Human Essential Parameters Monitoring and Precaution System

V.G.Amrita Deepika, M.Aravind Srivatsan, B.Aruthra, Bindu Babu

***Abstract*:The growth of the internet era has paved way for development of numerous applications. IoT plays a vital role in designing the devices that are very helpful to people by just a click away from the services they want to use.All the devices,connected together by making use of internet connection and working for the same objective is termed to form an IoT environment. Increasing the number of the population has also seen an increase in the number of people suffering from numerous diseases. IoT is a boon to the health industry and is used in performing plenty of tasks. In this paper, we have proposed a health monitoring and precaution system using IoT devices such as GPS trackers and GSM. Use of various sensors are also done to continuously monitor the health of a patient and send the updates automatically to the doctors who are in remote places.As in remote areas, patients cannot have frequent access to the hospitals and this model will serve to eradicate this challenge. The model is efficient and reliable as the monitoring of a patient is done 24*7. The system is also connected to defibrillator for precaution purpose. The performance of the system is evaluated and is observed to be much efficientwhen compared to other traditional health monitoring systems for the patients in the hospitals.**

***Index terms*:Health Monitoring, GPS, Navigation, IoT, Sensors, Hospital, Patient**

I. INTRODUCTION

numerous patients who get hospitalized for several reasons and get treated. It is possible for all the tasks to be done manually but involvesa lot of manpower and time consumption. Use of IoT in health care has reduced many manual operations and various task are performed manually so as to ease the work and also provide them with better accuracy consuming minimal time. Health monitoring is one of the upcoming research work where numerous researchers are working on to make the monitoring of the patients automated and provide them with good accuracy and performance.

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The proposed system is designed to be used remotely where the patients don't have access to the hospitals and the monitoring can be done from a doctor who can continuously monitor the health of patient. In case of any updates it would be directed to the care taker of the patient who is in any remote village. The model monitors the patient sends the report to the doctors periodically. The proposed system makes use of wireless sensors to detect the health conditions of the patients and stores all the details in a cloud storage system. Alerts are sent to the concerned doctors when there is a needs and GPS is used to actually tack the locations of the patients. The efficiency of the proposed monitoring system is evaluated and tested on real-time environments and is observed that it performs better when compared to the previous traditional health monitoring systems. The system is also connected to a defibrillator that gives a dose of electric current to the patients during any need. The entire model is subdivided into three modules whose specifications are discussed elaborately in the following sections. Section 2 outlines the literature review. Section 3 describes the research objectives of this paper. Section 4 outlinesthe research methodology used in this paper. Section 5 shows the discussion of theproposed method and Section 5 gives the conclusion and future works that can enhance the model in the future.

II. RELATED WORK

Various research works are being carried out by numerous researchers for monitoring the health conditions of a patient. NarasimhaRao designed a model that mainly focused on remote health monitoring that made use of sensors that were connected to Arduino microcontroller. Cloud was used to process and analyze the data gathered by the entire system [5]. A wearable ECG was designed by Jinxi Xiang [6], that combined HBC and LCS. The experimental results claimed that the proposed model exhibited an efficient result. In [7], a wearable sensor was designed for frequency -multiplexed EIT. The architecture was designed for the proposed system and was based on cooperative sensors which minimized the need of cabling. A low cost motion sensor was designed by Javier Hernandez that measured the opportunistic heart rate assessments [8]. The model yielded some of the most frequent assessments which claimed to be very accurate. The model proved to be more feasible when compared to

other traditional used systems. In [9], a personal health care system was designed that was both reliable and scalable. It made use of numerous embedded sensors which were used to monitor the health of the patient dynamically. Raspberry pie was used to process and analyze the data. The data after the process of analyzing was stored in cloud server for further processing.

KK Venkatasubramanian [10] designed a secured health monitoring system for sensor applications that was intended to secure the health care system. In this approach, beacons were used for transmitting and receiving the messages from the nodes. Mukherjee.S has designed a patient health management system. The architecture comprises of nodes that are used for communicating with the patients and the hospital staffs [11]. In case of any emergency, the patient or the family members could easily be communicated with each other and make them realize the situation better and in a fast way. In [12], the monitoring system for patients made use of antenna radar for health management. A layered architecture for the design proposed was constructed and claimed to monitor the health dynamically. PritiBinsen [13], designed a model that showed the output in an android application. This made the patients to easily track their own health at their own place. The ECG and heart rates of the patients were measured using sensors. In [14], an android based health monitoring system was designed where the sensors were connected to a microcontroller board while transmitting the data in a wireless transmission to a Bluetooth enabled smartphone. The readings and other details of a patient were stored in a cloud server which could be easily retrieved when needed both by the patient and the doctor. The main aim of [15], was to monitor the health of a patient using sensors and internet which paved way for an IoT based health monitoring system. The model periodically monitored the health of the patient while looking after various parameters periodically such as heart rate, temperature,and pulse rate. We have noted some problems by surveying all this model which are as follows.The doctors cannot track the sensor from single place with hybrid model,there is no regular monitoring of heart waves and rhythms,there are no precautionary measures taken. In our proposed system, we have implemented the GPS and GSM based sensor access for seeing the output using the smartphone and there is a two way communication where doctor and the patient/guardian can communicate with each other.

III. SECURED AND EFFICIENT MONITORING SYSTEM

In this paper, we have proposed a model that consists of developing an environment where the monitoring of the patients residing in a remote village. The model consists of a transmitter and
receiver.

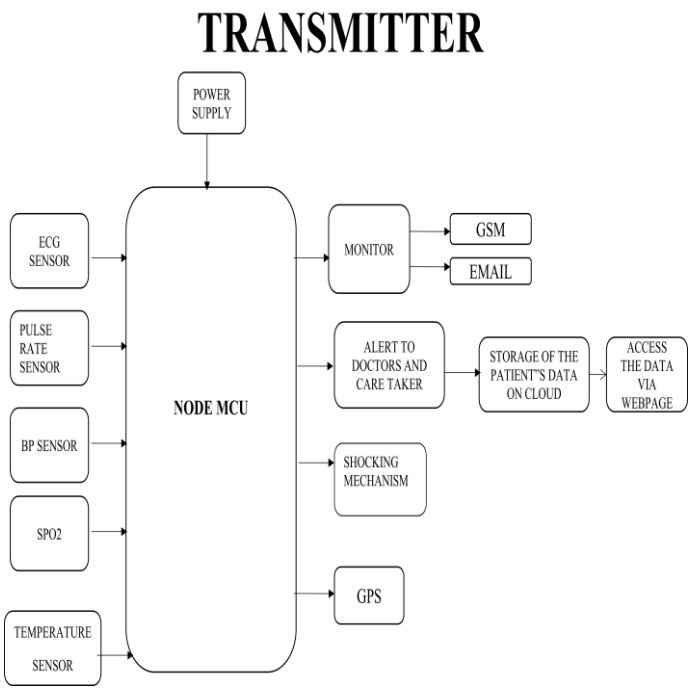

Fig. 1 Block Diagram of the transmitter of the Secured Monitoring System

The transmitter consists of various sensors as shown in Fig. 1.The model comprises of various sensors that are connected to each other in a wireless medium. Some of the sensors are ECG sensor that used to access the muscular and electrical functions of a heart. Then we have the BP sensor that is used to measure the bloodpressure of a human. The sensor is invasive and measures the arterial systolic and diastolic pressure. The pulse rate sensor is used to measure the change in volume of blood passing through an organ in a human body. The sensors also monitor the specific timings when the changes in the body take place for accurate performance. The SpO2 sensor is used to measure the oxygen content in the human body. The sensor is usually attached to patients finger where the device emits infrared rays to photo detect the amount of oxygen in the body. The system also consists of a defibrillator that is used to give a dose of electric current to the patients suffering from any cardiac arrest. The entire model is connected to a webpage where all the details of the patients can be viewed.

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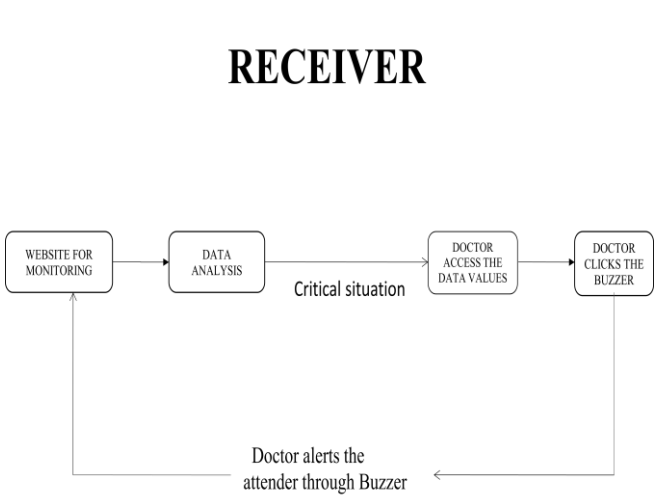


Fig. 2 Block Diagram of the transmitter of theSecured Monitoring System

The receiver end comprises of a website where the logs about the patients could be found by the doctor. The data analytics comprises of doing the calculation part of a patient and the doctors are made accessible to these data values to have a perfect monitoring system. The buzzer at the receiver end has a buzzer which could be used immediately for communicating with the patient in case of an emergency.

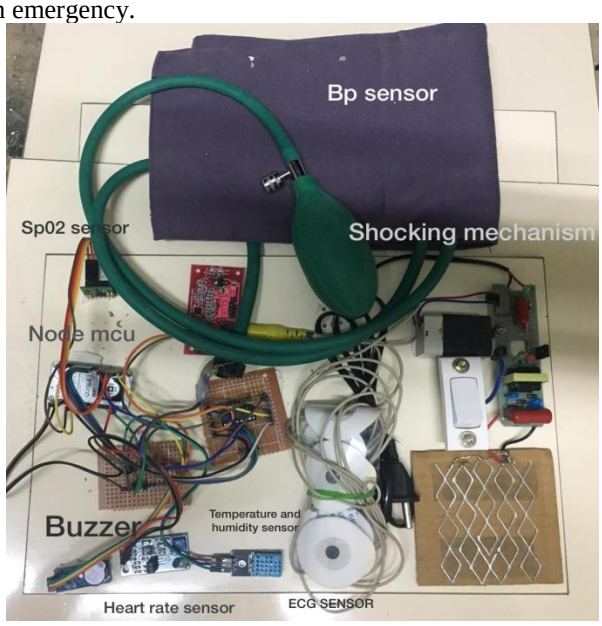


Fig. 3 Hardware kit

The overall proposed model is categorized into three parts. The first one is the detection of patients health by making use of various sensors as discussed above. These data are received by measuring the values of each sensor. The second part involves the cloud storage where the values obtained by each sensor are stored in a cloud server. This makes it easy for storing huge amount of data and also to access it when required by both the patients and the doctor. The third is remote viewing where the doctors have access to monitor the health of a patient even when he is far away. Two-way communication takes place in the model. The doctors and the patients can reach to one another when in need of an emergency. Emails can be sent and messages can also be delivered to one another. The GPS system makes the doctors to actually locate the users when in need. GSM is used extensively that provides that very vital service for the entire model. The messages that are via texts from the doctors to the patients or vice versa makes use of GSM. There are numerous sensors used in the monitoring system. All the sensors are connected to a microcontroller as shown in Fig. 4. Results are discussed and compared with existing model in the next section.

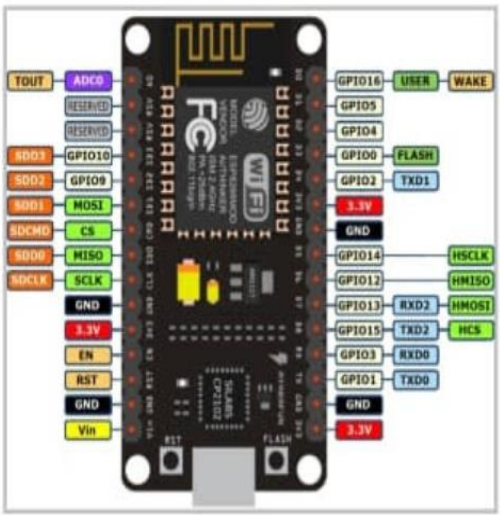


Fig. 4 Architectural View of the NodeMCU

IV.EXPERIMENTAL RESULTS

The system was evaluated on a real-time basis. Numerous information about the users were asked to log in and stored in the cloud server. The efficiency of the application was performed using various parameters.

Fig. 5 Parameter monitoring

In Fig.5, we can see the parameter monitoring screen, here we should turn on the system by clicking the option. After connecting to the sensor connected system. Doctor should set the port number or address which they

has to track as shown in Fig.6. What type of information is needed, options like accelerometer, magnetic field, GPS position and so on.

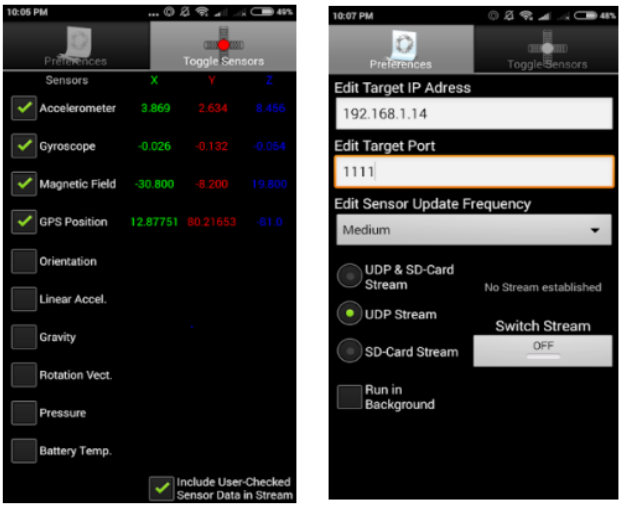


Fig. 6 GPS settings

In Fig.6, we can see the tracking information through the map representation. It will display

the information as per the option was clicked in the application. Doctor will use this application by using their own port number or IP address. After connecting to the GPS tracking, doctor has to choose the area which he has to track and feedback. In this screen, we can choose the human parts for getting the information.

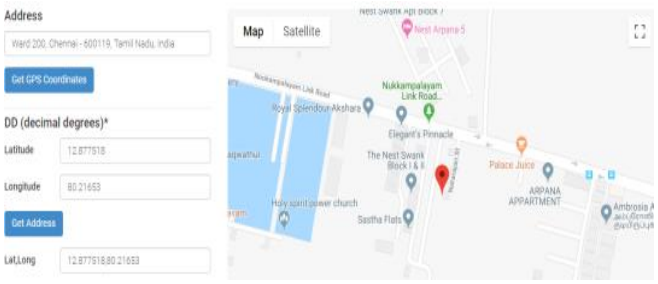


Fig. 7 GPS Tracking

In Fig.8, doctor has requested the data from the heartrate sensor. Our system has given the best output in the ECG format as well as in report format. By implementing this scheme. We have satisfied the doctor and medical region for the best service. We have added the special model in this project where we attached the alerting system for the doctors through email or SMS service.

Fig. 8 ECG data from sensor

In Fig.9, we can see the SMS and EMAIL alert to the doctors to feedback the repost as soon as possible. Without accessing the application, they can feedback the data through SMS service. In case of any critical situation like cardiac arrest, we have installed a defibrillator which gives a dose of electric current to the patients. In fig.10 we can see the output for the defibrillator mechanism. Later if any issues or server problem occurs also, this model will send the situation of the system and process. This kind of operation were done through the datasets and using all this parameters, we have achieved the transmission speed and efficiency of the monitoring system.

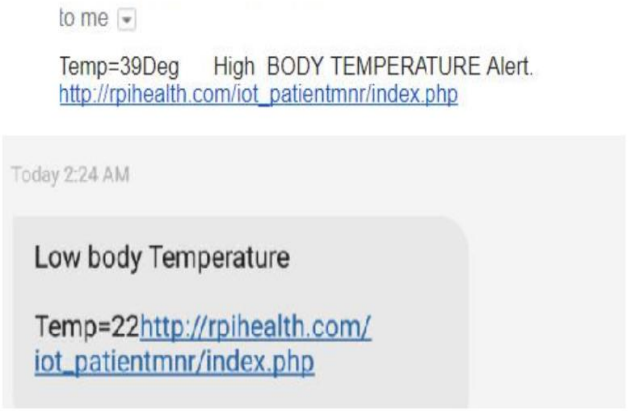


Fig. 9 Email and SMS alert

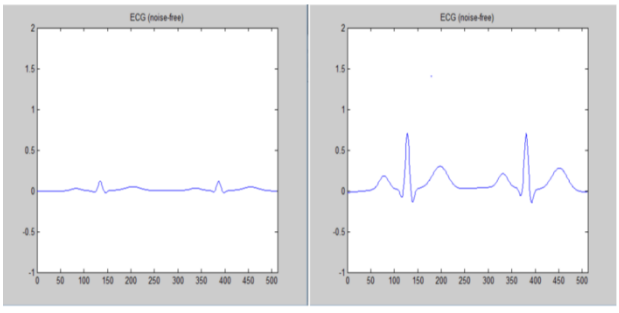
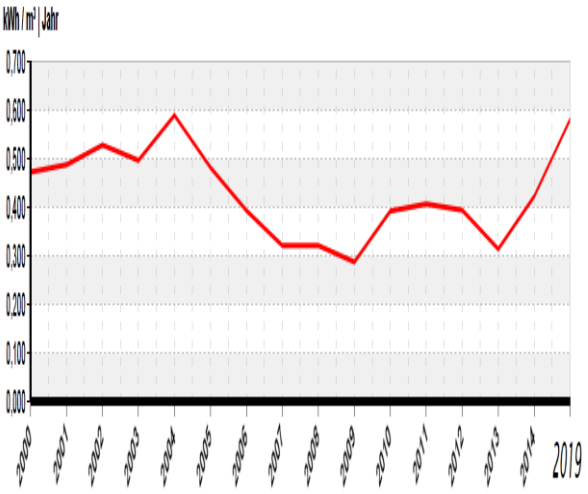


Fig.10 Defibrillator mechanism

Some of the parameters involved the speed, computational time, the fault tolerance and the loss of packets and also the computation of miss and the hit rates of the signal transmission through the sensors. Fig. 10 and 11show the transmission speed and efficiency of the proposed model when used in an IoT based environment.

Fig. 11The Transmission speed of the Monitoring System



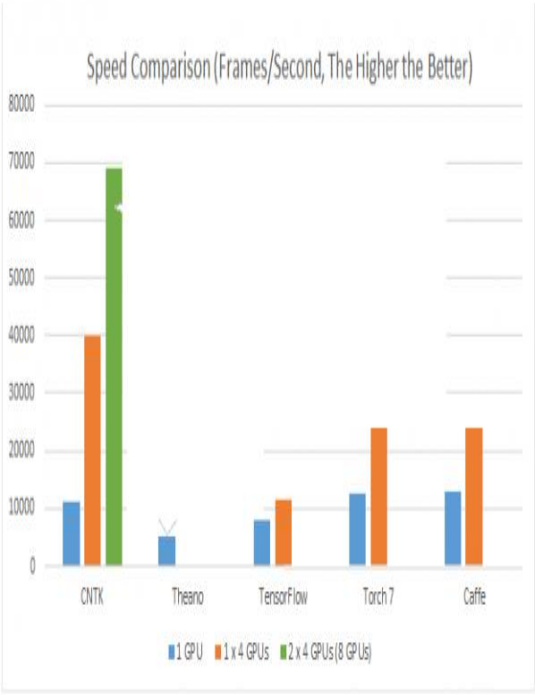


Fig. 12The efficiency of the Monitoring System

IV. CONCLUSION

Health is one of the most important things in one's life. There are numerous devices and applications that we use in our daily life's but we tend to forget to keep an eye on our personal health. In this paper, we have proposed a health monitoring system using various sensors from an IoT environment where the health of a patient is regularlychecked in a timely basis where the patient is monitored who is in a remote place. The report is sent to the doctors and he can monitor his patients whenever there is a need. Cloud storage system is used to store all the data and is retrieved when needed. GPS enables the doctors to find the current locations of his patients and increases the efficiency of the model. GSM is used for trasmitting the messages that needs to be sent through the proposed model. The future work could include the use of security protocols to make the transmission and storage forinformation more secure.

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