IOT BASED HEALTH MONITORING SYSTEM

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Abstract: *With the advent of coronavirus, healthcare is a top priority in every country. Patients generally feel discomfort thanks to the wires and leads placed over their body surface which are attached with the large and heavy monitoring machines. So, during this aspect, an IoT based health monitoring system is that the best solution for this kind of pandemic. IoT is a new internet ecosystem that is evolving very rapidly in research, especially in healthcare. In the paper, we proposed the IoT based health monitoring system. Configuration of this system, where the authorized person can access and monitoring the patients in remote location. In addition, many patients are hospitalized in hospital and medical institution, and there are many patients, too, and there is possibility to receive emergency medical care, and there is absence of doctor, too and is overwhelmed by service and treatment.*

Keywords- IoT, Raspberry pi, Health care sensor's, Deep learning.

I. INTRODUCTION

Life has always been a major issue for the entire technologically advanced human race. Like the recent corona epidemic that has devastated the economies of many countries to some extent is an example of how important health care has become.
In such areas where the epidemic is rampant, it is always a good idea to monitor these patients with the help of remote sensing technology. So, Internet of Things (IoT) based on a health monitoring system is its current solution. With an IoT-employed user monitoring system physical signals can empower and predict individual status such a s heart attack, chronic fever, elderly care and support, prevention rate and good health.

The quality of care can be improved by reducing the patient's mobility, providing reliable assistance when needed. The proposed IoT-based system in use has a smart sensor network to detect vital human signals. The collected signal is shared with a wireless central cloud server for analysis and visualization with a specialist. The vision of this eHealth Monitor is to significantly increase the individualization of eHealth services and thus the quality and acceptance of patients of electronic health care services for treatment and prevention.

The proposed system allows performing biometric and medical applications where body monitoring is visualized by using various sensors like body temperature, accelerometer, blood pressure (sphygmomanometer) sensor, pulse detector, breathing sensor, glucose sensor, electrochemical sensor. The use of Raspberry Pi and IoT is very beneficial in health surveillance, and this paper gives the impression of both forums. [1]

The popular Raspberry Pi platform offers a full Linux server in a small platform with very IoT low price. Raspberry allows interface services as well methods using the interface for the normal I / O purpose. By using this combination, the proposed structure is above successfully. IoT connects devices and what provides human communication for a better life.

Sr. No.	Author's	Features	Resources	
			Hardware	Software
1	Pandia Rajan Jeyaraj& Edward Rajan Samuel Nadar [2]	Automated physiological signal monitoring to elderly sick patient for fast access of data and also to get reliable service by accurate prediction by healthcare service provider.	Intelligent Sensor Array, NI-myRIO Processor, WearableSensor Module	Android Application, Database, Deep Learning
2	Prajoona Valsalan, Tariq Ahmed Barham Baomar, Ali Hussain Omar Baabood [3]	IoT monitoring of health helps in preventing the spread of disease as well as to get a proper diagnosis of the state of health, even if the doctor is at far distance.	Temperature sensor, oximeter, DHT Sensor, Controller, GSM	Cloud, Web Application,
3	Harsh Arvind, Juvith Ghosh, Medha Mani, Sharmila. N [4]	An innovative approach to monitor the various physical parameters of the patient like heart rate, SpO2 and body temperature by implementing cloud computing and low-cost processors with all sensors integrated in the vest that can be worn in form of jacket.	Broadcom2837 ARM Cortex – A53 Processor, MCP3008A-D Converter, SpO2 Sensor, Temperature Sensor,	Firebase, Android/Web Application,
4	Ashutosh Sharma, Ma Maode, Navin chilamkurti, M.Poongodi, Mounir hamdi [5]	Smart navigation system for ambulances was being coined. This system also facilitates to send request an ambulance on touch a button by the patient and sends the message both the family person and hospital.	Arduino Uno, Bluetooth Module, Breath Monitor, Heartbeat Measurement, LCD Display, Thermistor, temperature	Hospital server, database, web application, android application

5	Maryem Neyja, Shahid Mumtaz, Kazi Mohammed Saidul Huq, Sherif Adeshina Busari [6]	It aims to facilitate improved monitoring and timely intervention for Cardio Vascular Diseases (CVD) patients. It also employs patient path estimator, patient table and alert management Schemes within the hospital to facilitate the localization. Use of ECG Signal.	Hidden Markov Model (HMM) chain, ElectroCardioGram (ECG) sensors, Bluetooth module, Smart phone	Database, Alert SMSnotification,

Table 1: Review study of related paper

This paper, which provides an overview of health care management technology, protects patients from future health problems, and helps physicians to take appropriate doses in place appropriate time in the patient's life. [7]

II.   Literature Review

In early life people did not know about diseases until they could see the effect physically or mentally. This makes the patient and the doctors too complex to diagnose and treat the patient. It was not easy for me to go to the doctorand look for him. A wireless portable patient surveillance devices are often used as part of telemetry where patient data can be obtained from any parts of Land and case can be traced to a medical professional employee in a short time.

Generally, in hospitals big machines are kept somewhere like them ICUs where doctors need to visit each room follow-up cases and report of every patient, they cannot be made immediately useful in their case an emergency. Also, the devices are bulky that it. the patient is unable to move freely and participate daily works.

Remote wireless health systems have been praised by Various researchers for their superior performance in bringing a critical moment, accurate information on patients. Use of Raspberry Pi is majorly supported due to compatibility with coding languages like C programming and Python.

These can be simply implemented once got to know about the adequate libraries for taking the continuous sensor data and transmit it using internet. Thus, IoT is implemented using Raspberry Pi to continuously monitor parameters like Heart Rate, SpO2 and body temperature.

Raspberry Pi - The Raspberry Pi is a small sized and cheap computer. It is used such as weather monitoring system, robotics, tinkering lab etc. It has low cost and open design. In market, various raspberry pi boards in existing i.e., raspberry pi zero, raspberry pi 3, raspberry pi 4. The Raspberry Pi has the capacity to interact with the outer area and has been used in a wide array of digital maker systems, from music machines and parent sensors to rainfall stations or twittering birdhouses. [8]

fig :2.1 Proposed System Architecture

Blood Pressure Sensor - The Blood Pressure Detector isa non-invasive detector designed to measure mortal blood pressure. It measures systolic, diastolic, and mean arterial pressure exercising the oscillometric fashion. Blood pressure observers work by inflatinga cuff until it temporarily cuts off blood inflow through the brachial roadway. [9]

fig 2.2 Blood pressure measurement sensor

Palpitation Sensor- An optic palpitation rate detector measures palpitate swells, which are changes in the volume of a blood vessel that do when the heart pumps blood. Palpitation swells are detected by measuring the change in volume using an optic detector and green LED. Palpitation Detector is a well- designed draw-and- play heart-rate detector**.** [10]

Glucose Detector- The use of glucose detectors is a vital part of managing diabetes mellitus since they measure the blood glucoselevels in a patient. A detector consists of electrodes that measure the current generated by an enzymatic reaction between glucose,an enzyme, and a middleman.

fig 2.3 Proposed System Architecture

Breathing Detector- Breath detectors can revise medical diagnostics by on- demand discovery and monitoring of health parameters in a noninvasive and individualized fashion. These Detectors are generally grounded on semiconductive essence-oxides (SMOx).
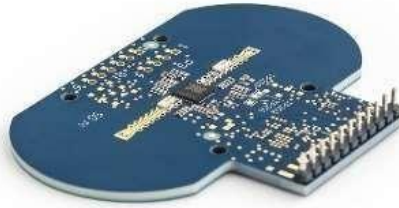

fig 2.4 Breathing sensor

Temperature Detector- A temperature detector is a device used to measure temperature. The proposed system uses thLM35 temperature detector. It's an analog detector but provides correct readings as asked by the operation.

fig 2.5 Temperature detector sensor

ECG Detector- Electrocardiogram detector is used for ECG monitoring. ECG provides detailed information about heartbeat rate and all other complaint suggestions.

Fig 2.6 ECG sensor's
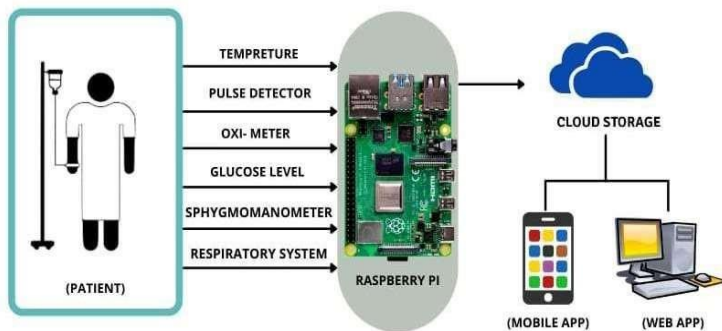
III.   System Architecture

fig 3.1 Proposed System Architecture

As shown in fig 3.1, Patient data is collected using various sensors and sent to the Raspberry Pi. The collected data is stored on the IoT cloud server according to the patient ID and sent to the doctor for analysis. Doctors can analyze this data and make appropriate recommendations, so they monitor each patient's health without visiting the bed. The flow of the system proposed here consists of five steps: data collection, data processing, data storage, data transmission, and data analysis.

With the help of proposed system, the medical staff supervise all the updated tables and data, and in the case of emergency, the controllers generate an alert, which prompts the medical staff to intervene in a timely manner. Hence, in case of data connection or inany network issue here the GSM is interfaced with the processor to send the data as a text message to the doctor. This message can beanalyzed by doctor and the required actions by the doctor can be taken for improving the patient's health on time and properly so that in case of any emergency also the patient should not face any problem during the treatment.
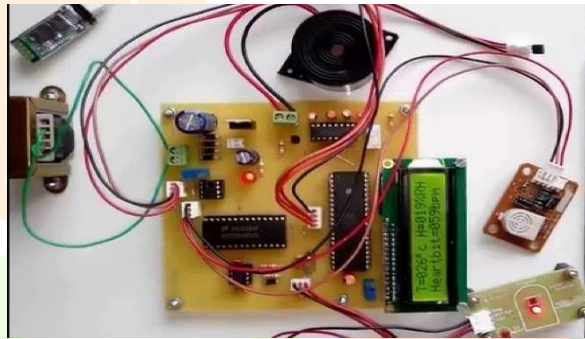
IV. Implementation

fig 4. Working module of health monitoring system

The proposed system has been connected detectors within their separate ways. The device receives the data from the detectors and integrated these with the board. Jeer Pi is the major tool in the proposed system; it's connected to all other detectors. As all detectorsdon't use the same power; then we used mills for handling them. The device is connected to the IoT garcon system, which is connected to colorful detectors, and provides services and controls over the network. The temperature detector, palpitation rate detector, an ECG detector, a glucose detector, a blood pressure detector, breathing detector all connected to this device. The generated results are displayed on IoT dashboard at every span of time on the stoners and croaker's device via internet which can be covered and anatomized constantly. The temperature detector is used to measure mortal body temperature. Hence so in this detector resistance value decreases as the temperature value increased.

$$\text{Potential divider } V_{out} = V_{in} R2 / (R1 + R2) \tag{1}$$

R1 resistor value 4.7K and R2 thermistor. However, the value of the input voltage added to the resistor and this value is reckoned from the value of the temperature If the resistor R2 temperature is attained. Also, the value goes

to the MCP 3208 IC and this work will use the analog to digital (ADC) form and vice versa. 3-lead electrocardiogram system is used with AD8232 sensor module for effective transmission with BCM2837. The output from the pin10 of AD8232 is connected with the MCP3008 CH0 pin0 that further integrated with the processor. After processing is done, the system goes for analyzing the pulse rate using peak detection algorithm:

$$HR = 60 \times Fs \tag{2}$$

$$R$$

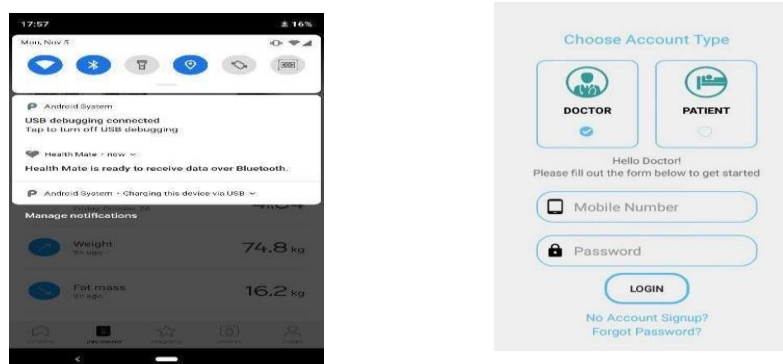**Where:**   R=Calculated R-R interval   HR= Heart Rate   Fs= Sampling Rate

fig 5.1. Dashboard UI

This peak discovery algorithm is used to calculate the whole QRS complex by Pan – Tomkin's system where it applies colorful pollutants like notch filtering to remove the background noise or rapid-fire depolarization signals and also applies the moving average sludge to calculate the unweighted mean of the signal of n samples which is the window for opting the template. Hence, all detectors like temperature detector, twinkle detector, an ECG detector, an acceleration detector, and blood pressure detector device, all are connected with the raspberry Pi device further, this information is transferred to the IoT Cloud platform through which the data is transmitted to the IoT dashboard or an operation. It generates information at every span of time and this displayed on stoner bias and on the croaker's device so that it can be fluently accompanied and covered.

V.   Results

The system was tested by connecting the processor externally with examiner and checking the acquired memoir – signals before transmitting wirelessly. To compass the graph, NumPy and Matplotlib function of python is employed. The body temperature detector, palpitation rate detector, room temperature and moisture detector values are calibrated using the processor. The perfect prototype of the health monitoring setup with the detectors is shown in Fig. 5 where it shows the affair values of the detectors calculated and displayed in a, so that these values are visible indeed to the case.
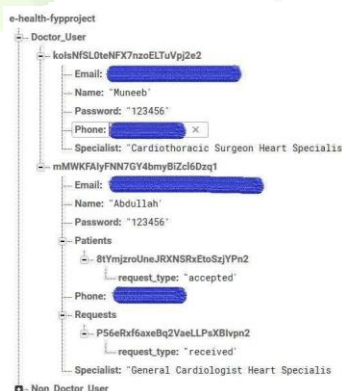

fig 5.2. firebase data

VI. Conclusion

In this paper, an IoT based health monitoring system was developed using Raspberry Pi. The system monitored body temperature, pulse rate and room humidity and temperature using sensors, which are also displayed on a IoT dashboard. These detectors data are then sent to a medical database using wireless communication. Further this data is then received in an authorized personals smart phone on', IoT platform hence with the values received the doctor then diagnose the disease and health of the patient.

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