

# Patient's Health Checkup System based on IOT using Raspberry Pi.

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**Abstract** - Now-a-days, Health has become one of the global challenges for humanity. Due to covid-19 pandemic people are significantly more worried about their health as cases are rising rapidly. Hence it is crucial to monitor the physical health of the patient. Due to several problem timely patient's health monitoring is very essential. This paper presents a design and implementation of patient's health monitoring system which includes several sensors. The patient's physique will be monitored constantly, and the doctor can know about the patient's condition continuously in front of a computer screen or on smartphone. Whenever the condition of the patient goes abnormal Doctor can analyze the problem immediately which can help to save patient's life. The main motive of this project is to update. The doctor about the patient's health condition timely and if any abnormality occurs, the doctor can take the best step immediately

**Key Words=** Internet of Things (IoT), Raspberry Pi, Temperature Sensor LM-35, Heartbeat and ECG Sensor AD8232 and Pulse Oximeter

## 1. INTRODUCTION

Due to covid-19 pandemic, shortage of beds in hospital and health check-up parameters in hospital are limited. due to this many patient's loss their lives due to unawareness and carelessness of the doctor about the critical condition of the patients. This is due to doctor cannot keep on monitoring the patient continuously. Even if they are monitored with utmost care especially for those patients that need continuous monitoring, situations arise when doctor needs to be away even for another patient's and at that moment. the patient's condition shows variation that led to an urgent situation and the time the doctor come back to medicate his patients, the patients already losses their life due to delay in his treatment. So, there is a straight way need of a system that keeps on examine the status of the patients constantly, and the doctor is updated and if there is any difference in his condition i.e., if the condition becomes critical, the doctor is alerted so that he can treat the patient immediately. This will avoid loss of many lives of patient and will save doctor's time as well. In this Paper IoT based Patient Health Monitoring System uses Temperature Sensor, Heart Rate Sensor, and pulse oximeter Sensor & ECG Sensor along with the Raspberry Pi.

All these sensors are attached to the patient's body. these sensors will collect the data and then collected data will forwarded to the server through the Raspberry Pi board. A doctor can look at real time data on their system or on their smartphone or computer at any moment. A database can be maintained on a server to store the patient's information for future use. Internet of things (IoT), as the name suggests, is a 'network of things' or in more certain context 'network of devices' (having some intelligence) that are connected to achieve some brilliance in the entire system. The 'Internet of Thing' in IoT can be any device with any type of built-in-sensors with the capability to collect and transmit data over a network without physical intervention. The embedded equipment in the object assists them to interact with internal states and the external environment, which in turn assist in decisions making process Devices in the network have distinctive identities so that it is easy to use them and to manage the entire network. And the network systems have ensured that the data generated by the IoT devices should be accessed only by the authenticated individuals by involving security controls like authentication by User ID and password.

## 2. LITERATURE REVIEW

In Shashikant Ghumbre [1] purposed an idea of Heart Dieses Diagnosis using Support Vector Machine. Author has implemented a Decision Support System for diagnosis of heart disease using Support Vector Machine. The diagnosis of heart disease is carried out by taking different data samples from diverse patients. As the classification accuracy, sensitivity and specificity of SVM are high, it's a good option for the diagnosis of heart disease. A system is designed to monitor the Electrocardiogram (ECG) and other vital parameters. This data is stored in a database and then displayed in a website that can be accessed by authorized personnel only. For easy access, Python programming language is used for the communication with ECG machines and updating website database using MySQL db. Then update the websites database with new health parameters. If the heartbeat is in normal range monitoring continues. If the heartbeat is not in normal range alert the authorized person by sending SMS through GSM module and alert in the hospital through buzzer sound.

Vivek Pardeshi [2] designed a Health Monitoring System using IoT and Raspberry Pi which monitors the

Temperature, Blood Pressure, Heartbeat and ECG of a person using wearable sensors. Same data is transferred to the server through Raspberry Pi. Here, the energy consumption of data acquisition is reduced with MEMS Technology. Also, the energy efficiency in a processing unit is achieved by ultra- low power processors. And the data transmission is improved by integrating radio transceivers into SoCs. Any abnormalities in the health condition can be known directly and are informed to the person through GSM technology or via the Internet.

Arjun Aggarwal [5] discussed a systematic Methodology for Storing Data using Nested Cloud. To provide security to cloud data author proposed a model where different cloud storage is used to store data as well as the key. Again, key will get distributed to multiple parts using Shamir's secret key sharing Algorithm. A threshold number of key shares will be required to reconstruct key. Similarly, data also divided into several parts which will change their path dynamically and one separate directory is maintained to re-access data when a user wants.

### 3. COMPONENTS USED IN IMPLEMENTATION

#### 3.1 Raspberry pi

It is a credit card sized single board computer which can do everything a normal PC can do. which is an ARM based created by Raspberry pi foundation. It is cheap and powerful where many devices can be interfaced. This board contains BCM2837 Quad core processor which is running at 1.2 GHz, 1GB RAM and memory, Bluetooth and Wi-Fi module, HDMI port for connecting pi camera and DSI display port for connecting pi touch screen display, Micro SD port for loading operating system and storing the data. The CPU BCM2837 is efficient, and it does not consume more power.

#### 3.2 Temperature sensor-LM35

LM35 is an IC sensor that is used to estimate temperature with an output voltage linearly proportional to the Centigrade temperature. The LM35 sensor has an upper hand over linear temperature sensor, as the user has not to make the conversion of Kelvin to Centigrade. This is major importance of LM-35 that it calibrates directly in Celsius, and it is also acceptable for remote applications. It has better efficiency than thermistor.

#### 3.3 Heartbeat sensor

It is used to estimate the heartbeat of the patient. heartbeat sensor gives a digital output of heartbeat when a finger is placed on it. It is compressed in size. The operating voltage of heartbeat sensor is +5V DC. It works on the working of light modulation by blood flow through finger at each pulse. Heartbeat sensor is used to estimate heartbeat which normally lies between 60- 100bpm.

#### 3.4 ECG Sensor

Electrocardiography (ECG) is the procedure of recording the motion of the heart for a period using electrodes placed on the skin. These electrodes notice even a small electrical change on the skin that appears from the heart muscle's pattern. The fundamental component of ECG is the Instrumentation Amplifier, which is accountable for taking the voltage difference between leads and amplifying the signals.

#### 3.5 MCP3208

The MCP3208 Analog to Digital convertors is used for embedded control applications which combines high performance and low power consumption in small package. It has the capability of allowing 12-bit -8-channel ADC to be added to any pic microcontroller.

#### 3.6 Pulse oximeter

Pulse oximeter is a noninvasive procedure/method for monitoring a person's oxygen saturation. A pulse oximeter or pulse o2 meter measures blood oxygen saturation level (SpO2) & pulse rate/heart rate of the individuals. It is also called as blood oxygen saturation monitor, which helps to measure the saturation level of oxygen carried in the blood cells.

### 4. DESIGN METHODOLOGY

The system is classified into two parts, i.e., Hardware & Software; whereas hardware unit includes of transmitter section and receiver section and software unit includes of software languages as well as their interfacing. Here we consider IoT applications that are useful to health monitoring. Hardware part which includes interfacing of sensors with raspberry pi, and software part which includes coding which must be done in python on Raspbian OS. The conventional stages of an IoT application consists a) data acquisition, b) data processing, c) data storage, and d) data transmission. The initial and final stages exist on every application, while the processing and storage might or might not exist in some applications the system will continuously monitor the body and collect the data.



Fig. 1a-: Common operation stages

All this data will be stored or updated into the database the doctor can easily access this data either in his computer or on his smart phone. IoT server is connected to the system; it permits the connectivity for data exchange with other devices. IoT permits the connected of objects to recognize and control remote access across network. The outcome of

temperature sensor and heartbeat sensor is displayed on LCD at user end too. The output of sensors is sent to the receiver or doctor end. All the data is first obtained then processed and kept in the memory of raspberry pi. The stored data is then transferred to the receiver by the mode of IoT server. The Receiver section is available at doctor end. At receiver unit, all the data is received, and monitor shows the outcome of each sensor which is connected to raspberry pi.

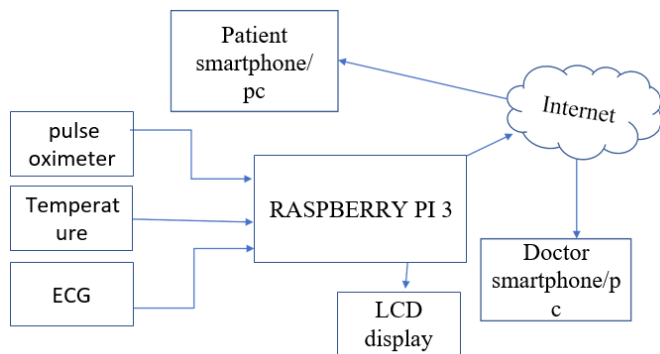


Fig 1b: Block Diagram

### 5- Result

The users of the application are authenticated using registration and login. The results of the model are attached here the data will be collected from the sensors continuously. If the condition of the patient goes abnormal notifications will be sent to the doctor immediately. The complete prototype of the health monitoring system with the sensors are shown in Figures, where it shows the output parameter of the sensors computed and shown on LCD display, so that these output parameters are visible even to the patient.



Fig. 1c: Login Page

Database on the server:

temperature	ECG	HEARTRATE	oxygen level	time
98.4		120	111	99 12:20
99		119	121	99 12:25
100		112	110	98 12:30
100		119	119	97 12:35
101		119	90	96 12:40
100		115	76	96 12:45
99.5		112	134	95 12:50
99.5		122	123	95 12:55
98.4		122	122	94 01:00
97.5		122	123	94 01:05

Fig. 1d: Data Storage on the IoT sever

The output of the sensor is then transmitted to the database server and, these data can be accessed from cloud by the legitimate users using the IoT based applications. for patient also output values of the sensor is shown in the application as shown in Figure. Based on these values received, the problems of the patient can be diagnosed by the doctor.

### 6. CONCLUSION

A patient's health monitoring system based on concept of internet of things with implementation of it on raspberry pi is suggested. This system helps to monitor health of people's who cannot visit the hospitals on regular basis. Hence health checkups are also made easy. Patient's health parameter history is saved on the server hence it benefits the follow-ups. As it uses information technology for the assessment human errors are removed hence gives better performance. Thus, the patient's health monitoring system using raspberry pi has been successfully implemented. We have examined that sensors which are interfaced to the raspberry pi are measuring the sensors values from the patient's body and then sensor values are updated on the database. Then doctor can access the data from cloud, which is done by implementation of IoT. Thus, our system would save patients from censorious loss of patient's life and would help the doctor to take suitable action at proper time.

### 7. REFERENCES

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