crofter to improve the farmhouse land. The location of the farmhouse can be monitor by using sensor and Wi-Fi,

Keywords: *Cluster Head, Base Station, as packet delivery Ratio, Wireless Sensor Networks Delay, Energy Consumption, Throughput ratio.*

I. INTRODUCTION

Wireless Sensor Networks services to change the farmers old methodology of agriculture to present agriculture. WSN comforts the farmers in various phases. Wireless Sensor Networks uses disseminated sensors to collect the data and transfer the collected data through wireless networks.A sensor networks are designed with large sensor's device that is organize to do some definite action different from normal networks, it is based on node placement and synchronization to fulfil their jobs (J. Joselin and V.S. Anita Sofia ,(2019)).Though the exact location of a particular occurrence is unknown, distributed node sensing allows for closer location to the sensation than a single sensor would permit. As well as , in most of the cases, multiple sensor nodes are needed to avoid environmental problems like hitches, line of eyesight limitations etc. In many of the cases, the location is perceived no existing arrangement either in communication or energy . Which converts dynamic for sensor nodes to persist on small, finite source's energy and communicate by using communication channel. In other hand requirement for sensor networks would be dispersed handling competency.

II. APPLICATIONS OF WIRELESS SENSOR NETWORKS

Those applications especially categorized into several domain like health, military, eco-friendly, home and some marketable areas.

Military: it is an important portion of facility, military intelligence, communications, control, computing, targeting systems, enquiry and front-line surveillance.

Area Monitoring: The sensing nodes are located by the location where some display is to be single-minded. When the the registered information had been identified (pressure, temperature, sound and etc.), those information are collected to one of the sink device, which then takes decision properly.

Medical: Some of the application benefits for which are used in drug administration investigative, diagnostics and administration, secondary boundaries to the ineffective, incorporated patient management and monitoring, human physiological information's tele monitoring , and following observance medical patients or practitioners inside of the facility of medical.

Agricultural: this is useful and help to agriculturalists in several sides such as the preservation of wiring location, awkward, irrigation's techniques this supports more accomplished water use and dropping of wastelands.

The various types of sensor are used in agricultures

1. Temperature's Sensor

The temperature sensor have been used to extent the amount of temperature in the farmhouse area. The temperature like coolness or heat is unrushed by using temperature sensor. Two types of temperature sensors are exists. The linking sensor's temperature and non- exchange temperature sensor used to compute the temperature(Vyas, R., Kim, S., Cook, B. S., Thai, T., Le, T., Traille, A., et al. (2014))

2. **Humidity's Sensor** The humidity sensor has been made to extent the position of humidity at air. It calculate both air content and moisture. The humidity sensor alternative name is dew sensor. Here electrical conductors two numbers bearing the electric field is placed in middle it. The sensors are poised among metal plates two numbers and polymer firm conduct is placed among conductors. Of electrical

3.Soil Moisture's Sensor

It's used in farmhouse lands to calculate the water relaxed of soil. This type of sensor is very modest to compute the amount of water in farmhouse .which helps in irrigation more powerfully. This sensor can be used in city as well as residential areas. It is also used in climate investigation, cultivation and also in eco-friendly discipline.

4. Bio's Sensor

it is made to compute the virus. It customs the modules like, transducer, processor bio element and amplifier, display. Here it cast-off to amount of the contagion of plant life. The range of problem is stately and the process is finished. The range of poison is less the threshold value notification send to farmer. The range of poison is less the threshold value notification is send to farmer and agriculture people of specific village through phone . The agriculture people gets notification about farmland and location The location is identified by using wireless sensor network

II. RELATED WORKS

Manisha Bhende and Pratibha Gangurde defined a Novel Approach for Precision Agriculture Using Wireless Sensor Network (Vyas, R., Kim, S., Cook, B. S., Thai, T., Le, T., Traille, A., et al. (2014)) here Wsn can be used to gather data relate to crops on the agriculture areas. Wireless sensors are very low cost size in small. At this point rare sensors is established for checking the agriculture lands. Heinzelman al. (Vyas, R., Kim, S., Cook, B. S., Thai, T., Le, T., Traille, A., et al. (2014)) defined a Low Energy Adaptive Clustering Hierarchy (LEACH). LEACH chooses the CHs dynamically. This is the core objective of the LEACH. CH is selected unsystematically, so high energy is debauched in node communicates to the BS. LEACH protocol is having two states, initial phase is be a Set-up state and second pstate is Steady state state. In set-up state, all nodes decides to become CH or not for that round. The decision of CHs is decided by percentage of Cluster Heads in the network and how much the node become a CH i. If node value is lesser than the threshold value then it become a Cluster Head (CH). Younis(J. Joselin and V.S. Anita Sofia ,(2019))defined a Hybrid Energy-Efficient Distributed clustering (HEED). Which is a multi-hop clustering algorithm. An energy-efficient clustering routing with explicit anxiety of energy is HEED. It not select CH unsystematically. HEED is very different from LEACH. on the combination of two activities The way of formation of cluster is achieved. Firstly communication cost of intra-cluster then remaining ener gy. In HEED, Cluster Head had somewhat maximum average level permanent energy relevant to MNs. C. Raghavendra and S. Lindsey (J. Joselin and V.S. Anita Sofia ,(2020)) defined Power Efficient Gathering in Sensor Information Systems (PEGASIS) protocol in the year 2002. Which is an improved version of LEACH. It's based on creating chains of sensor nodes instead of creating clusters for routing the consolidated data to the sink, one node is responsible. the collected data with its own data, and then passes the aggregated data to the next ring is aggregated by each node. To employ multi hop transmission and selecting only one node to transmit to base station is the difference from the LEACH. multi hop transmission and data aggregation is employed Since the overhead caused by dynamic cluster formation is eliminated PEGASIS outperforms the LEACH. However excessive delay is introduced for distant nodes, especially for large networks and single leader can be a bottleneck . , D. P. Agarwal and A. Manjeshwar (V.S.Anita Sofia, ,p ranjith ,S.Arockia samy, jebaThangaiah)In 2001 discussed Threshold sensitive Energy Efficient sensor network Protocol (TEEN) protocol. Nearer nodes clusters formation , with a cluster heads to transfer the grouped data to one superior level. two threshold valuesare identified for cluster heads by forming the clusters. One of this is hard threshold; it contain minimum possible value of an parameter sensor node. Which allows the provision for transfer nodes , Therefore main issues transmission delay can occurs. The node can transfer packet until it become a soft threshold value. With the help of . soft threshold value can avoid for transferring duplicate Since the protocol is to be responsive to the sudden changes in the sensed attribute, it is suitable for time critical applications. D. P. Agarwal and Manjeshwar (Deepali Virmania, Savneet Kaurb, Satbir Jainc (2014)) defined Adaptive Threshold sensitive Energy Efficient sensor Network Protocol (APTEEN) protocol in the year 2002. The aim of An delay of TEEN to capture both periodic data collections and time-critical events are the protocolthe structure of networks like TEEN. The cluster heads show threshold values, the transmission schedule attributes, to all nodes which are in clusters. Process of data transmission to sink node in order to reduce data transmission size so energy consumed,

the Cluster heads had taken responsibility for those process . According to energy dissipation and network lifetime, TEEN gives better performance than LEACH and APTEEN because of the decreased number of transmissions According to energy dissipation and network lifetime. The main disadvantages of TEEN and APTEEN are complexity ,forming clusters and overhead in multiple levels S. Fahmy and O. Younis defined (Lee, J. G., Chim, S., & Park, H. H. (2019)) Hybrid Energy Efficient Distributed clustering Protocol (HEED) protocol in the year 2004. the basic structure of LEACH through residual energy as important arguments and topology of network features (e.g. distance to nearest node ,node, degree) are passed as secondary arguments to break between candidate cluster heads, as a metric for cluster selection to accomplish energy balancing is extended. The clustering tasks are spitted into a number of iterations, and in each steps , nodes which are not handled by any cluster head double their probability of becoming a cluster head. Since these energy-efficient clustering protocols enable every node to individually and probabilistically decide on its role in the clustered network, they can't guarantee optimal selected group of cluster heads.

III. DESIGN ISSUES IN EXISTING METHODS

The tasks modelled by a positioning of sensor networks is a previous version of those originate in wireless sensor networks. Sensor nodes transmit through wireless, no infrastructure for Wireless lines. Next issues are relevant to the restricted, usually non-renewable energy supplying of the sensor nodes (Dattatraya, K. N., & Rao, K. R. (2019))In order to exploit the period of the network, the protocols need to be premeditated from the opening with the independent of efficient management of the energy resources (Vyas, R., Kim, S., Cook, B. S., Thai, T., Le, T., Traille, A., et al. (2014)). The following are:

Fault Tolerance: the sensor nodes might be transferred wrong information or stopped. The failure of device is not be affected the job of the sensor network.so, it is mandatory to either select new routes with maximum energy to link with the sink node in the network to minimize the energy consumption.

Scalability: whose activity mends after adding hardware, correspondingly to the capacity added, is said to be a scalable system. The group of sensing nodes arranging in the identifying area may be in the order of thousands or hundreds, or more than it .

Coverage: In WSNs, each sensor node has a particular extent of act and it covers a minimum physical the location. Hence, area covering also an important strategy parameteristics quantities are WSNs.

Quality of Service: Protection of energy is measured more significant than the quality of data sent. If the energy acquires drained then it reduces the value of the results in order to minimize the energy distribution in the nodes and therefore the total network period will be improved. Hence, energy sensible routing protocols are required to overcome this problem.

Energy formation: Sensor node is used their minimum amount of energy performance of calculations and transferring information in a wireless atmosphere .Energy preserving format of computation and communication are important. In a multi-hop WSN, each node shows a double part is data sender and data router.

IV. PROPOSED METHOD

Objective of Proposed Algorithm

Wireless sensor networks are cast-off to observer the crops. The agriculturalist can calculate the level of water, moisture contented, humidity and also the reduces the damaged in the crops. The sensors collects data and load it in the webserver. Then which sends message to already registered mobile phone The agriculture authority talks with the farmer in person and suggests the bug killer. Both can observer the crops using their smart mobile phones. The main objectives of this proposed work is to analyze and provide suitable solutions to design protocols for secure energy efficient cluster head selection in WSNs (Mehra, P. S., Doja, M. N., & Alam, B. (2020)) Which keep tracking the energy level of Every device in this network and securing the cluster by identifying and removing the malicious node in clustering, trust value is calculated for routing and route is optimized from source to designation with the help of optimization techniques. Then cultivation people can easily receive their notification immediately and then they can solve their problems

i).CLUSTERING

One of the energetic activities in wireless sensor networks, which reduce energy ingestion is clustering. And spreading the network period in **wireless sensor networks** (**WSNs**).It involves number of sensor nodes into the form of **clusters**. All nodes has to be registered and represented like node1, node2… Node N. After the registration process nodes will be clustered based on the associativity. If the node is suitable to converted a member of cluster then it has maximum energy and minimum distance is calculated and evaluated. The trace data is collected from the network. It contains the information about the network like node identifier, source node identifier, packet number, packet size, transmission time, transmission type and energy level of the nodes

ii).CLUSTER HEAD SELECTION

Network of sensor nodes are separated into N no of clusters. As far as cluster in wireless network, have to select clusters head. Here a node will be acted as CH (cluster head) and other nodes will be acted as a cluster member (CM). Each transmission is handled by CH(Lee, J. G., Chim, S., & Park, H. H. (2019)) In the proposed method Proficient Cluster Head Algorithm (PSCH) which is used to select Heads The main functionalities of CHs is to gather the data from individual cluster's head and forward the combined data to sink node. Moreover, Cluster head handles activities of nodes and Computation in Cluster and It is used to reduce the number of transmission in network. The main aim of this selection is that only one CH will communicate and share the information with base station. So that rest of the node can put to sleep mode. The cluster head (CH) node should not be selected in randomly(V.S.Anita Sofia, ,p ranjith ,S.Arockia samy, jebaThangaiah). At the time Fuzzy Logic offers solution for reasoning. Hence Fuzzy Logic is used for Cluster head selection. In WSNs, Fuzzy Logic is used to progress decision-making, routing, clustering, data aggregation, security, cluster head Selection, etc.

iii) SELECT MAXIMUM ENERGY, THROUGHPUT & LOWEST DISTANCE NODES

The proposed method select the nodes based on the threshold value of the parameter (Deepali Virmania, Savneet Kaurb, Satbir Jainc (2014)). It select the cluster head with highest energy, lowest distance to the Base Station and having highest throughput which shown in Fig. 2.The method is dynamic in nature because selection process is refreshed periodically(Mehra, P. S., Doja, M. N., & Alam, B. (2020))If throughput value is same for all devices, then consider rest of the factors. Maximum energy & short distance from BS is shown Fig.3. Then node (1,0,1) is selected.

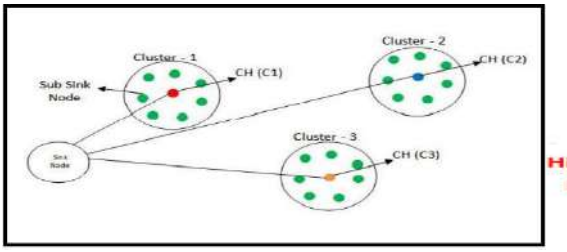


Figure 2. CH Selection

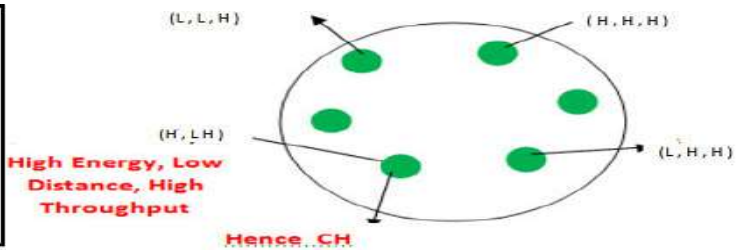


Figure 3.CH Selected Based On Rule

Table 1: Cluster Head Selection using Fuzzy Based Rule

Energy	Distance	Throughput	Cluster Head(CH)
Very Low(E)	Low(D)	Very High(T)	Low(CH)
Low(E)	Low(D)	High(T)	Low(CH)
Low(E)	very High	VeryLow (T)	Low(CH)
Very Low(E)	High(D)	High(T)	Low(CH)
High(E)	Very Low(D)	Low(T)	Low(CH)
High(E)	Low(D)	**High**(T)	**High**(CH)
High(E)	VeryHigh(D)	Low(T)	LoW(CH)
Low(E)	High(D)	Very High(T)	Low(CH)

iv) MALICIOUS NODE DETECTION & REMOVAL

This step is playing vital role in clustering because it reduces the chances of the faults(V.S.Anita Sofia, ,p ranjith ,S.Arockia samy, jebaThangaiah) Hence after selecting cluster Head have to predict malicious node from the network. By default cluster comprises Cluster Member (CM) and Cluster Head (CH) (Sadeghian, H., & Aghaei, M. S. (2019) where both might be a malicious. If the Cluster Member might be malicious then which deny services to other nodes. Suppose Cluster Head might be malicious the node which modifies data before, after and during transmission. In this proposed method malicious node are detected using Node One of the common attacks in network is node replication attack It takes full control over the network. Consequences of this attack which modify the data, injecting false data, dropping packets and initiating a warm-whole attack thus, all these results in leaking of authorized data to an adversary node these issues can be solved by using Replication Attack Detection Protocol which is Used to detect replicas node in the network and The witness is selected dynamically using randomized hash function. & all the predicted nodes are removed from network by using Replay attack detection protocol which is control traffic is signed for every hop. This means only one signature is needed here several messages age together in a packets to avoid replay attack here timestamps concept is used the node wants to

transfer data within timestamps to sink node otherwise it will not be allowed to transfer so that it can identify which is malicious node that node wont transfer an information any more

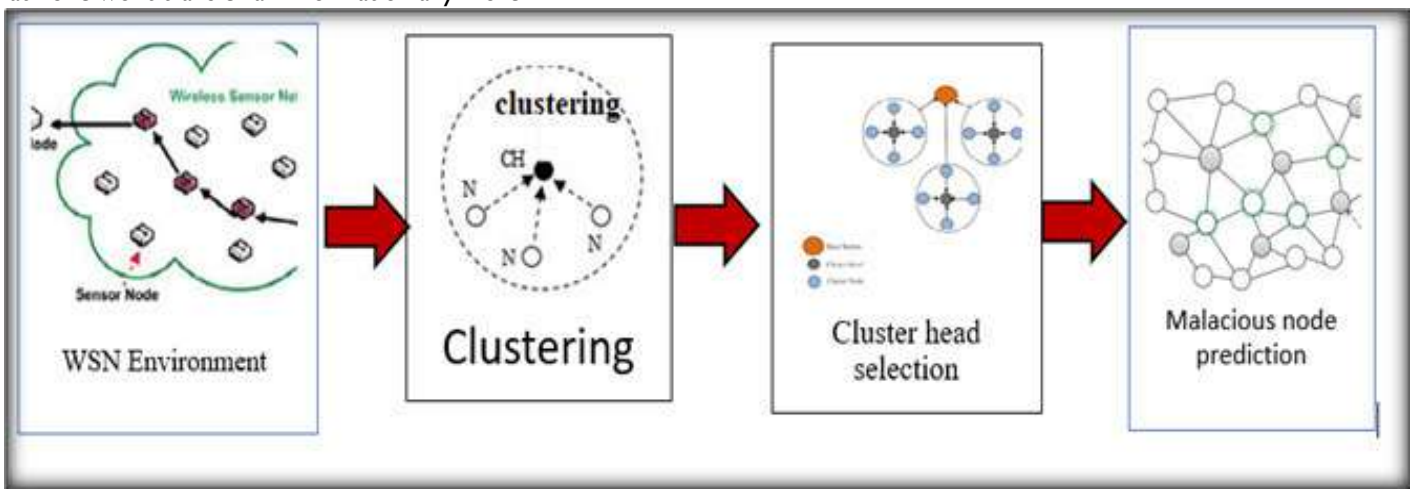


Figure 4. Flow Of Proposed Algorithm

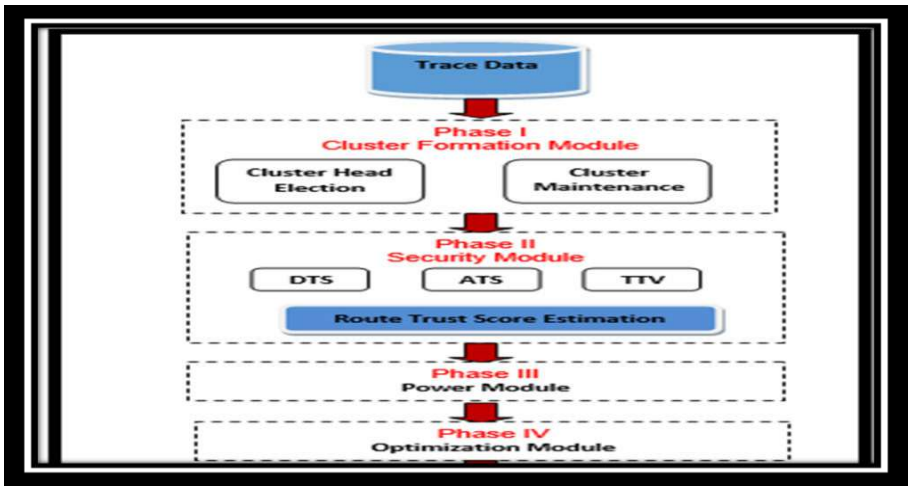
v) Security Module

Overall Trust value is computed by Security module. Which has three components such as. Direct Trust Score (DTS), Approval Trust Score (ATS) , Total Trust Value (TTV) Security module is responsible for work out the trust value for the path from end to end .The Direct Trust score is responsible for computing the direct trust score. And Approval (Baradaran, A. A., & Navi, K. (2020)Trust Sore is used to calculate trustworthy third party about the neighbors. The Total Trust score is calculated by adding Direct Trust Score and Approval Trust Score and based on Total Trust Value the secured route will be generated then transfer information to base station through this path.

vi) Power and Optimization Module

Power is a constrained resource in the sensor networks. The power module is responsible for tracking the energy of all the device in the network which is an important component in this architecture and it provides the data about the energy of the devices to cluster formation module and Optimization module. The optimization module optimizes the path from the starting point to the ending point in the network. by considering the energy of the nodes [3]and Total Trust Values and using optimization techniques.

Architecture of Proposed Work



PROPOSED ALGORITHM

Step 1: Identifying& Registering Sensor Nodes
Step 2: Grouping the node as a cluster based on the associativity
The node is selected as a CH is such a way that it has maximum associativity as well as satisfies a minimum connectivity requirement.

Step 3: To select the Cluster head by using Fuzzy logic
Step 4: Malicious node prediction and removal is carried out using Node Replication Attack Detection Protocol & Replay attack detection protocol.
Step 5: Data is gathered from cluster by cluster Head
Step 6: Data transferred to BS.

VII. CONCLUSION

Agriculture process can be used through new trends. WSN are given for creating crop with maximum yield and minimum cost. Recent day's cultivation has not been done by the human beings. To reduce manpower wireless sensors networks used. At this time sensor nodes gather the information and send to registered person. Wireless Sensor Networks having energy proficient to cover network lifetime (J. Joselin and V.S. Anita Sofia ,(2019)). To rise the network lifetime efficient clustering technique is required. Proposed an energy-efficient securing method in wireless sensor networks to improve energy efficiency as well as maintaining security. tracking the energy level of each node in the network to extend the lifetime of network predict and remove the malicious node in clustering to avoid unauthorized access, based on the trust value path is generated and selected path is optimized by considering energy level and trust values. Using some components information are transmitted to smart phones. This is further proper for farming reliant areas like India.

CONFLICT OF INTEREST

Conflict of interest declared none.

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SP-24

A LITERATURE REVIEW ON CONSUMPTION OF FAST FOOD USING DATA MINING TECHNIQUES

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Abstract: In this fast-growing field, most people prefer to consume food that is quickly processed. Such preference for fast food maybe because the people are busy with their daily routine job or lazy in preparing food, or they are addicted to the taste of quickly processed food. However, they won't waste the time and can rush up to their work. The Junk food prepares and serves very quickly. So, they prefer fast food to consume every day not only to rush up but they attracted towards the taste of the fast food. But people forget that to work human body has to be stronger and healthier, people have to consume healthy food. This work shows a few papers which are related to the effects of fast food using data mining techniques to review.

Keywords – *fast food, review, data mining techniques.*

INTRODUCTION

Fast food means quickly prepared and served as well. Consumption of fast food will lead to many serious health issues from headache, stress to obesity, diabetes even cancer. An escalating problem since fast-food restaurants is provoking obesity from a very young age[1]. Most fast foods are consumed by people who are all well-educated. Even they know what type of foods are healthier for our body and which are not. Many researchers, social activists are spreading awareness of fast food consumption to our society even though people can't take it seriously. The truth is that the consumption of fast food will lead to a deficiency of nutrition in the human body as well as affects the physical condition. Many researchers took efforts to create awareness about the effects of fast food [2]. This paper list a few papers to review those works of literature.

REVIEW OF LITERATURE

Review on PCA - Clustering method

Lekha et al., A novel method for culminating the consumption of fast food using PCA Reduction and K-means Clustering Algorithm, discussed the effects of fast food using data mining techniques. It shows the preprocessing techniques and clustering. The analysis was done using the R tool and Programming. R is a free statistical software environment. The dataset contains the types of fast food, calories, nutrition's and its level. Here, preprocessing was the first step to clean the dataset and which was used to remove the null values, normalize the data, and from each attribute it found the strings and summary values. Next, PCA means Principal Component Analysis used to minimize the dataset. The Principal Factors are minimized set of variables that allow the user to create and use it[3]. It is the Dimensional Reduction. In PCA, they applied the prcomp() function, which is used to find the maximum variance and shows the bend from the plot. The biplot has been applied to show the clear result of PCA. The Plot showed that PC1, saturated fat, and calories are the closest and in PC2, TYPE and Disease are more correlated than PC1 features[3]. For Clustering, they used preprocessed data. In clustering, the K means clustering algorithm has been applied in this work. K means used to find the number of similar attributes is grouped, which is numeric. Therefore, three clusters were found in this work. Each three clusters groups its

variables together and the point variability of the components are 82.17%. In both PCA and K means clustering, this work applies the formulas to find the accurate result. Finally, the accuracy was found using classification techniques which are not discussed in this paper.

Review on Classification- Decision Tree method

D.Latha, et al., Data Mining Analysis of Impact of Fast Food among Children: A District-Wide Case Study**,** gathered the data from children less than 10 yeatywers of Theni District, Tamil Nadu in India[4]. Their objectives are to identify the change in eating patterns, food choices, and effects of fast food. The data are analyzed using the XL-miner tool of data mining. This work was done using classification techniques. The data were gathered using a self-administered questionnaire. The aim is to test the hypothesis that fast food consumption adversely affects dietary factors linked to the health risk of children[4]. Once the data has been cleaned applied several relevant techniques to sample data. The results are evaluated for each technique. After a model is selected and validated, that can be implemented by the decision-makers. They evaluated the results and chose the best technique. So the classification technique was implemented to evaluate the predicted data. Finally, the results are visualized using two- dimensional computer screen. Therefore, they derived a decision tree out of their processing. They find the probability value for each attribute by using Information gain. The classes are in the probability value is 0.3. Here it finds the decision nodes are 3 and the terminal nodes are 4. The root node of the tree is attribute anemia. This was selected by the probability value. The overall elapsed time was 6 sec. They concluded that after this case study, the effects of fast food were classified. They felt they have done some nation work.

Review on Classification- Decision Tree – Neural Network method

Bayu Adhi Tama, Data Mining for Predicting Customer Satisfaction in Fast-Food Restaurant, analyzed the customer satisfaction in the fast-food restaurant. The data were gathered from the customer and analyzed using classification techniques in data mining. In classification, two algorithms were implemented they are Decision tree and the Neural network to find the determinant factor for customer satisfaction. One more objective of this paper is to explore and examine the utilization of information based on marketing strategy by extracting useful and interesting rules from fast food customers' data using a Decision tree and Neural network[5]. This one was the marketing research. Overall 10 Input variables were distributed. First, the preprocessed data and moved to data mining and model evaluation. They adopted the C4.5 program and which was implemented as Rattle in R packages to extract the rules. In the Decision tree, the rules are extracted and assigned the target values of (0, 1) for DT and (1, 0) for NN. Datasets were divided into 2 parts to evaluate the model. For training, rule extraction, and model validation. They have applied REANN Algorithm. In the Performance Evaluation Decision tree (C4.5) Rules are 16 and the REANN rules are 2. Rules generated from C4.5 and REANN were quite similar. The accuracy of the rules extraction from REANN was 2% higher than the DT (C4.5). Hence, the work provides some findings that are useful for marketers, policymakers who have an interest in customer satisfaction research[5]. Finally, food presentation and quality become essential factors in understanding customer satisfaction in fast food restaurants. In this study, the taste is also considered the most important part of fast food.

Review on various Supervised & Unsupervised learning method

Md.Ridowan Chowdhury et al., Understanding University Students‟ Fast Food Consumption Behavior and Associated Health Concern. The objective of this research is to find out the measurement of fast food consumption behavior and the health issues while consuming fast food. The data is gathered by questionnaires to the university students‟ to analyze the correlation analysis and chi-squared test to understand the behavior. To group the students‟ with their preferences while choosing a restaurant, used K means clustering algorithm[6]. K means is unsupervised learning model. They have also used supervised learning models to predict the students‟ fast food consumption rate, which are Decision Tree Classifier, Gaussian Naive Bayes, Logistic Regression and Random Forest Classifier. For predictive analysis and cluster analysis, they were used Spyder – Python in the Scikit - learn

tools. Classification Rapid miner and SPSS tool were used for cluster analysis and Chi-squared value testing. Finally, the Naive Bayes algorithm performed better than other algorithms with 79.4% accuracy outcomes.

Review on Classification - Decision Tree – Random Tree method

Mr. Vijay Jaiswal et al., A new approach for recommending healthy diet using predictive data mining algorithm, gathered the food data with the nutritional information of each food. Using data mining tool and algorithms, they were proposing healthy food habits and eating patterns to know anyone about their everyday food consumption level, calories burned, and intake of macronutrients. It's a Recommender System that is used to analyze an individual's food habits and will help to avoid the illness caused by improper diet or food habits. This paper works with data mining algorithms to predict the outcomes. The Classification, Decision Tree and Random Tree were applied in this work and also used Harris Benedict equations to calculate the individual's basal metabolic rate (BMR). The decision tree describes whether the particular food item must be included in the client's diet plan or not[7]. If a person is allergic to a displayed food item in the system the food is directly removed from his diet plan, else the system further checks the likeness factor of clients towards that food item[7]. If the likeness factor of a client for a particular food item is high the food will be included in his diet plan regardless of his fitness goal[7]. If the likeness factor is medium for a food item displayed, then the decision, whether that food item should be included in the diet plan or not will be taken by considering the fitness goals of that particular client, else if the likeness factor is low the food item won't be added to the client's healthy diet plan[7]. After the classification technique is used to determine the food items that are suitable for an individual, the predefined rules are applied to the algorithm and a healthy diet plan is generated based on an individual's preferences[7].

Table 1.1

Paper	Method	Dataset	Evaluation Metrics	Result	Future Work
M Mohanapriya, Dr. J Lekha, et al., A novel method for culminating the consumption of fast food using PCA Reduction and K-means Clustering Algorithm	PCA Clustering	Fast food Ingredients Dataset	Elbow Method	3 no. of clusters, PC bend at 3, shown comp 3 has more variance than others.	In the future, apply classification methods to find the accuracy value from the existing dataset
D.Latha, et al., Data Mining Analysis of Impact of Fast Food among Children: A District-Wide Case Study	Classification techniques-Decision tree	Self-administered questionnaire, food behavior data from children less than 10 years	Probability value, Elapsed time	The probability value is 0.3 for all classes. 06 sec elapsed time.	—

Bayu Adhi Tama, Data Mining for Predicting Customer Satisfaction in Fast-Food Restaurant,	Classification techniques-decision tree and neural network, REANN, C4.5	Customer satisfaction dataset	Accuracy, Rules Extraction.	REANN Accuracy in training test is 84.78%.	In the future, they intend to conduct cross-sectional research by comparing the characteristics of fast food.
Md.Ridowan Chowdhury et al., Understanding University Students‟ Fast Food Consumption Behavior and Associated Health Concern	K means, Decision Tree Classifier, Gaussian Naive Bayes, Logistic Regression and Random Forest Classifier	Students Food Preference Dataset	Accuracy, Correlation, cluster analysis, Chi-square test	The Naive Bayes algorithm performed better than other algorithms with 79.4% accuracy outcomes.	In Future, remove outliers and noise from the dataset to train the models best fit for the machine learning algorithms. More clustering algorithms have to be tested to find the best model that best fits the data.
Mr. Vijay Jaiswal et al., A new approach for recommending healthy diet using predictive data mining algorithm	Harris Benedict equation, Random Tree Algorithm, Decision Tree, Classification	Food Dataset	Rules, Decisions	The studies and their implementation showed that the decision tree learning algorithm, Random Tree works well on any classification problems having a dataset with non-repeated values.	In the future, an algorithm can be generated to suggest the diet plan based on advanced nutrition levels such as sodium content, phosphorous, fibre content, manganese content, etc.

SCOPE OF THE PROPOSED SYSTEM

In the proposed work, the author can gather data from all age category people and find the food behaviors based on covid-19 to create awareness about health care. To find the changes in food behavior before and after covid-19. To find the accuracy level of fast-food consumption. To make aware about traditional foods habits and their healthiness. In the existing system, data are collected and the research is done from children's, based on fast food ingredients and regarding the satisfaction of fast food and its restaurant. The proposed work will apply different types of data mining techniques to find the exact result.

CONCLUSION

This paper reviewed three papers which is related to the effects of fast food using data mining techniques. From these papers, the author realized the fact which is that people are satisfied with the fast-food taste and its environment, they are addicted towards the fast food and the main thing is frequent consumption of fast food will lead to severe health issues. It will affect the human body.

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SP-25

Machine Learning Datamining Methods To Predict Fore Coming Covid-19 Cases

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Abstract: Corona virus (CoV) is a broad family of viruses that can cause a variety of illnesses, from the common cold to more serious illnesses. A novel corona virus (nCoV) is a strain of coronavirus that has never been seen in humans before. The disease COVID-19 is caused by SARS-CoV-2, a coronavirus that first appeared in December of 2019. Now, in 2021 we have 4 variants Alpha, Beta, gamma, Delta for which we have no clinically proven vaccines. To stop the rigorousness of the virus the cases have to be predicted so that preventive measures can be implemented in case if higher ratios are depicted. Data mining models were created during this work to discover COVID-19 cases using datasets from covid19india.org. To create the models, the support vector machine, linear regression, polynomial regression, and decision tree techniques were directly implemented on the dataset using the Python programming language. For a given day, the model projected an estimated number of cases. The findings of this study revealed that the model produced using the decision tree data processing algorithm is more efficient in predicting the number of cases with 100% accuracy and it's very simple than any other algorithms.

Keywords : COVID-19, SARS-CoV, Support Vector Machine, Linear Regression, Polynomial Regression Decision Tree

INTRODUCTION

The latest COVID-19 outbreak in numerous countries is similar to the SARS and the Middle East respiratory syndrome (MERS) outbreaks in China and Saudi Arabia, respectively, between 2003 and 2012 [1-3]. SARS and COVID-19 are both caused by the corona virus, which affects the respiratory tract and causes large disease epidemics around the world. SARS-CoV causes SARS, whereas COVID-19 is caused by SARS-CoV-2. There is no specific treatment for SARS or COVID-19 at the moment. Even though SARS-CoV-2 is a novel corona virus, there is some indication that it is comparable to human corona virus HKU1 and 229E strains [4,5]in the current search for a COVID-19 treatment. According to official government recommendations, India is preparing for the COVID-19 outbreak, and failing to take specified crisis actions or downplaying its significance will have highly serious consequences. COVID-19 positive cases have been documented in all of India's surrounding countries. The Indian government has taken essential and stringent measures to combat the deadly virus, including installing health checkpoints between national borders to determine whether persons entering the country are infected [6].We created a few data processing algorithms for detecting COVID 19 cases for this investigation. The models forecast when COVID-19 cases for the fore coming days. This model aids clinicians & the government in depicting the number of cases and taking preventive measures accordingly. The models are created using data from covid19india.org. Decision trees, Support vector machine, Linear Regression & Polynomial Regression are used in this data processing approach directly with a python programming language to create these models. The paper describes the methodology, Implementation & results respectively.

Dataset Processing Method

The information was gathered from the covid19india website [7]. The raw dataset of COVID-19 patients is taken up until April 19th. The dataset has 17364 rows × 23 columns along with Patient Number, State Patient Number, Date Announced, Estimated Onset, Date, Age Bracket, Gender, Detected City, Detected District, Notes, contracted from which Patient (Suspected), Nationality, Type of transmission, Status, Change Date, Source_1, Source_2, Source_3, Backup Notes, Num Cases (Number of cases)Only relevant attributes were taken from the original dataset after it was constructed and erased. Also, month and day were separated from Date Announced to group separated results for hospitalized patients (*Table1*). Frequencies of gender (*Table2*), Frequency of cases every day respective to each month (*Table3*).

	Patient Number	State Patient Number	Month	Day	Date Announced	Estimated Onset Date	Age Bracket	Gender	Detected City	Detected District	...	Notes	Contracted from which Patient (Suspected)	Nationality	Type of transmission	Status Change Date
0	1.0	KL-TS-P1	1	30	30-01-2020	NaN	20	F	Thrissur	Thrissur	...	Travelled from Wuhan	NaN	India	Imported	14-02-2020
1	2.0	KL-AL-P1	2	2	02-02-2020	NaN	NaN	NaN	Alappuzha	Alappuzha	...	Travelled from Wuhan	NaN	India	Imported	14-02-2020
2	3.0	KL-KS-P1	2	3	03-02-2020	NaN	NaN	NaN	Kasaragod	Kasaragod	...	Travelled from Wuhan	NaN	India	Imported	14-02-2020
3	4.0	DL-P1	3	2	02-03-2020	NaN	45	M	East Delhi (Mayur Vihar)	East Delhi	...	Travelled from Austria, Italy	NaN	India	Imported	15-03-2020

Table

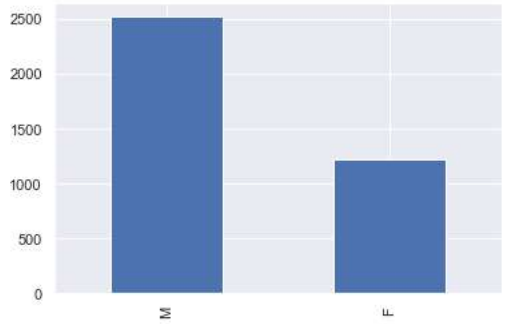


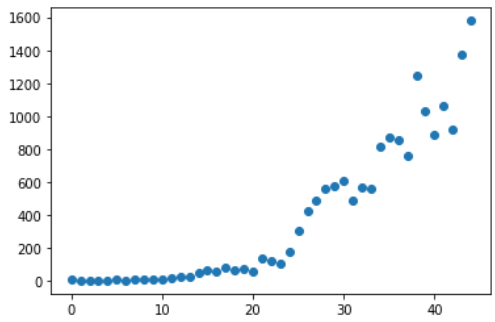
Table2

Month	Day	Number of cases
3	4	5
	5	1
	7	2
	9	4
	10	4

Table3

Linear Regression

In statistics, linear regression is a linear approach for modeling the relationship between a scalar response and one or more explanatory variables (also known as dependent and independent variables). The case of one explanatory variable is called simple linear regression; for more than one, the process is called multiple linear regression [8]. Datasets were preprocessed where only necessary details were taken and applied python programming language to draft a dataset plot prediction for May.



Fig

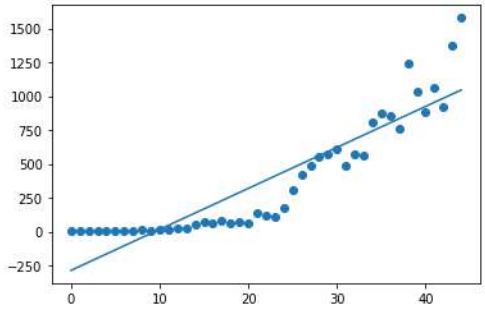


Fig2

There was a total of 44 data in the dataset *Fig2* shows the approximate prediction of 45 data that is not in the dataset. The accuracy of the Approximate value is 82.10410012608074.

Support Vector Regression

The supervised learning algorithm Support Vector Regression is used to predict discrete values. SVMs and Support Vector Regression are both based on the same premise. SVR's main premise is to locate the best-fitting line. The best fit line in SVR is the hyperplane with the greatest number of points [9].The SVR, unlike other regression models, aims to fit the best line inside a threshold value, rather than minimizing the error between the real and projected value. The distance between the hyperplane and the boundary line is the threshold value. SVR's fit time complexity grows more than quadratically with the number of samples, making it difficult to scale to datasets with more than a few tens of thousands of samples.

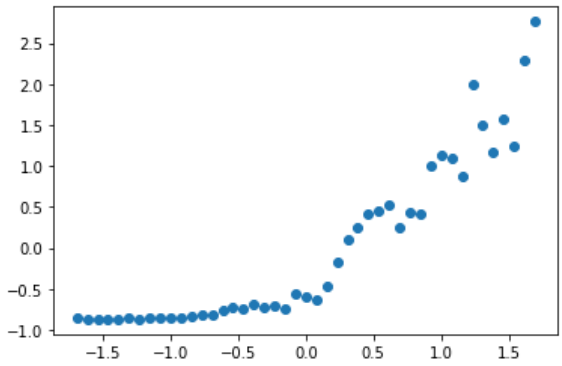
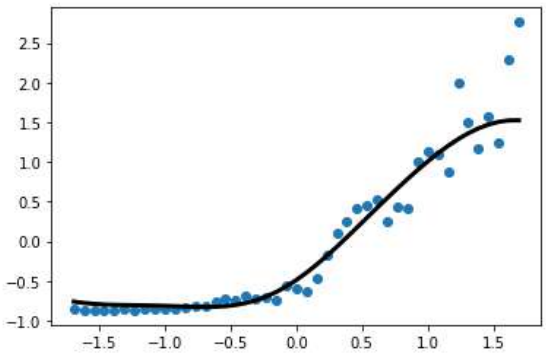


Fig3



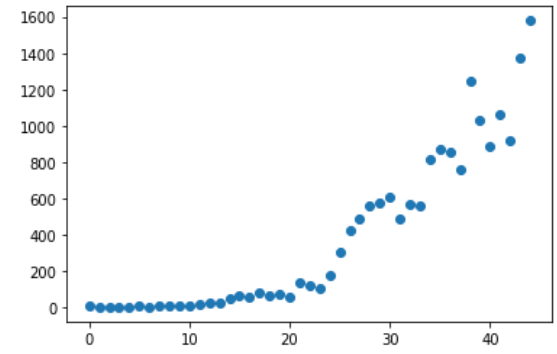
Fig

The values were reshaped and plotted (*Fig3*). The value for prediction is sh... along with the plotted graph. The support vector machine was recorded that it has 92.2% Accuracy.

Polynomial Regression

The link between the independent variable x and the dependent variable y is treated as an nth degree polynomial in x in polynomial regression. Polynomial regression, designated E (y |x), fits a nonlinear relationship between the value of x and the conditional mean of y. Even though polynomial regression fits a nonlinear model to the data, it is a linear statistical estimation issue in the sense that the regression function E (y | x) is linear in the unknown parameters inferred from the data. As a result, polynomial regression is regarded as a subset of multiple linear regression [10].Polynomial regression is a special case of multiple regression, with only one independent variable X. one-variable polynomial regression model can be expressed as [11]

$$y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2 + \beta_3 x_i^3 + \cdots + \beta_k x_i^k + e_i \text{ , for } i = 1, 2, \ldots, n$$



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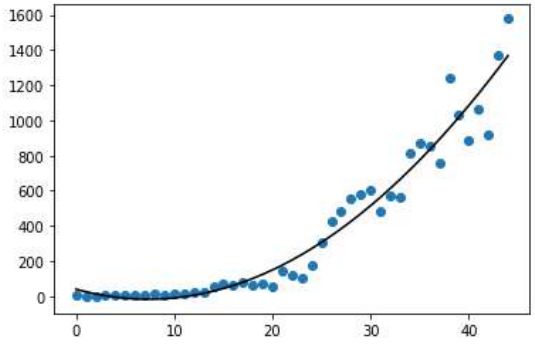
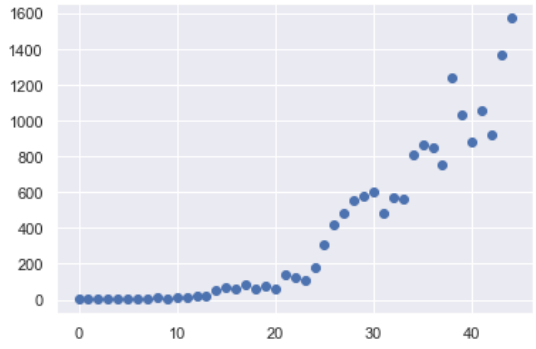


Fig6

The prediction value has ...% accuracy from the Polynomial regression model.

Decision Tree Regression

Decision trees where the target variable can take continuous values (typically real numbers) are called regression trees. Decision trees are among the most popular machine learning algorithms given their intelligibility and simplicity[12]. One of the most widely used and useful models for supervised learning is the Decision Tree. It can be used to tackle both regression and classification problems, albeit the latter is more widely utilized.



Fig

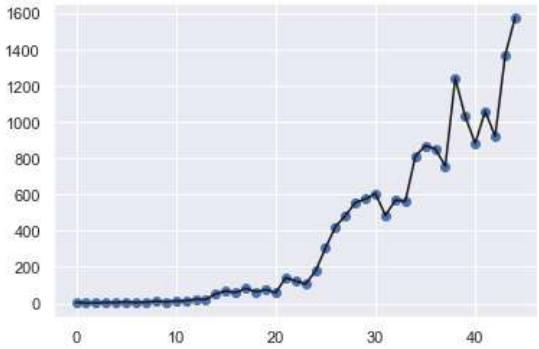
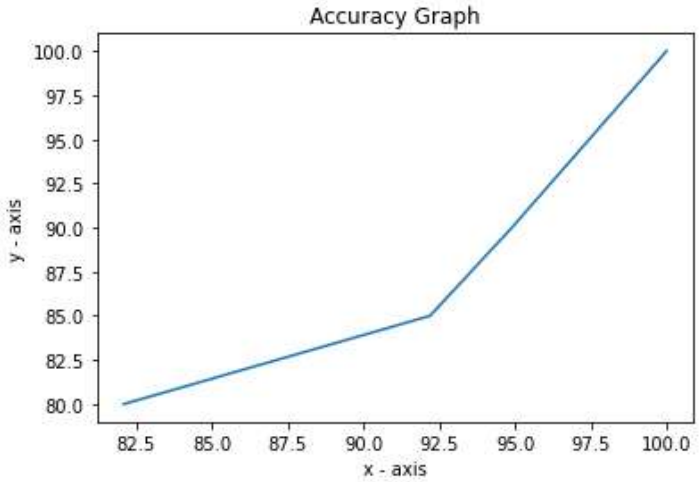


Fig8

From all the other algorithms, the Decision Tree has the most Accuracy with 1.0. The data values predicted from the decision tree exactly match the datasets.

Evaluation of Models

From the above, it is very clear that the Decision tree has the highest accuracy of all other Data mining models with 100%.



The Python programming language was used to apply data mining algorithms such as DT, SVM, PR, and LR to the dataset. However, as shown in Fig8, the model created using the DT method was found to be the most accurate, with 100% accuracy, the highest among the others. The COVID-19 foreseen instances were projected by the model.In comparison to LR, SVM, and PR, which have an overall accuracy of 82.10 percent, 92.02 percent, and 94.91 percent, respectively, the model developed with the DT data mining technique is capable of accurately predicting the probability of COVID-19 cases with an overall accuracy of 100 percent.

Conclusion

Data mining algorithms for predicting COVID-19 future cases were constructed using a dataset of COVID-19 patients. The DT, SVM, PR, and LR algorithms were applied directly to the dataset using the Python programming language. With a percentage of accuracy of 100 percent, the model constructed with DT was found to be the most effective, followed by PR with 94.90 percent, SVM with 92.02, and LR with 82.10 percent. The developed models would be immensely beneficial in bringing forward preventative measures.

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