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Human Health Monitoring System

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***Abstract*—The paper presents the design and development of a human health monitoring system that could be used for various types of biomedical engineering applications. Our research paper approaches on how we can monitor our health at any place and any point of time. With an improvement in technology and miniaturization of sensors, there have been attempts to utilize the new technology in various areas to improve the quality of human life. One main area of research that has seen an adoption of the technology is the healthcare sector. As a result, this project is an attempt to solve a healthcare problem currently society is facing. The main objective of the project was to design a remote healthcare system. It's comprised of three main parts. The first part being, detection of patient's vitals using sensors, second for sending data to cloud storage and the last part was providing the detected data for remote viewing. Remote viewing of the data enables a doctor or guardian to monitor a patient's health progress away from hospital premises. The Internet of Things (IoT) concepts have been widely used to interconnect the available medical resources and offer smart, reliable, and effective healthcare service to the patients. Health monitoring for active and assisted living is one of the paradigms that can use the IoT advantages to improve the patient's lifestyle. In this project, we have presented an IoT architecture customized for healthcare applications. The aim of the project was to come up with a Remote Health Monitoring System that can be made with locally available sensors with a view to making it affordable if it were to be mass produced. Hence the proposed architecture collects the sensor data through ESP8266 microcontroller and relays it to the cloud where it is processed and analysed for remote viewing. The work presented in this paper is the mini-project work of the under-graduate students of the engineering college guided by their supervisors.**

***Index Terms*— Internet of Things, Health monitoring system, ESP8266 microcontroller.**

I. INTRODUCTION

Traditional medical technology often requires patients to come to the hospital for treatment in front of a doctor, which often requires the patient to have enough time, but it is very unsatisfactory for some irregular diseases, sudden diseases, and patients who need periodic care. In order to reduce the consequences of sudden illness, researchers around the world are stepping up research and development of effective telemedicine technologies. Of course, as a technology of great significance, telemedicine can remotely monitor the patient's physiological

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condition in real time through a monitoring centre, which can effectively control the spread of sudden infectious diseases to a large extent [1][2].
With the qualitative changes in communication quality and communication speed of wireless communication technology, various advanced communication technologies are being continuously adopted in the field of telemedicine. The gradual popularization of Wi-Fi networks has made Wi- Fi networks and the Internet a rapidly developing area. Multi- network fusion technology will be more and more favoured by research experts. Relevant scholars have studied the family intimate nurse system. The system is mainly composed of a home monitor and a hospital console. The monitor has a built- in intelligent control system that can remotely record and record real-time ECG (Electrocardiogram) and ambulatory blood pressure values, and realize real-time analysis of cases. Once an abnormal heart rate appears, the user's ECG is transmitted to the hospital console via the telephone network for consultation and diagnosis by experts. The hospital console can simultaneously receive and display the ECG and blood pressure data of multiple home users, and immediately return diagnostic opinions and treatment plans to the home users. In addition, related scholars have also conducted research on virtual medical data acquisition instruments based on the Internet [3][4].

II. Research Objectives

This paper address the two important research objectives,

- Giving care and health assistance to the bedridden patients at critical stages with advanced medical facilities have become one of the major problems in the modern hectic world. In hospitals where many patients whose physical conditions must be monitored frequently as a part of a diagnostic procedure, the need for a cost- effective and fast responding alert mechanism is inevitable [5][6].
- Here the main objective is to design a Remote Patient Health Monitoring System to diagnose the health condition of the patients such as body temperature, pulse rate, ECG, and non human parameters such as toxicity, room temperature, humidity [7][8].
- Present-day systems use sensors that are hardwired to a PC next to the bed. The use of sensors detects the conditions of the patient and the data is collected and transferred using a microcontroller. Proper implementation of such systems can provide timely warnings to the medical staffs and doctors in case of medical emergencies [9][10].

III. Literature Survey

Internet of Things (IoT) and cloud computing plays a vital role in today's Tele-monitoring health system. This system keeps track of patient's physiological parameters through collection of body sensors' data using Raspberry Pi board. The patient's health card are developed by the doctors and displayed on a webpage where doctors and patients can access and communicate each other without physical presence [1]. Using cloud computing, the data can be stored, updated and accessed from anywhere in the world. It is very suitable for rural areas where medical facilities are not available. In Remote health monitoring system using IoT, Body wireless sensor Network (BWSN) is being used to transmit the patients' health parameters collected through Raspberry Pi microcontroller to the physicians and caretaker wirelessly [2].
Being long range wireless technology, emergency situation of the patient's health is quickly detected and timely intervention leads to save the life of the patient. Owing to costlier healthcare and long waiting time in hospitals, the concept of in-home patient monitoring system have been emerging in the recent years. This system collects data of various body parameters through Biosensors, wearable devices and smart textiles and it transmits the data to central node server securely through Cipher text Policy Attribute Based Encryption (CP-ABE) method. In turn, the server shares the collected data to the hospitals for further treatment. The server rings alarm to the ambulance [3] during emergency situation. It is very beneficial for elders and chronic patients who require continuous monitoring of the system parameters [11][12].

IV. Methodology

Systems The system used for health monitoring is the fixed monitoring system, which can be detected only when the patient is in hospital or in bed. Recently accessible systems are huge in size and available only in the hospitals in Intensive Care. Nowadays, IOT can be used to transmit the patient information to their loved ones or to their concerned doctors. In existing system, patient needs to get hospitalized for regular monitoring of the patient. It is not possible once he/she is discharged from the hospital. This system cannot be used at home. The

existing systems are measuring the health parameters of the patient and send it through IOT. The Fig. 1 gives the methodology that is being adopted with the block diagram [13][14][15].

Fig. 1 : Methodology adopted with block diagram

V. Working Principle

In this section, the working principle of the project is being explained in brief as follows in seven compacted steps [16][17][18].

1. Block 1 represents temperature sensor which is used to measure body temperature.
2. Block 2 represents temperature and humidity sensor which is used to measure room temperature and room humidity.
3. Block 3 represents toxic gas sensor which is used to measure toxicity present in the air.
4. Block 4 represents pulse sensor which is used to measure pulse rate.
5. Block 5 represents ECG sensor which is used to help diagnose and monitor conditions affecting the heart.
6. Block 6 represents ESP8266 which is used to collect real time data and to enable the internet connection to various applications.
7. Block 7 represents things peak IoT platform that allows to aggregate, visualize and analyze live data streams in the cloud.

The smart sensor platform was developed to experimentally and monitor vital parameters on the computer. The main characteristics of the proposed system are to integrate and monitor body temperature, heart rate, ECG, toxic gas, air quality and room temperature and to communicate to doctor by using IOT connection. Our system is made up of both hardware and software components. The system's hardware consists of the following components: We utilize an ESP8266 as the primary controller, a temperature sensor to detect core temperature, a pulse sensor, toxic sensor, humidity and temperature sensor and a wireless IOT device. The multi-parameter body monitoring system is depicted in block diagram. The following components make up the system's software: Arduino software is used to control different sensor hardware components as well as link to IoT devices (computer) [19][20][21].

VI. Steps Involved

IOT patient monitoring has 5 sensors. They are temperature sensor, Pulse sensor, ECG sensor, toxic gas sensor and humidity sensor. This project is very useful since the doctor can monitor patient health parameters just by visiting website. To operate IOT based health monitoring system, you need a Wi-Fi connection. The standard imodule connects to arduino via UART, is responsible for connecting the machine to the IOT server for storage and monitoring. The Fig. 2 gives the circuit diagram of the project implemented by us [22][23][24].

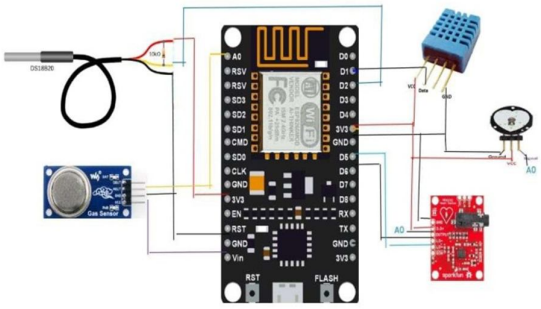

Fig 2. Circuit diagram of the project work done

VII. Explanation of the Methodology

Here, we use thing speak, an IOT analytic platform services which allow us to visualize or analyse the live data stream in the cloud. A doctor or guardian can log in to web portal to monitor patient's data at any point in time. The microcontroller board connects to the Wi-Fi network using a Wi-Fi module. This project will not work without a working Wi-Fi network. You can create a Wi-Fi zone using a Wi-Fi module or you can even create a Wi-Fi zone using Hotspot on your smart phone. ESP8266 wifi- module continuously reads input from these 5 sensors [25][26][27].

Then it sends this data to the cloud by sending this data to a particular URL/IP address. Then this action of sending data to IP is repeated after a particular interval of time. This system could be made into a medical device and used to record the health measurements of the people living in remote areas or villages. The people in a particular area will record their health measurements. The date and time will also be recorded. n this proposed system, the Arduino microcontroller with ESP8266 uses for sending data to cloud. The microcontroller is useful to access sensors values and forward it. The pulse sensor uses to calculate the pulse rate of human being. The digital records are kept in a particular computer or memory device like pen-drive because there are chances that these devices can get corrupt and data might be lost. In case of IOT, the cloud storage is more reliable and has less chances of data loss [28][29][30].

VIII. Simulation Results

The data collected are simultaneously uploaded to the cloud servers. The data can be shown graphically with respect to time. The location is also shown. The data uploaded can be retrieved at any time using the data export facility. This shows the data in a table format with various values monitored using sensors with respect to time. The doctor can view the results immediately and prescribe the patient with proper medication. In this project, health monitoring of a person is done using the values obtained from the sensors. The temperature sensor senses the value based on the Thermistor. The values are plotted based on the temperature measured with respect to time and date. If the graph shows a stable condition in which the value is around 30°C to 100°C. If the values are lower or higher than the normal values the graph shows a variation. The pulse rate sensors measure the values based on the pressure of the blood flow. The normal range is about 60 BPM to 110 BPM. The variation in the beats per minute creates a change in the pulse rate. The simulation results are shown in the Fig. 3.

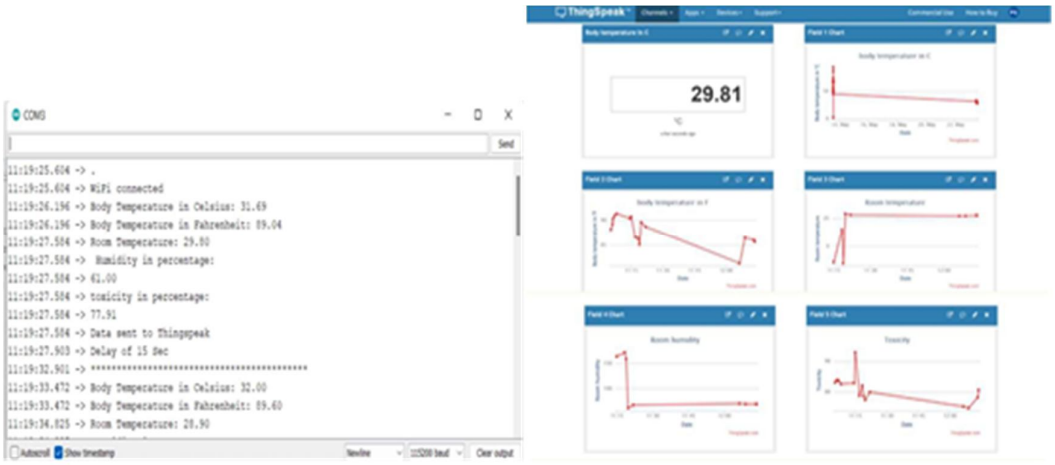

Fig 3. Simulation results

IX. Conclusion

The main objective of the experiment was successfully achieved. All the individual sensors like temperature, humidity, pulse rate, toxicity, ECG gave out the intended results. More important fact that came up during project design is that all the circuit components used in the remote health detection system are available easily. The Remote Health Care system utilizes these concepts to come up with a system for better quality of life for people in society. From an engineering perspective, the project has seen concepts acquired through the computer science and embedded study period being practically applied.

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