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Review Article

Microbiology for health care

Model Building for Internet of Things Based System for Monitoring Healthcare

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Abstract: Internet of things is becoming a big part of almost every sector and Obstetrics/Gynecology is no exception. IoT serving major roles form automating drudgery and tasks in medical practice to manage patients and medical resources. This IoT provides the outputs immediately but cannot completely depend on the decision, human interaction is necessary. It sure does as environment around mom is good, so it leads to better health of both mom and child. The importance of health care during pregnancy is emphasized because proper health care increases the probability of a successful pregnancy, a successful infant. Maintain healthy environment, regular monitoring of the vital parameters of fetus and women, that should eventually decrease the mortality rate. Molecular biology researchers would have sufficient expertise or resources to manually create and maintain relation between findings in their field, owing to the rapid growth of data both in molecular biology and in virtually every clinical medicine domain. The Internet of Things (IoT), network of interconnected medical devices is an application for health-related uses, collection of data, processing for testing and monitoring. This review article aims about how IoT can track and allows healthcare persons to be more responsive and interact with patients which provides a basis to interpret new clinical and basic research ? ndings in the areas of cloning, gene transfer and targeting, the application of genetic medicine to clinical conditions, ethics, government regulation, genomics, and biotechnology and bioinformatics.

Keywords: Internet of Things, Bioinformatics, Data collection, IoT Sensors, Healthcare, Medical.

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1. INTRODUCTION

Ever since the structure of DNA was unraveled in 1953, molecular biology has witnessed tremendous advances. With the increase in our ability to manipulate biomolecular sequences, a huge amount of data has been and is being generated. One of the key goals of the global health community is to prevent early infant mortality[1]. Reducing child mortality requires a wide range of interventions that improve healthcare quality for the whole family before pregnancy and a healthy environment[2]. With the increasing growth of IT-based technology such as IoT and cloud computing[3], low-cost healthcare facilities and their support[4], centralized management can be efficiently managed and public health monitoring can be achieved[5]. Growing attention has been paid to combining IoT and healthcare in both the academic and business environments, an increased understanding of the challenges and opportunities associated with IoT-based healthcare systems is needed[6]. Rapid growth of state-of-the-art technology has revolutionized the agricultural and medical sector to provide a varied population with emergency, reliable and economical facilities for safety[7]. So, we explore here in this article about how data collected from several devices were analyzed and visualized remotely on the application[8]. Social activities for stimulating cognitive abilities to develop educational games dedicated to the stimulation of cognitive disabilities like mental retardation[9]. There is an urgent call for developing efficient strategies which could reduce healthcare costs and meet the demand of older people affected by these chronic neurological diseases at affordable cost using IoT[10]. Health care information was sent to pregnant women's devices via wireless sensors like Bluetooth. Wearable devices are now expanding clinical safety monitoring capabilities and have tremendous potential to boost early detection of complications in pregnant conditions[11]. One of the central goals in biological sciences is to develop predictive models for the analysis and visualization of information. However, the analysis and visualization of biological data patterns have traditionally been approached as independent problems[12]. Until now, biological data analysis has emphasized the automation aspects of tools and relatively little attention has been given to the integration and visualization of information and models. Moreover, given the vast amounts of data generated by high-throughput technologies, there is a risk of identifying spurious associations between genes and functional properties owing to a lack of an adequate understanding of these data and analysis tools[13]. By blending physical and digital realms, the Internet of Things (IoT) vastly expands the reach of information technology. The myriad possibilities that arise from the ability to monitor and control things in the physical world electronically have inspired a surge of innovation and enthusiasm. The sweeping changes that IoT can bring to how companies manage physical assets, how consumers attend to their health and fitness [14]. Two types of IoT technology applications fall under the human setting. The first category is health and fitness. The second set of human productivity involves using IoT technology to improve performance in the workplace[15]. IoT has potential for transformative change in human health. Using connected devices to continuously monitor patients as they live their lives—particularly those with chronic conditions such as diabetes—the Internet of Things can improve patient adherence to prescribed therapies, avoid hospitalizations (and post-hospitalization complications), and improve the quality of life for hundreds of millions of patients[16]. Wearable devices offer several exciting new possibilities for improving clinical surveillance, diagnosis, and pregnancy safety management beyond conventional care, as shown in figure 1.

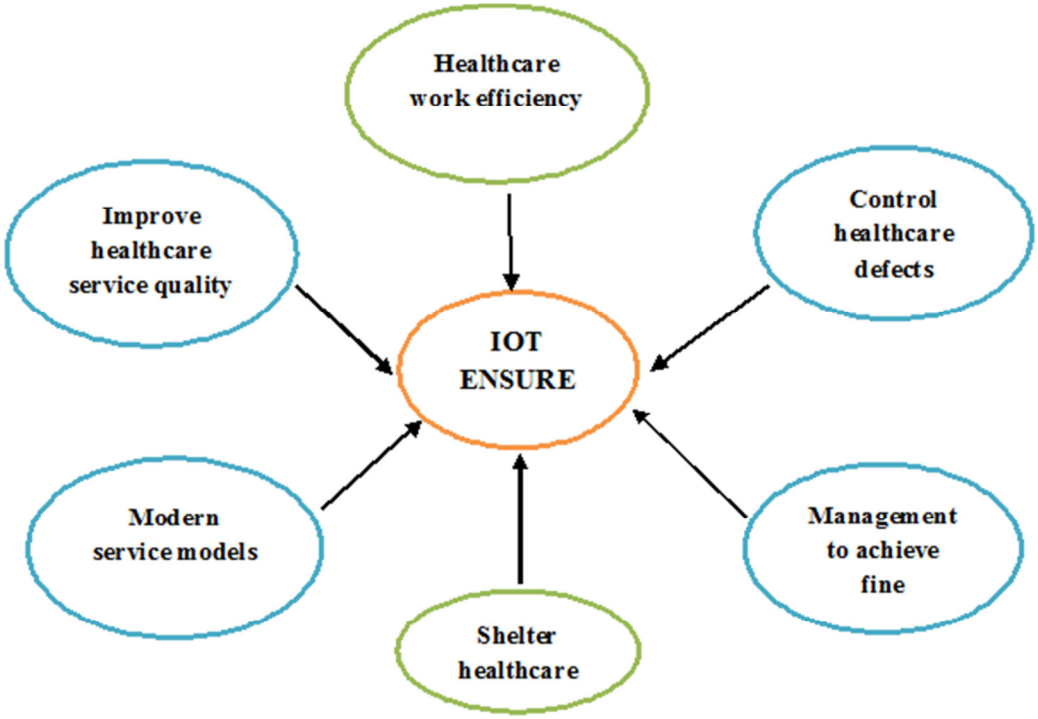

Fig 1: Applications Of Iot Ensure The Enhancement Of Clinical Practices.

1.1 MODEL BUILDING FOR INFANT SUPERVISING SYSTEM

1.1.1 USE CASE

Sudden infant death syndrome (SIDS), according to the US census, the worldwide average of infant mortality rate is 90, that means 90 infants die per 1000 live births within a one-year period after birth. The US death rate of infants has increased in recent times due to SIDS. It is one of the leading causes of infant mortality rate. The leading causes are birth defects, preterm birth and maternal complications of pregnancy[17].

1.1.2 LEAD-IN

We want to implement various sensors that give the instructions directly to the parents and the clinicians from the infants, by this the death rate could be decreased to some extent. So, for that we want to implement these sensors using this IoT (Internet of Things) - MQ2 Sensors (CO_2 indicator sensor), Temperature Sensor (temperature recording), Humidity sensors (check dry conditions of baby), Heartbeat sensor (beats per minute), accelerometer (acceleration) for biomedical applications[18].

1.1.3 DATA PREPARATION

For this purpose of this experiment, let's consider only two categories for each sensor: normal and abnormal output. Each sensor was connected through IOT web technologies, we can easily know every action of an infant through this IOT network without devices and take an immediate action towards the infant. When an infant is in a dangerous situation it creates audible alarms to warn the parent[19].

1.1.4 MODEL BUILDING

The outputs of the sensors indicating the temperature, humidity and oxygen concentration of the incubator internal environment in varied living cells[20] are the inputs of the Artificial Neural Networks, which defines the appropriate case and decides the correct response based on the previous training.

1.1.5 BIO TOOL

ZigBee devices also transfer information over long distances by transmitting data through an intermediate machine in a mesh configuration[21]. ZigBee works in the commercial, research and medical radio bands in drugs and biopharmaceuticals[22] as shown in figure 2.

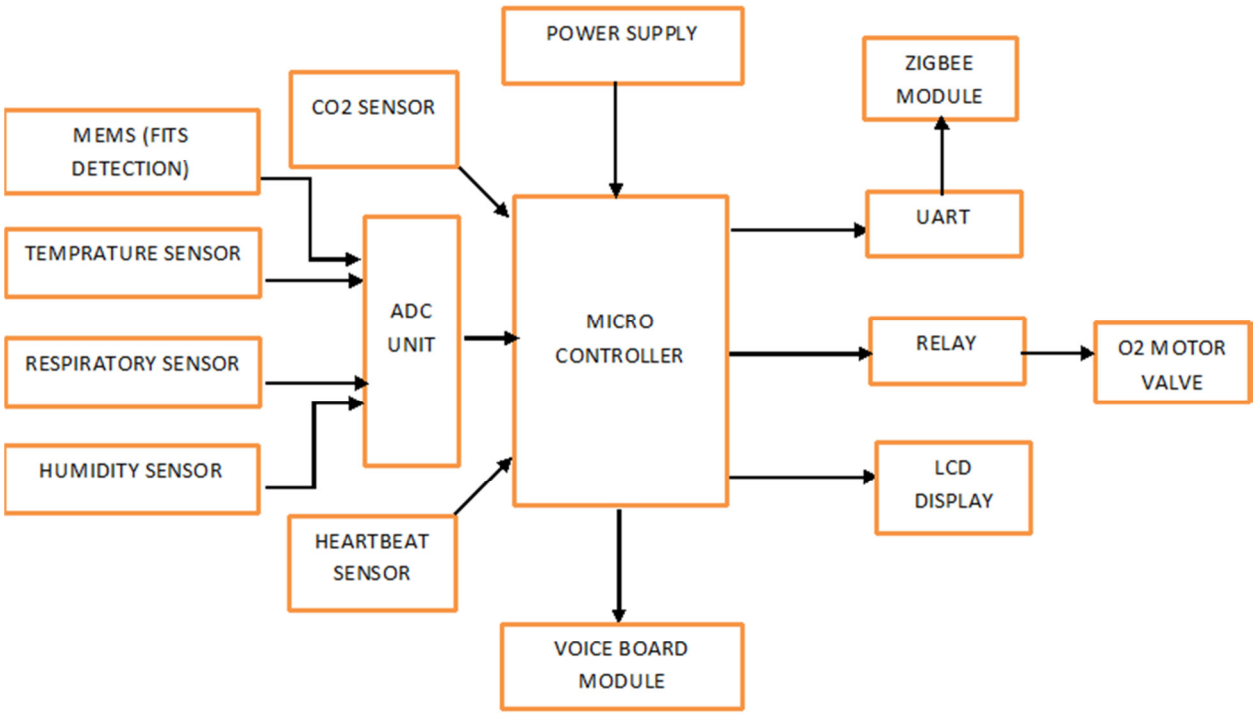

Fig 2: Block diagram of the process for model building for infant supervising system

2. IOT SENSORS

Here IOT technology based PWHCS (Pregnant Woman Health Care System) is used to monitor the condition of the pregnant women inside hospital and outside and make decisions timely by the clinicians, especially for rural underserved populations, device have advantage of being able to synthesize specific pregnant women data, do multiple evaluations, and send results to gynecologists, physician speedily anytime anywhere. The program will help to enhance the tracking of the current status of pregnant women; it can create alerts to ensure that the scheduled activities are not completed[23].

2.1 TYPES

Different types of sensors are developed from this IOT these allows the development of a new generation of constant health monitoring for infants and mother. We use sensors like wearable sensors, wireless communication and power

supply technology, Temperature sensors, Heart rate sensors, Accelerometer. Healthcare information sent through wireless sensors with Bluetooth to the pregnant women device (Gateway). Wearable apps are already widening the capabilities of clinical safety surveillance and have a major potential to enhance early detection of pregnancy complications. Some of the wearable sensors, mobile health innovations are present exciting new opportunities to enhance the clinical monitoring, diagnosis and management of pregnancy health[24].

3. WEARABLE SENSOR

Wearable sensor technologies produce large scale, multi-dimensional datasets that can be used to classify lifestyle, environmental and behavioral risk factors in the sub-clinical process of adverse pregnancy outcomes. Here we are providing a health care solution that combines web app and CC3200 techniques in a wireless sensor network to monitor the health condition of pregnant women. A specialist who stays nearby can examine and observe the health condition of the pregnant women and can react with effective health care services to save the lives of both the women and infant in an emergency. The sensors incorporated measures the body temperature, pressure, pulse rate which is transferred to micro controller CC3200, which has an inbuilt WIFI and ADC module, so that the patients' health condition can be monitored by the doctors from anywhere at any part of time with the help of IP address link generated by the cloud data. At any point of emergency an alarm will be generated both to the doctor and the patient relation who can react and help to save the life of pregnant women[25].

4. ADXL SENSOR

Fetal movement can currently only be quantified using ultrasound or MRI scanning. So, for this accelerometer is implemented. The accelerometer sensor is placed in abdominal wall (limb) of fetus and a threshold signaling processing method to identify the acceleration and fetal movements. The use of the (ADXL335) accelerometer sensor on the mother's abdominal wall is an important development in the automated non-invasive detection of fetal movements. This system is highly sensitive even for small movements and light weight. This is a preferable home monitoring device. Fetal hypoxia can be measured using this accelerometer as it counts the fetal movements (kicking) and estimate the situation of the infant in the womb. Regular monitoring of fetus and women in rural area, eventually the infant mortality gets reduced[26].

5. ALLOMOM AND ALLOBABY

Jewelry is that every woman loves to wear, then how about monitoring the health of a person using it? Save Mom is a conceptualized portable kit that constantly monitors and tracks the health of a pregnant women. Jewelry such as bracelets or necklaces contains colorful beads with IoT enabled sensors which tracks and analysis the condition of the pregnant women and record every data including calories burn, heart rate etc. Based on the observation it collects the data and sends to the device and remedies the women about the parental care to be taken. All the data is transformed to cloud using women's phone via Bluetooth[27].

6. CONCLUSION

Digitization of data, including health data (known as the Internet of Things-IoT in Healthcare) and its use in healthcare delivery, has been rising increasingly worldwide. The study article offers an overview of the worldwide emergence of IoT in healthcare, Artificial Intelligence is becoming a major part of almost every industry and it's no exception to obstetrics. AI performing major roles from the automation of work and tasks for handling patients and medical services in medical practice. This AI provides the outputs immediately but cannot depend entirely on the artificial intelligence decision, human intervention is required. Sure, it does as mom's atmosphere is healthy, and it contributes to better mom and child safety. It stresses because proper health care increases safety of a healthy baby. Maintain a safe climate, monitor fetal and female vital parameters regularly, which will gradually decrease mortality rate.

7. AUTHORS' CONTRIBUTION STATEMENT

Pavan Kumar Tummala and Srikanth Vemuru has taken the responsibility in the conception and idea of the study. Rajeswari Setti and Lakshmi Saranya Medida contributed substantially in compiling literature sources and drafting the manuscript. Kusuma Naredla and Mahathi Gummavajjala has provided critical revision of the article for important intellectual content. Kiranmayi Varma Lanke and Sai Vardhan Myneni has checked the references. All authors have given final approval of the version to be published

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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