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Application of Internet of Things (IoT) in Analysis of Medical and Smart Healthcare Monitoring System

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ABSTRACT:

Health is the level of useful and metabolic potency of a living organism. In humans, it is the power of people or communities to adapt and self-manage one's facing physical, mental, psychological and social changes. Keeping track of the health standing of the patient reception may be a troublesome task. Specially maturity patients ought to be sporadically monitored and their adored ones got to learn concerning their health standing from time to time whereas at work which increases the burden on modern healthcare system. This paper is a solution to the above problem which describes the design of a simple, low-cost controller-based patient health monitoring system using IoT which enables monitoring of the health condition of various patients simultaneously.

INTRODUCTION:

Nowadays, the internet has become a vital part of our daily life. It has changed how people live, work, play and learn. Internet serves for numerous ideas such as education, finance, industries, entertainment, social networking, shopping, e- commerce etc. The next innovative mega trend of Internet is Internet of Things (IoT). The IoT connects smart objects to the Internet. It can facilitate an exchange of data and bring users processed data in a more reliable and secured way. Medical care and healthcare represent one of the most attractive application areas of the IoT. IoT-based healthcare services are foreseen to minimize costs, increase and provide a better quality of life, and enrich the user's experience. Congregating real-time data from different sources, in this case, an unlimited number of patients for a considerable period of time has become very simple and fast using the potential of IoT. The potential of IoT for health and medical services are tackled by smart sensors which accurately measure, monitor and analyze a variety of health status designators. These include basic crucial health signs such as pulse rate and blood pressure. With the help of IoT's potential, doctors are now able to collect real-time raw data from numerous patients for a continual period of time through smart devices connected to an interconnected network, which ensure them not only with trustable and reliable results but also time-saving which will be of maximum benefits. Internet of Things (IoT) is going to revolutionize healthcare by significantly lowering costs and improving quality

METHODOLOGY:

This system collects patient's information with the help of sensors. In this design we are monitoring respiration, heartbeat and temperature where sensors are electrically connected to the system and physically to be worn by the user.

On the press of button, the sensor senses the heartbeat, respiration and temperature and sends it to the 8051. The Temperature sensor senses the temperature of its ambience, so when this sensor is in close proximity of the user it reports the users' body temperature. An LCD is used to display these parameters. If system detects any abrupt changes in patient heartbeat or blood pressure, the system automatically alerts the user and the doctor about the patient's status over IoT and also shows details of heartbeat, temperature, humidity and blood pressure of patient live over the internet. The doctor can get access to these vital parameters pertaining to the patients' health over the web

interface from anywhere over the world. Thus, IoT based patient health tracking system effectively uses internet to monitor patient's health status and save lives on time. In this way IoT based Patient Monitoring System is an enhanced system that helps in monitoring patients without any manual intervention. The inputs to the 8051 are values from the sensor readings.

Courtesy by http://www.ijircce.com/upload/2017/may/3_Application.pdf
Fig 1: Smart Healthcare Model
In the system there are four layersFirst, the sensor layer consists of devices embedded withsensors and transmitters. The network layer is responsible of transmitting signals from sensors to the Cloudlets whereas the internet layer does the work of storing the data into the cloud and make it available to the people who are concerned. Finally, in the services layer, analytics and diagnosis process are performed.

TOOLS REQUIRED:
8051 Microcontroller, Arm7 Microcontroller, Pulse (Hearbeat) Sensor, Humidity Sensor, Lm35 Temperature Sensor, Zigbee Technology, Wifi Module (Esp8266), Thingspeak.

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WORKING:
Figures 2 & 3 shows the block diagrams of patient transmitter and receiver section respectively.

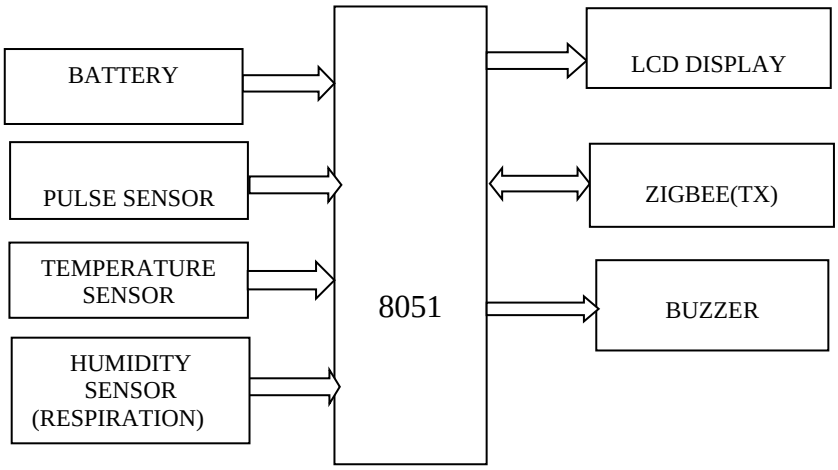


Figure 2: Block Diagram of Patient Transmitter

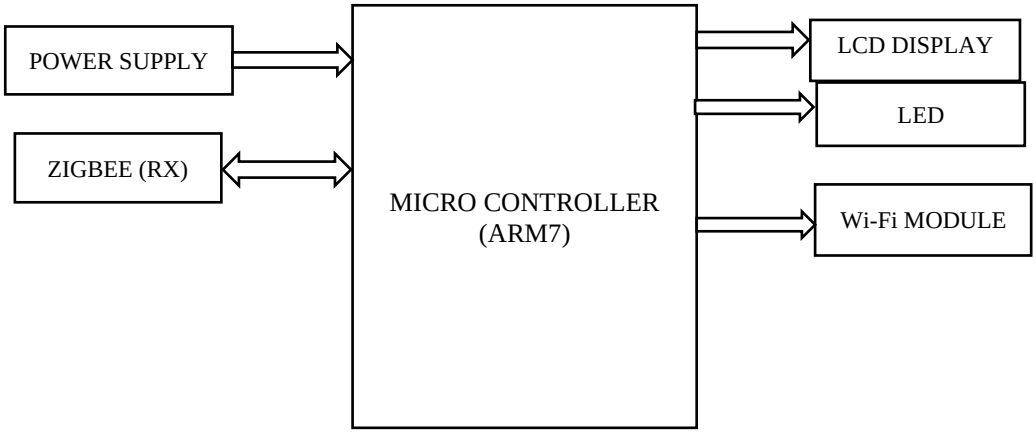


Figure 3: Block Diagram of Receiver Section

In this paper the transmission section is placed in the patients' wards and the receiver section will be placed with the medical staff. Patients will be given with the necessary wearable sensors capable of measuring temperature, pulse rate, respiratory rate.

From the compact sensors attached to the patients' body, data is collected from various patients consisting of necessary physiological parameters i.e., sensor readings. This data is then sent to a microcontroller (8051) which is capable of pre-processing the acquired data. This information is then transmitted wirelessly through Zigbee transmission (from transmitter Zigbee interfaced with 8051 microcontroller to receiver Zigbee interfaced with ARM7) to hospital staff so that it makes it easy to monitor the patient's health continuously. If any abnormal condition occurs such as the pulse rate, respiration or temperature readings from the sensors exceed the normal levels possible for a human being then the buzzer at the patient's transmitter section turns on so that any medical staff near the patient's ward could provide assistance and also the LED glows at the receiver section intimating the doctor of the patient's condition so that proper help can be provided without any delay.

Further, this information regarding patient's health can be shared with an authorized person by storing it in the cloud through a Wi-Fi module which allows them to look at the collected data regardless of their place, time, or device with the help of this link https://thingspeak.com/channels/437459.

RESULTS:

We have conducted the experiment and the following results have been obtained. Figure 4 & Figure 5 shows the Conditions that are displayed on the LCD in the transmitter section when heartbeat is normal.

Figure 4: Heartbeat Count Displayed on LCD

Figure 5: Heartbeat Condition

Figure 6 & Figure 7 shows the abnormal conditions that are displayed on the LCD

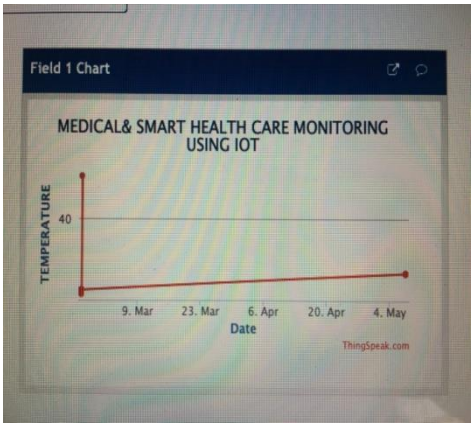
Figure 6: Abnormal Heartbeat Condition

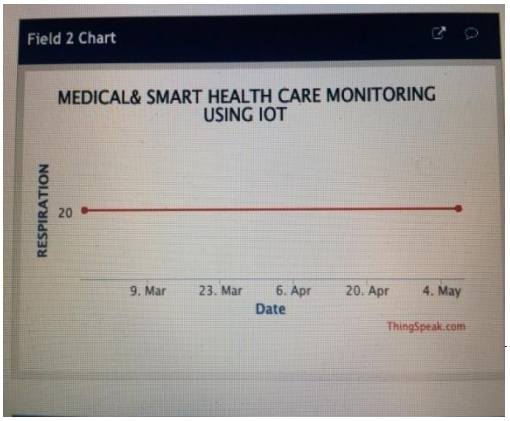
Figure 7: Respiration Condition

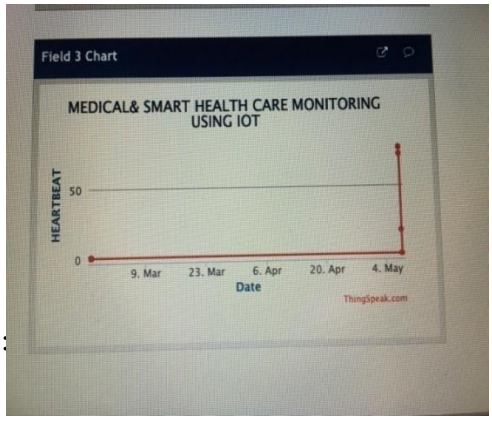
Figure 8 shows the blinking red LED at the receiver section during abnormal conditions to alert the doctor/ nurse.

Figure 8: Red LED Blinking at The Receiver Section

Figure 9, Figure 10 and Figure 11 shows the patient information stored on the cloud and is viewed in the form of graphs in the given link: https://thingspeak.com/channels/437459







CONCLUSION:

We have presented and proved the prototype for an automatic system that guarantees a constant monitoring of various health parameters and prediction of any kind of disease or disorder. It also sends an alert to the hospital staff in case of an emergency. The proposed system can be set-up in the hospitals and massive amount of data can be obtained and stored in the online database. The results can be accessed from mobile through an application/link.

For medical institutions, smart healthcare can reduce costs, relieve personnel pressure, achieve unified management of materials and information and improve the patient's medical experience. For research institutions, smart healthcare can reduce the cost of research, reduce research time, and improve the overall efficiency of research.

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