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Patient Health Monitoring System based on IoT using Raspberry Pi

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Abstract: ***IoT globalizes the objects by connecting them on the Internet. This IoT technology is extended to many applications like smart home, smart parking, smart agriculture, health monitoring process etc., Our proposal relates to health monitoring of patients. IoT facilitates medical equipment to be more effective by allowing real time monitoring of patient's health where the sensors acquire patient's data and these parameters are transmitted through medical devices via a gateway, where they are stored and analysed. The important aspect is that patients from various places are monitored. The parameters monitored in our proposal are body temperature and heartbeat.***

Keywords: IoT, Raspberry Pi, Pulse sensor, Temperature sensor, Thing speak.

I. INTRODUCTION

Late years have seen a rising enthusiasm for wearable sensors and today, we have a few gadgets that are industrially accessible for individual human services, fitness and movement mindfulness. Notwithstanding the speciality recreational fitness field taken into account, analysts have additionally considered uses of such advancements in clinical applications in administration and clinical access to patient's physiological data. The current innovative patterns help us to do our work without being completely involved in patients care. In the meantime, while we are gone, the sensors that are connected to the patient's body monitor and record the patients physical parameters like body temperature, heart rate, etc, thus by helping us in this aspect. And when we return we will have the complete and exact information regarding the situation of the patient. Utilizing the accessible information, and helped by the decision support frameworks that likewise approach an expensive corpus of perception information for different people, the specialist can improve a much guess for your wellbeing and prescribe treatment. Such a troublesome innovation could have a transformative affect worldwide medicinal services frameworks and definitely diminish human services and costs and thereby enhancing the speed and precision for the analysis. However, wearable sensors had a little influence on the current clinical routine with regards to medication. In this paper, we concentrate on the clinical field and look at the open doors managed by accessible and up and coming advances and the difficulties that must be tended to with a specific end goal to permit and to incorporate these into the act of solution. Rest of the paper is organised as follows, Methodology, Components and Conclusion and Future works.

II. METHODOLOGY

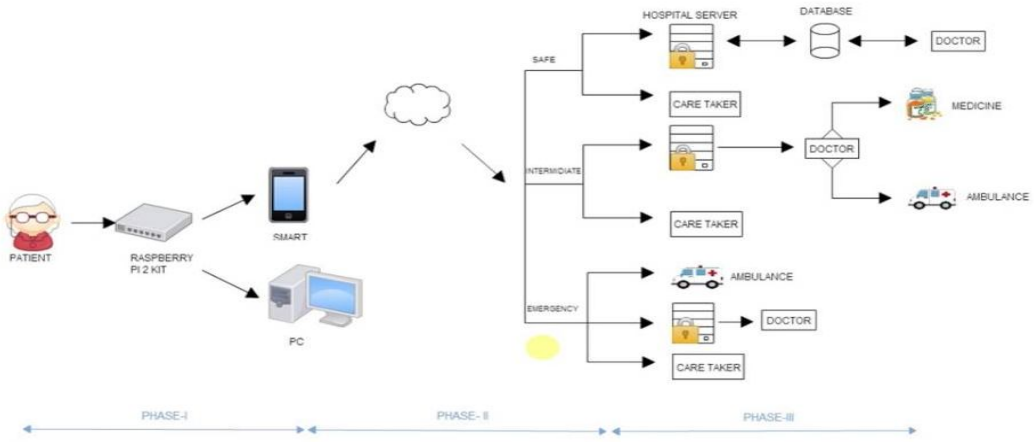

Fig. 1Architecture for monitoring patient's health

In this paper we have temperature and heart rate are monitoring using Raspberry Pi.

III. COMPONENTS

A. Raspberry pi

Fig. 2: Raspberry Pi

Raspberry pi is a low budget, small sized computer that plugs to a monitor. The official operating system of this computer is Raspbian and linux software apart from some other software's that are also used. The programming language for raspberry pi is python. Broadcom BCM2837 SoC and 1.2 GHz 64/32 bit quad core ARM Cortex-A53 CPU is used. Data will be stored in micro SDHC Slot and power capacity ranges from 1.5W to 6.7W. Hardware components of Raspberry pi consists of mainly I/O and USB ports, CPU and RAM.

B. Heart Rate Pulse Sensor

Fig. 3:Pulse Sensor

This sensor is very sensitive. So, it is tied with some sort of covering to a finger tightly. This sensor makes the measurement of heart rate extremely easier.Heart rate monitors generally come in two types — either a wireless chest strap that sends data to a monitor worn on the wrist, or pulse monitor worn on the wrist that requires you to put your finger on a certain spot to take your pulse.Heart rate sensor monitors provide quick feedback on how strong you are working out so that you can make adjustments on requirements to get the more benefit from your exercise plan.

C. ADC (Analog to Digital Converter)

Fig. 4:MCP3008

ADC used here is mcp3008. It is very cheap and 8channel 10-bit analog to digital converter. The output of the heart rate pulse sensor is given to this mcp3008 so that the reading will be converted and displayed. The range of this analog to digital converter is from 0 to 1023 i,e., it produces 10 bit data. This data canbe limited and set to desired range by using the Range node in node-red. We can map any value of input range to the desired output range.

D. Temperature sensor

Fig. 5:DS18B20

The temperature sensor used isds18b20 and it provides 9 to 12 bit configurable temperature readings which will show the patients temperature. It derive power directly from the data line, eliminating the use of outside power supply. The range is from -55degree.C to +125degree.c or -67f to +257f temperature.

E. Node - Red Software

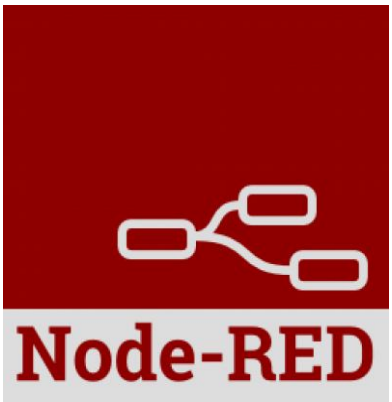

Fig. 6**:** Node-Red Logo

Node red is used as programming tool for hardware devices and APIs in the purpose of writing together and also for writing online services in new and interesting ways. As this node-red has a browser based editor, the flows can be wired together by using a wide range of nodes that are available in the palette which can be deployed to its runtime in a single click.

F. Thing speak

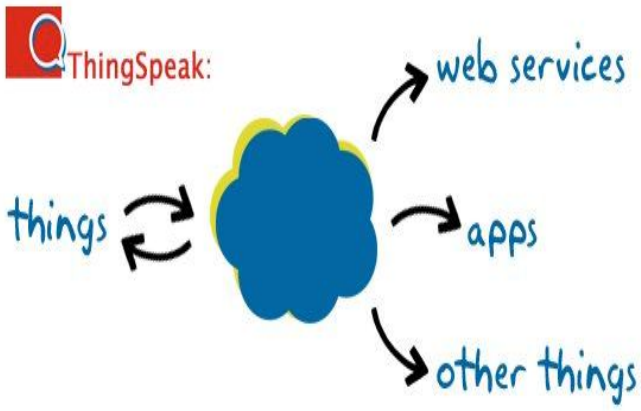

Fig. 7**:** Thingspeak

Thing speak cloud, where all the physical data can be stored.

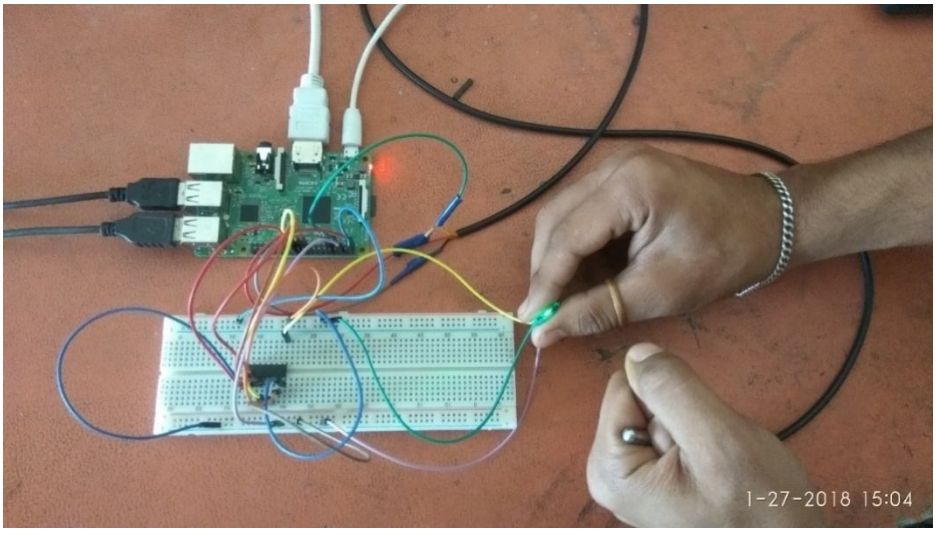

Fig. 8**:** Experimental Setup of Patient Health Monitoring System

In this paper, a three phase operation on the patient is performed. In phase I, the data is read from the sensors through raspberry pi and is posted into the cloud through node-red. The information in the cloud can be accessed from anywhere and at any time as it stored there permanently. In phase II, the data in the cloud will be accessed through a personal computer or any smart device to check the conditions of the patient. In phase III, based on the data, the treatment is taken. Here again, three conditions arise. Firstly, the safe condition. Here, the data is accessed by hospital server to take care of the patient. Secondly, the intermediate condition. And finally, the emergency condition. The information in all these conditions is regularly shared with a caretaker and he can, from anywhere, access the data to check the patient's status. Based on the results in the cloud, action is taken according to the situation of the patient irrespective of the location of the patient.

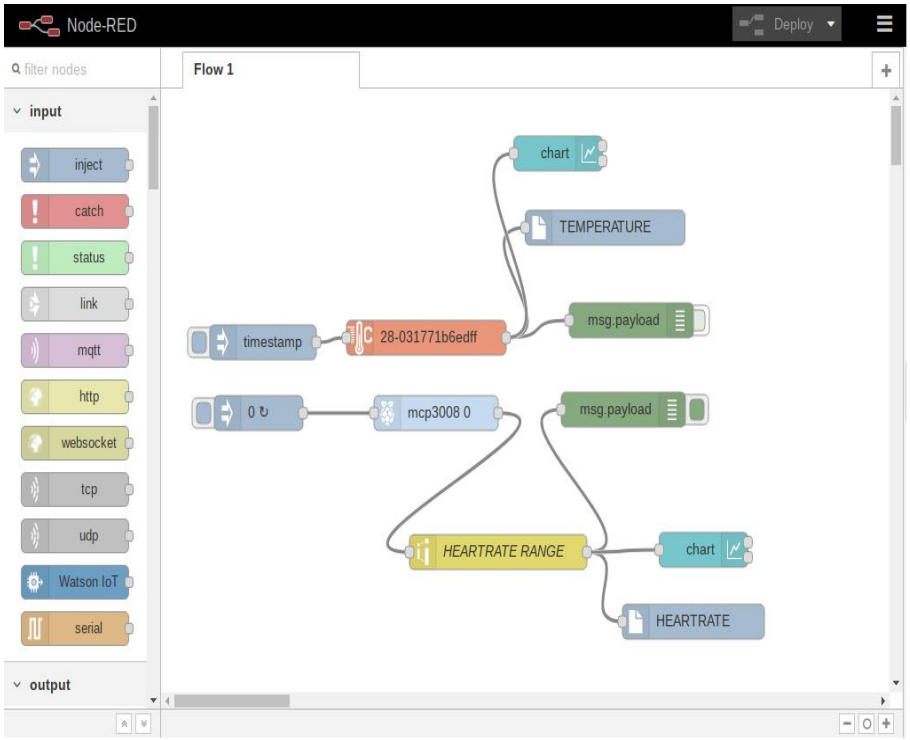

Fig. 9: Node-Red Flow

Then doctors will suggest the required medicines to patient health condition observed in server. Node red software plays important role in this method to upload patient data in cloud. Data send by the concentrator required to be transferred to the cloud for long term storage. Offloading data storage to the cloud offers benefits of scalability and accessibility on demand, both by patients and clinical institutions. Also, utilized with analytics and visualization, cloud hosting and processing can reduce costs at HCOs and provide better diagnostic information. In this section, we outline such could architectures and discuss issues that impact long term medical data storage on the cloud.

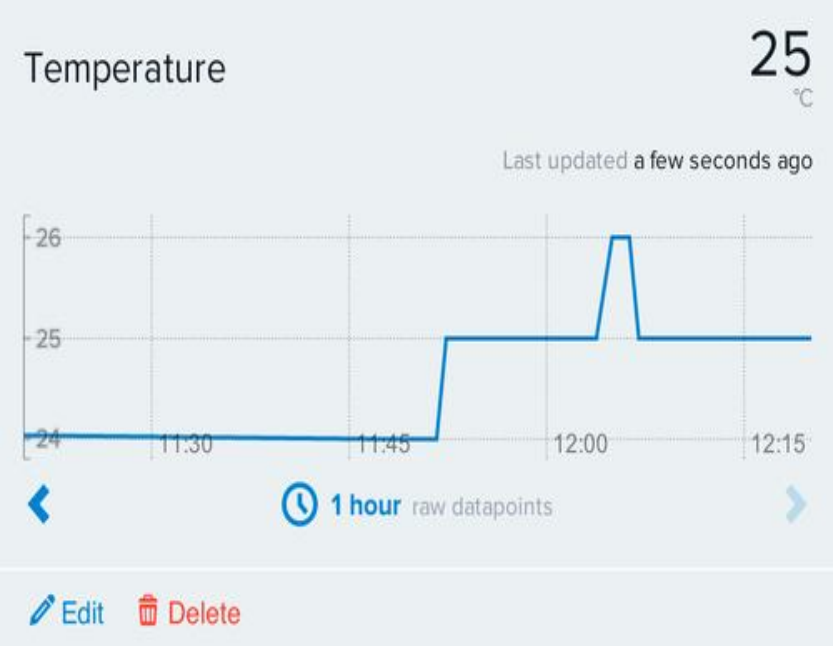

Fig. 10:Temperature readings in chart format

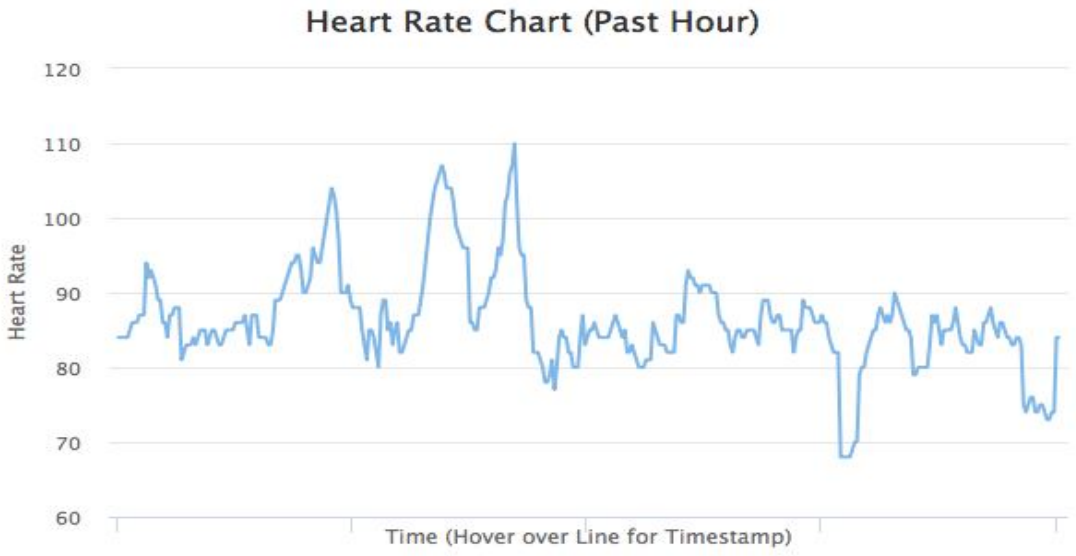

Fig. 11:Heartrate of the patient

IV. CONCLUSION and FUTURE WORKS:

Technology plays an important role in today's world. Using this technology remote patients health can be monitored by a doctor at his clinic. The patient's data is collected over longer duration than considering one time data if abnormality is observed in the parameters doctor immediately responds and alerts the caretaker of the patient for the further action to be taken. Here only the body temperature and heart beat are monitored this can be further extended to other parameters like

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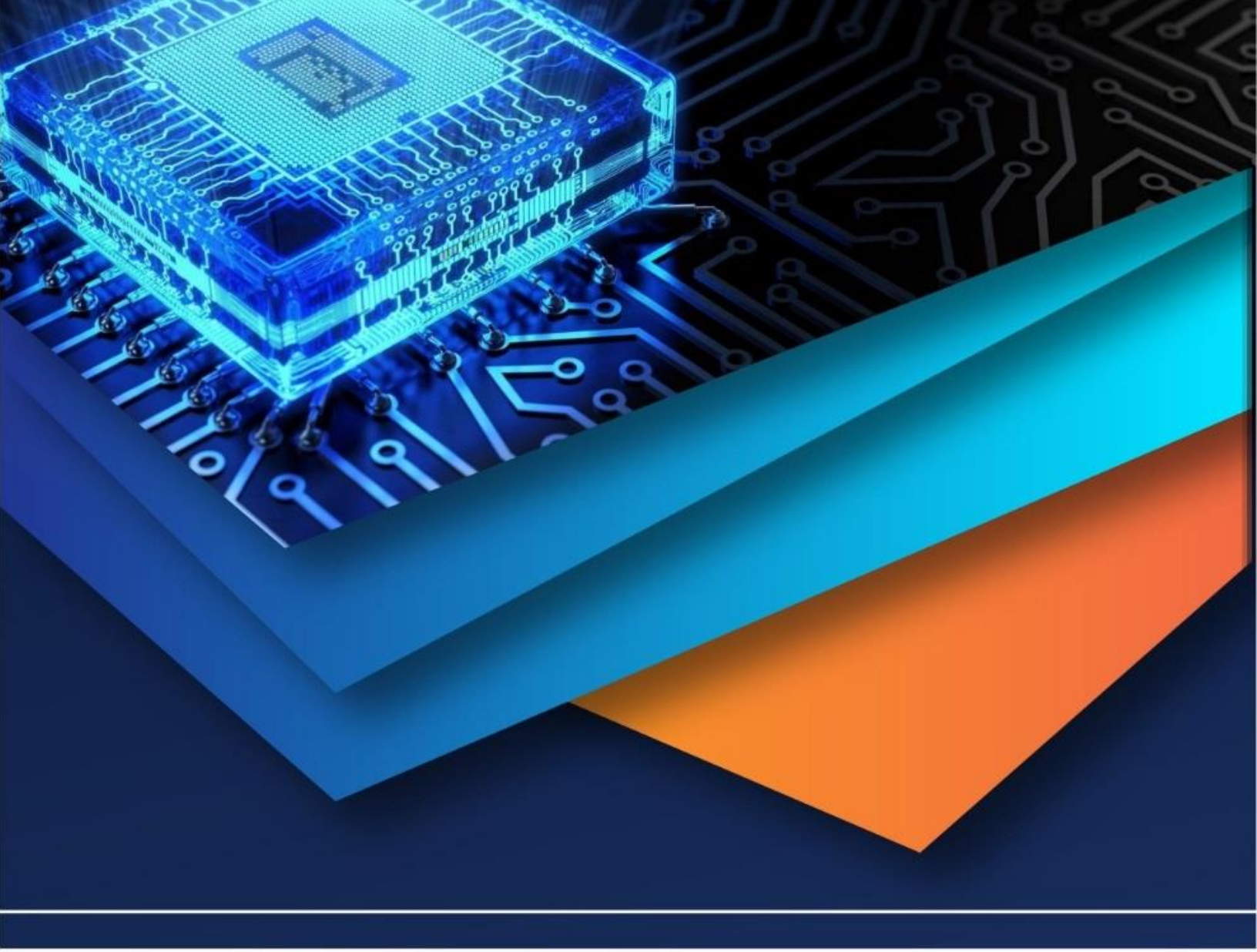

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