

Smart Medical Monitoring System for Dotage Using IoT

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Abstract

In recent day's health problem like cardiac failure, heart related disease is rising day by day at a very high rate. Keeping track of the health standing of the patient reception may be a troublesome task. Specially dotage patients ought to be sporadically monitored and their standing from time to time whereas at work. Thus doctor can monitor the patient without actually visiting the patient. Along with this emergency contact also be notified regarding health of patient who is being monitored. An Internet of Things device which is capable of detecting multiple parameters of human body such as blood pressure, temperature, heart rate and further transmitting this information on an Internet of things server through 2G/3G/4G GSM technologies. Also in case of emergency, automatic alerts will be sent to doctors and family members. Raspberry Pi is cheap flexible fully customizable and programming minicomputer board provides the advantages of a PC to the domain of sensor network. Measure the patient parameters through different available sensors. This sensor collected data is biometric information about the health statistics is given to device, processed, transferred to the doctor and emergency services.

Keywords: Blood Pressure, ECG, GSM, IoT, Raspberry Pi.

INTRODUCTION

In recent years, the growth of internet has been further extended to connect all the devices through internet. All devices are connected to one another using smart automation to create worldwide universal network called Internet of things. The platform offers a promising scientific knowledge. To achieve the aforementioned healthcare service this can further improve the medical service system. The development of technologies such as Internet of things generates huge amount of data, leads to new age of information.

The Internet of things wearable[5] platform can be used to collect the needed information of the user and its ambient environment and communicate such information wirelessly where it is processed or stored for tracking the history of the user. The application of Internet of things can be grouped into domain like transport and logistics, healthcare, smart environment, personal and social. The role of Internet of things

is remarkable high, the government mainly focus on creating smart cities to all the emerging technologies a developing the nation to complete internationally. Each and every person is surrounded using by smart devices, which is used to connect 3G/ 4G network, social network and other intelligent technology. The key technique of Internet of things used in health care system is 1) remote monitory medical parameters 2) diagnostics 3) medical equipment 4) secure data of the indoor environment. Data are analyzed using various medical parameters about the patient which is used to communicate them to the doctor through the network channel with increasing health related problems and lack of proper solution in healthcare to monitor the patient in the absence of doctor, the patients face serious problem and cost life in critical condition, here the problem can be overcome using smart medical monitoring [1] system which is used to evaluate and monitor the status of the patient by the doctor.

RELATED WORKS

(Ahmed Abdelgawad, Kumar Yelmarthi and Ahmed Khattab[1]) has Proposed Health Monitoring System is composed of 6 modules: the physical sensors that collect the user information and provides the needed feedback, a sensor interfacing circuit, an indoor positioning module that helps locating the users, a low power microcontroller that manages the data collection and forwarding process, a wireless transceiver that connects the system to the internet, and a cloud server in which the data storage and processing takes place. A prototype of the system is built and tested to illustrate its different performance aspects. The architecture collects the data and relays it to the cloud where it is processed and analysed. Proposed and implemented a medical support system considering peer to peer and Internet of things technology. They used a smart box to control the situation of patients. The patient with vision impairment who is suffering from diabetics, hypertension or obesity is also supported by adapting a "Text to speech "engine that allows data to be transmitted as type string to the device. If the patient is out of range for the Wi-Fi or the server is unavailable, the patient data will be stored locally.

(Thiurmalasetty sivakanth and S. Kolangiammar [9]) this system tells about Real time and periodic structural health monitoring can reduce the probability of collapse and the

consequences of potential life threatening conditions. Internet of things enabled health monitoring system has huge advantage over traditional health monitoring system. Health sensing components have become very close compressed, portable, allowing patients to wear them perpetual for monitoring. The system consists of three parts: patient module, doctors module server module consist of two units: local and remote. The remote unit enables storing and distributing the data to the doctor. The local unit deals with processing of collected information from the sensor connected to the patient. If these monitoring devices are equipped with unique identifiers like RFID then those devices can be uniquely identified over the internet. It consist of several sensor connected to a person and they communicate with a data aggregator and processing unit. The data aggregator and processing unit may be a specialized device and pc. The aggregator unit has the responsibility of collecting each sensor [1] data following strict sampling rate. The aggregator uses wired USB serial connection to communicate with the data processing unit. The data received from the aggregator unit processed on the data processing unit (computer). The collected raw data will generate meaningful information that can be understood by specialists and doctors. The system can receive valuable medical advice from the doctors for the patients and can set alarms or remainder for timely medications and appointment.

(Shivam Gupta, Shivan Kashaudhan, Devesh Chandra Pandey [7]) this describes about the development of a microcontroller based system for wireless heartbeat and temperature monitoring using Wi-Fi module. By this we can easily provide real time information available for many users and can send them alert in critical conditions over internet. The microcontroller AT89S51 is used for monitoring the heartbeat. The fingers are placed in between, a Light emitting diode and photo resistance, where a person can easily detect the pulses of heart, the analogue electrons are further processed with an operational amplifying device LM358, this chip has been built on Op-Amps. The Transistor-transistor logic pulses or digital pulse are then feed to the external break in of AVR microcontroller. LM35 consist of precision mingled circuit, temperature sensor whose output voltage is linearly reciprocal to the Celsius temperature. The heart beat sensor will give a digital turnout when a finger is placed on it. Piezoelectric effect is a device that operates on the phenomenon which measure pressure acceleration strains or force by converting them into electrical signal. The different biomedical sensor which are used to monitor the health condition which is integrated on a single chip. If any varied change takes place it is notified. This notification would help to take an appropriate action at an instance of a time. This would save patients from the future health problem which would arise. This would also help patient's concern doctor to take an appropriate action at proper time. This system provides more medical instrument facility on single system. This system takes less than one minute to calculate result related to health condition.

(Aruna Devi.S, Godfrey Winster.S and Sasikumar.S [2]) the blood pressure monitor and heart beat are connected to the body of the patient. The device detect the detail from the patient body and send them to a total system. The status of the data which is collected using IoT device is huge and can be viewed through mobile application anywhere any time. Patient health monitoring system which uses IoT device is used to collect the required health parameters and evaluate the data. It also notifies the patient with possible precautionary measures to be practised. It can be extended by adding features to the mobile device like linking the ambulance services, leading doctors list and their specialist, hospitals.

(Sneha N.Matokar, Samadhan D. Mate June 2017 [8]) this illumination about human health via an Internet of thing wearable device. DATAMINING: Analysis and patient the chronic disease in initial stage through the concept of data mining technique which give useful information for the process of decision making. It pre-process the information about the human (if necessary). The doctor can continuously monitor the patient condition using smart phone and can also store patient history on web server where the doctor can access the information whenever needed from anywhere. Monitoring the system using wireless sensor system doesn't provide high accuracy.

(Narendra Kumar, Alok Aggrawal and Nidhi Gupta [5]) the aim is to provide health care service and medical monitoring. Using sensor [7], detecting the emergency case of patient health problem. This information is transmitted to Personal Server and Health server. From that it is transmitted to Nurse and Ambulance. An Efficient patient health monitoring system. It is helpful for elderly people live an independent life, besides providing people with quality care. Although offering significant benefits the field of wearable [5] and implementable body sensor networks still faces major challenges and open research problem.

(Yunzhou Zhang, Huiyu Liu, Xiaolin Su, Pei Jiang and Dongfei Wei [10]) the aim is to provide end to end solution specifically in Physiologic Parameter. It provide data to doctors and family members through web interface. It supports real time alarming and positioning services during urgent situation (Heart Attack). Easy information sharing between Patients and doctors. Real-time response for abnormal situation. User-friendly process the operation and light weight on body monitoring [3] sensors. The main limitation was that system was capable of only real time monitoring [5] of the patients states not professional's analysis and instruction. Therefore data analysis with expert expertise needs to be further studied to provide more useful information.

ARCHITECTURE

This section provides a high structured implementation of proposed system and explains the main building blocks and interconnection relationship among the system block.

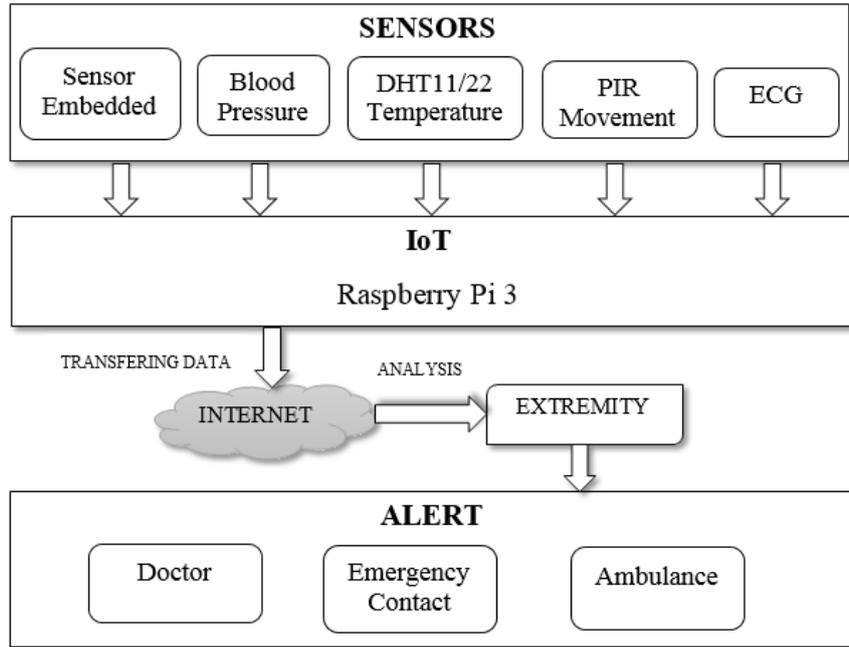


Figure 1. Architecture Diagram

The heart beat sensor, blood pressure, temperature collect the data from the sensor and then transmit the data to the raspberry pi. The collected data are transmitted based on the threshold values alert message are send. GSM stands for global system for mobile communications. Controls as the worlds most extensively used cell phone technology. Cell phones use a GSM network by searching for cell phone towers in the near area.

ARCHITECTURE REQUIREMENT

Input Unit

- Internet of things is used to take input from the user
- Sensor which is used to measure the Blood pressure, Temperature, ECG and Heart Beat

Communication Interface

- In this system is used as an interface to alert the Patient Guardians and Doctor.
- Alert are send through SMS via GSM and Mail.

Intrusion Detection Module

Raspberry pi3 which is the third generation raspberry pi, it has

- 1.2GHZ 64-bit quad- core ARM
- 802.11 wireless LAN
- Bluetooth 4.1
- 1B RAM
- 4 USB GPIO pins
- Full HDMI port
- Ethernet port combined

- 5mm audio jack and composite video
- Power supply: maximum of 5v is needed for sensors.

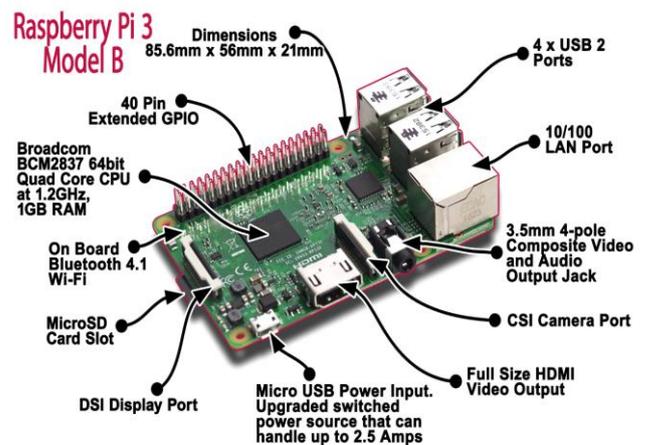


Figure 2. Raspberry pi 3 model B component diagram

METHODOLOGY

1. Data Collection from Sensor
2. Analysis
3. Alert

Data Collection from Sensor

BLOOD PRESSURE

The Ms5536 shown in figure 3 is a high resolution factory calibrated gage pressure module. The leaded hybrids are compatible with standard PCB assembly technologies. The

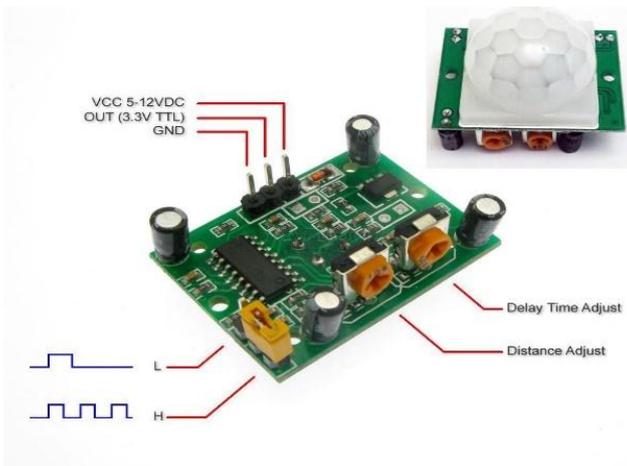


Figure 6. PIR sensor

Analysis

The proposed system aims to cover an end to end smart health application that can be build up from two functional building blocks. The main function of the first building block is to gather all the sensory data that are related to the monitored persons, whereas the second block functions are to store, process and present the related information of this stage to the doctors and emergency services. Data collected from each sensor are analyzed and categorized based on threshold value as follows

1. Normal
2. Abnormal

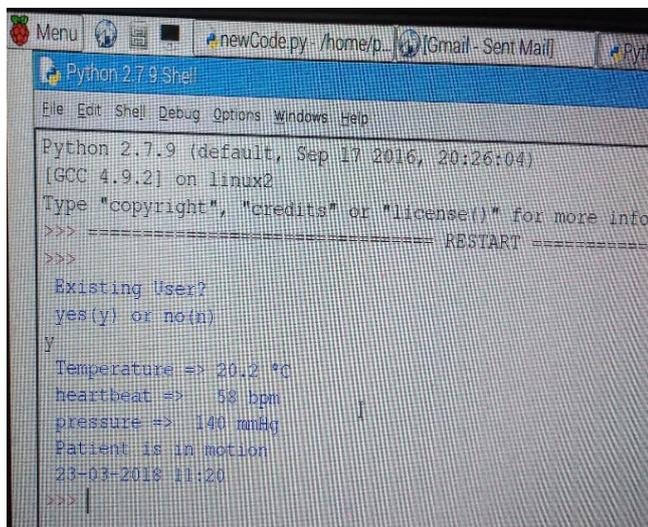


Figure 7. Shows Patient Medical Data while analysing

Alert

When the patient’s heart rate changes badly, the raspberry pi which recorded pulse and temperature through the sensor readings, orders GSM shield to send an alert [9] message to the family members, doctor, and emergency service.

Alert occurs for two condition

1. If the patient is in abnormal condition the message and email is send to the family members, Doctors and Emergency services. Email and Message contain information about the patient Heartbeat rate, Blood pressure level, Temperature in Celsius and movement of patient along with time and date

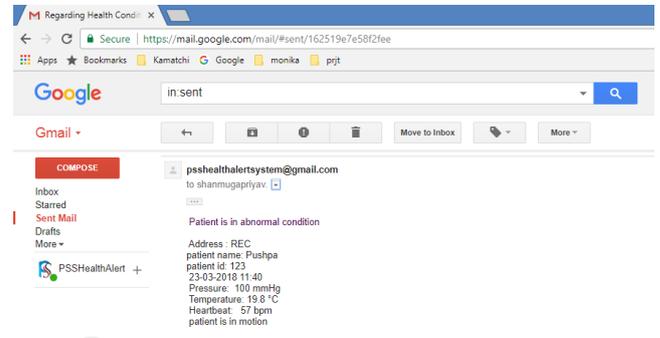


Figure 8. Shows Alert Message through Email

2. If the patient is in Normal condition, the message and email is send to the family members which is shown in below figure 9.

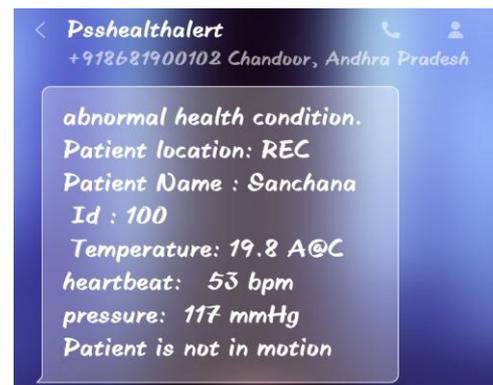


Figure 9. Shows Alert Message through SMS.

RESULT AND CONCLUSION

In this paper we have presented a low power wearable IoT device for Dotage. We have outline main component of the proposed system and explained their implementation details. We have built a prototype to illustrate the different performance aspects of the proposed system. The preliminary performance evaluation results have demonstrated the efficiency of the proposed system – despite being a low-cost one. Our future work will include how to store the data in server for doctor references and this data will be view from anywhere at any time.

As health care services are important part of our society, automating these services lessen the burden on humans and eases the measuring process. Also the transparency of the system helps patient to trust it. In this paper we have presented a low power internet of things system for healthcare monitoring applications. The proposed model enables user to improve

health related risks and reduce healthcare cost by collecting, analysing and sharing the data streams in real time and efficiency. When threshold values are reached alert message are send to the doctor and emergency services where they can act more quickly. The objective of developing smart health care monitoring system is to reduce health care cost by reducing physician office visit, hospitalizations, and diagnostic testing procedures. The proposed outcome of the project is to give a proper and efficient medical services to patient by connecting and collecting data information through the internet of things devices which would include patient heartrate, blood pressure and send an alert to doctor and emergency services. Future work can be extended to integrating the health monitoring system into a small compact devices like wrist watch and analects. In case of any emergency the buttons in the wrist watch can be pressed. When the button is pressed the alarm will alert the emergency service. This helps the patient to easily carry the devices with them wherever they go.

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