Real Time Health Monitoring System Through Iot Using Sensors

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Abstract-Cardiovascular Diseases is one of the major causes of death in the world and COVID-19 is threatening the wholeworld with its high mortality rate in recent days. COVID-19 is a disease caused bycorona virus called SARS-CoV-2. People aged 60 and above and those with underlying medical conditions like cardiovascular disease, chronic respiratory disease are more likely to develop serious illness through COVID-19. The World Health Organization report shows that 17.9 million people die every year from cardiovascular diseases, an estimated 31% of all deaths worldwide and by 2030, cardiovascular diseases will be the main cause of death accounting for more than 35%. In this project, we intend to save people by giving them an alert message and sending mail to the concerned doctors using their android phone and also monitor the individual's body temperature and SpO_2 level to detect any abnormalities in an individual relating to these biological factors. The Arduino UNO R3, LCD display, heartbeat sensor, temperature sensor, SpO_2 sensor, ESP8266 Wi-Fi module, LM35 sensor, LM358 Op-Amp and other electronic devices coupled together through an android app will help to accomplish a better way of the health monitoring system.

Keywords-Cardiovascular diseases, Sensors,COVID-19, Internet of Things.

I.INTRODUCTION

Internet of Things is the network of various devices connected through electrical components like sensors, Arduino UNO R3 and other technologies for exchanging information within devices and controlling the devices through the internet.IoT helps to collect immense information with proper accuracy,prompts real time data [3]. Internet of medical things is the application of IoT for medical and health-related analysis, diagnosis and monitoring. An emergency notification system is the key aspect of IoT in the medical field. These health monitoring devices have various monitoring factors incorporated in them including heartbeat, SpO_2 level,temperature and even advanced medical devices are inbuilt in the human body. Cardiovascular diseases are the class of

diseases which is related to the heart and blood vessels. Cardiovascular diseases include myocardial infarction, rheumatic heart disease, heart failure, hypertensive heart disease, cardiomyopathy, so on. The affected people will experience respiratory illness likebreath suffocation and lowering of SpO_2 level. A system is designed, which is capable of collecting the heartbeat, SpO_2 level, temperature and pulse rate and transfers the data to the IoT device through a Wi-Fi module. The main objective of this project is to provide quality healthcare and lower the mortality rate

II. EXISITNG WORK

The advancement in sensor technology have made it possible to record the electrical impulses from heart in the absence of conventional ECG machines [1]. But there is no analysis of the collected data. In our project, we overcamethe above said drawback using IoT device. IoT systems are better to utilize in advanced medicinal services.

The heartbeat is the onlybiological parameter taken for consideration [2]. The entire IoT setup is given in the form of wearable device for the individual that does not require doctor's periodic diagnosis.

A system is built such that it gathers information about the heart rate and temperature andthis informationis utilized to examine the patients In citation [3].

In the above-mentioned systems, they have used temperature and heart beat sensor to check the patient's abnormality, but in our system we have added pulse oximeter sensor and ECG sensor to check the early signs of COVID-19. Early signs of COVID-19 can be detected with a decreased SpO_2 level and a low heart rate. Thus,COVID-19 can be treated effectively as soon as possible.

III.PROPOSED HEALTH MONITORING SYSTEM

Patient's condition monitoring is the main idea of the proposed system. Therefore, the healthcare monitoring system utilizes the sensors, IoT and Arduino to collect, save and compare the test results of patients.The proposed health monitoring system is shown in Fig.1. The system is mainly associated sensors, which are used to analyse every detail from the patient. This system is made up of four main sensors:

(1) ECG Sensor,

(2) Pulse Oximeter sensor,

(3) Temperature sensor, and

(4) Heart Beat sensor

The sensors are wired which are used to collect data from the patient's body. The information is then gathered together and sent to Arduino UNO R3. The collected data

in Arduino UNO R3 is then transferred using ESP8266Wi-Fi module which then sends it to the web application developed. Then the data is consolidated and stored. The information in the web application gets updated every five seconds. The threshold values are entered in the web applicationwhich compares the data collected from the patient. If there are any abnormalities, it immediately sends an alert message to the respective doctor and the patient.
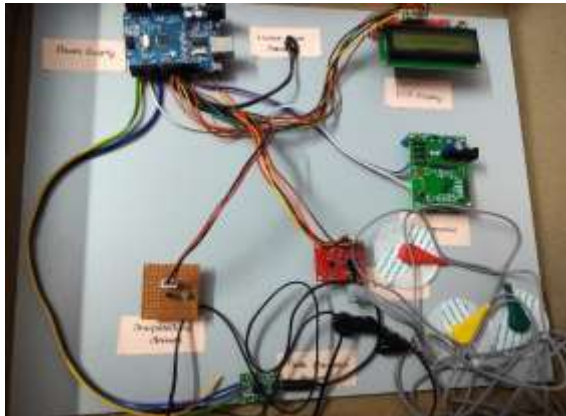

Fig .1: The proposed health monitoring system

The healthcare monitoring system requires the three-stage architectural features, namely Sensor Module, Data Processing Module, Web User Interface. The process starts when power is supplied to the Arduino UNO R3. As it boots up its operating system, it triggers the sensors to start. All the sensors are triggered at the same time approximately, thus the delay in the sensors is very low.

Sensor Module is the part where the sensors comes in contact with the human body and check for the signal, from which they gather the information.The temperature sensor senses the heat waves and stores the temperature. The SpO_2 sensor senses the O_2 content in blood and stores the O2 level of the individual. The heart beat sensor senses the beats per minute and the ECG sensor senses the pathway of electrical impulses through the heart muscle and stores the values.

Data Processing Module is a part where the data collected by the sensors are transferred to the web application through the Wi-Fi Module. The Arduino UNO R3 not only acts as a power supply but also collects the data output from the above sensors and then processes them into an output that gets displayed on the LCD display. All four sensors are connected to the Arduino from which it gets its input, and turn those into an output, which gets displayed on the LCD screen.

Now the data enters the third stage of the architecture i.e. Web User Interface. The data from the Arduino is fed into the web application by using the ESP8266Wi-Fi Module. The threshold values of an normal human being is already fed into the system. When the ESP8266Wi-Fi Module sends the data to the web application the system automatically

checks the obtained values from the individual with the threshold values. If the obtained value is below or above the threshold value then the system sends an alert message to the concerned doctor and the patient with regard to the abnormality sensed.Then the concerned doctor will treat their patient according to the restorative details collected from the health monitoring system.

Figure 2 illustrates that the complete framework of the proposed project. The first step starts with the Arduino UNO R3. If it is ON, the process continues, else the system shuts down.Next the sensors collect data from the human body and sends it as input to the Arduino UNO R3 which then sends the obtained values to the web application through Wi-Fi module ESP8266 which displays it in the LCD display.

Here the analysis takes place if any abnormalities are detected and an alert message is sent to the doctor as well as the patient. If no abnormalities are detected then the reading are just stored as database in the web application.

Fig. 2: Block diagram of health monitoring system

The system is designed in such a way that every reading gets updated for every five seconds. All the readings can be managed and verified from the IoT system which we have designed.

IV.ANALYSIS OF RESULT

Here are some sample values of patients with different ages. The normal values for each parameter is given below:

1. Temperature: 97^0F – 99^0F
2. ECG: 120 – 130 mm
3. Pulse: 60 – 100 bpm
4. SpO_2: 95 – 100

These normal values are the threshold values fed into the entire IoT system as well as the web application. The obtained values iscomparedwith the threshold values.

This assessment work gives the information about the abnormalities of the patient at regular intervals to the concerned doctor and the medical data analysis is associated

withthe server. The concerned doctor will be able to check the patient'sabnormalities at regular intervals. Analysis is done effectively with the obtained readings.The sample obtained reading is illustrated in Table 1.

Table 1: The various biological parameters of the patient are analysed and determined by the proposed health monitoring system

Patient Id with age	Temp.	ECG	Heart Rate	SpO2	State of the patient
P1 (57)	90 °F	80/135	110	92	Normal
P2 (27)	95 °F	80/135	90	96	Normal
P3 (54)	102 °F	80/123	110	85	Abnormal
P4 (60)	105 °F	80/116	120	78	Abnormal
P5 (43)	90 °F	80/125	100	96	Normal

V.CONCLUSION

The health monitoring system gathers the values of the biological parameters like temperature, heartbeat rate,SpO$_2$ level of the patient and sends a message to the concerned doctors and the patient. So, the doctors can treat their patients timely and provide the proper diagnosis at the earliest with at most accuracy and the diagnosis is continuous as it does not require in person checking. Cardiovascular diseases and COVID-19 is the most attention seeking threats in the whole world only because of its' high mortality and communicable nature. Human loss is irreparable, which is saved by our work and it will be a great boon to the humankind.

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