



Patient Health Monitoring Systems using IoT and Raspberry Pi – A Review

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ABSTRACT: This paper focus on review of Internet of Things (IoT) based Patient health monitoring system using Raspberry Pi. The proposed system is based on Body sensor network (BSN) which is a core application of IoT. The BSN consists of many sensors such as temperature sensor, heart beat sensor, blood pressure sensor etc. These sensors are interfaced to the Raspberry Pi, which is used for monitoring the real time data of the patients and provide timely details to the doctors, thus the doctors can respond in correct time to the patient's health care conditions. With the help of this proposal the time of both patients and doctors are saved and doctors can also help in emergency scenario as much as possible. The proposed outcome of the project is to give proper and efficient medical services to patients.

KEYWORDS: ECG, GSM, Internet of Things (IoT), Raspberry Pi

I. INTRODUCTION

A continuous record of body health parameters can be used to detect the disease in a more efficient manner. Now-a-days, people pay more attention towards prevention & early recognition of disease. In addition to it, new generation mobile phones technologies & their services provides an important impact on the development of network varieties (3G, Bluetooth, wireless LAN, GSM) etc.

In the proposed system, the BSN sensors such as blood pressure sensor, temperature sensor, heart beat sensor are interfaced to a Raspberry Pi. The received data from these sensors are further transmitted on an IoT platform which is accessible by the user via internet. An accessible database is created about patient's health history which can be further monitored & analysed by the doctor if necessary.

This paper as showing the advancements in health care management technology, it would save patients from the future health problems that would arise and would also help healthcare providers when there is any change in the vital functions of a person. These devices would be capable of applying complex algorithms and analysing them so the patient.^[1]

II. COMPONENTS USED IN IMPLEMENTATION

1. **LM 35:** The LM 35 shown in Figure 2.1 is a favored temperature sensor. It is a three terminal device. It functions on operating voltage ranging from 4-20 V. It is low cost and less current drain. The value measured by the LM 35 is linear with the Celsius temperature reading. It eliminates the problem of oxidation. It works on the fundamental of thermocouple. It has a desired accuracy of +/- 0.4°C. It can measure a set of values ranging from -55°C to +150°C.^[2]

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figure 2.4 Raspberry Pi

4. **GSM MODULE** : GSM is used to send alert message to the authorities if it crosses the threshold values. In our project we are using SIM 300 GSM module.^[5]

5. **LCD**: Liquid crystal display is a type of display used in digital watches and many portable computers. LCD shown in Figure 2.5 used to display the measured data. A 16 x 2 Alphanumeric Display which means on this display we can display two lines with a maximum of 16 characters in one line.^[2]



figure 2.5 16 x 2 LCD module

6. **COMMUNICATION NETWORK**: In health monitoring system, wireless network is used to forward measurement through a gateway towards cloud. The main network used here is IoT. The meaning of IoT is Internet of Things, simply called as Internet of everything. Different wireless communication technologies can be used for (i) Connecting the IoT device as local networks, and (ii) Connecting these local networks (or individual IoT devices) to the Internet.^[4]

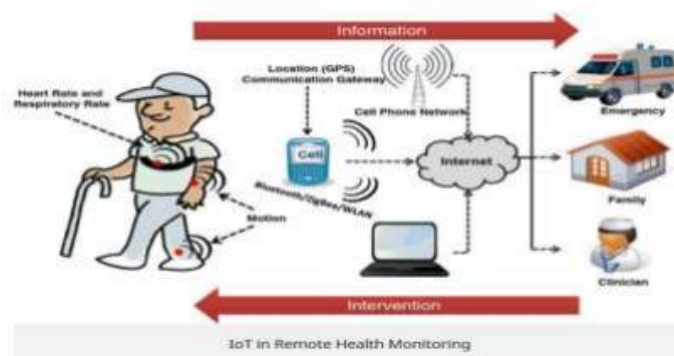


figure 2.6 IoT in health monitoring system

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III. PROPOSED METHOD

In the proposed system, the sensors such as temperature sensors, heartbeat sensors, pulse sensors, blood pressure sensors are adhered to the patient's body, which are then interfaced to a Raspberry Pi. These sensors collect the body parameters and these are then transmitted over the internet to the concerned doctor.

The temperature sensor LM 35 is used to measure the patient's body temperature and collect the data and transfer it to the Raspberry Pi. The patient's temperature parameters are continuously updated with the help of central server Raspberry Pi to the database on the web server and the doctor can monitor the temperature of the patient's body. The temperature parameters of the body must be within some preferred limit. If the logged value is not in the favourable range, then the doctor will be notified easily.

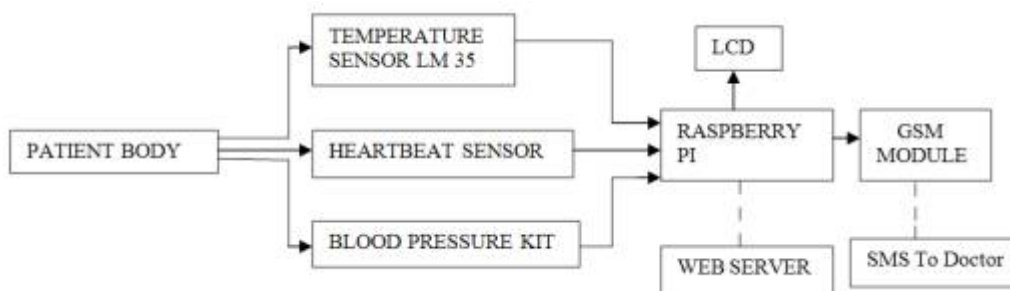


figure 3.1 Block diagram of patient health monitoring system

The heartbeat sensor analyses the number of times the heart beats and it is measured with the help of practical heartbeat sensors. The heartbeat sensor is attached to the finger of the patient and the data are continuously uploaded with the help of Raspberry Pi into the database on the web server and the doctor can easily monitor the patient's details. If the doctor is not available with the monitoring system, doctor will receive a message if the heartbeat is not within the favourable range and immediate action can be taken place and patient life can be saved.

The Blood pressure measures the systolic and diastolic measurements of the patient. The Blood pressure of the patient is measured with the Sphygmomanometer in terms of mm Hg. The parameters of the patient's blood pressure are sent to the Raspberry Pi and from there it uploads into the database on the web server. The doctor can monitor the blood pressure of the patients on the web page. If the blood pressure parameter of the patient is not in an accurate range, then doctor will receive an SMS and immediate medication is provided by the doctor. The patient health monitoring system provides the doctors with the patient's health parameters and it acts like a warning to the doctor about the patient's health. The developed system decreases health care cost, doctor to patient efficiency.^[2]

IV. CONCLUSION

In this paper, we have analyzed Raspberry-Pi based health monitoring system using IoT. Any abnormalities in the health conditions can be known directly and are informed to the particular person through GSM technology or via internet. The proposed system is simple, power efficient and easy to understand. It acts as a connection between patient and doctor.

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