Patient's Health Parameters Monitoring through IoT

Sunil Kumar Kuppili[1], Manthini Swathi[2]

[1]Assistant Professor, Dept.of ECE, Raghu Institute of Technology, Andhra Pradesh, India.
[2]M.Tech, Dept.of ECE.

---***---

Abstract - *This paper deals with the problems faced by common people when they are isolated in home by the doctors due to their medical conditions and illness. Most of the times it becomes hard to keep the patient in hospitals for treatment due to the busy schedules of both patient and doctor and also due to the high cost of the hospitals. So, to overcome this, the present model comes with the basic health parameters related sensors. These sensors note the accurate values and these values are sent to cloud using inbuilt Wi-Fi present in raspberry pi-3 [3]. Here raspberry pi3 is considered as the heart of the model.*

Key Words: **IOT, Raspberry Pi, Patient guidance.**

1. INTRODUCTION

In the present era, it is difficult to keep a patient in a hospital for prolonged time due to two reasons, firstly many common people can't afford the bills of the hospitals and secondly, due to the busy schedules of both patient and the doctor. Sometimes the availability of hospital and doctor to some of the areas is difficult. So to overcome this, the raspberry model takes the temperature, heartbeat, pressure (which is the basic health parameters of a person) [2] as its input from the respective sensors, and sends these data to the cloud. The cloud access can be both private and public as per the convenience. This data is viewed by the doctor from anywhere around the globe. If at all the patient is bed ridden and he has an emergency, then he can touch a button due to which a buzzer sound is produced and the home members are notified about the emergency and they can act according to it. These sensors note the accurate values and these values are sent to cloud using inbuilt Wi-Fi present in raspberry pi-3 [3]. Here raspberry pi3 is considered as the heart of the model.

2. MOTIVATION

Previously, the method for calculating the basic health parameters was difficult and was only possible when the patient visits his doctor or the doctor visits the patient. If at all the patient requires a prolonged treatment, then he is supposed to leave all his personal and professional work aside and has to be in the hospital till his course ends. This IOT based model provides basic health parameters like heartbeat, pressure and temperature to the physician to his monitor via wireless network. This is a major benefit to both the patient and to the doctor.

3. BLOCK DIAGRAM

The figure shows the block diagram for the unit. Here, the raspberry pi can be called as the heart of the unit to which all the sensors and other components are attached
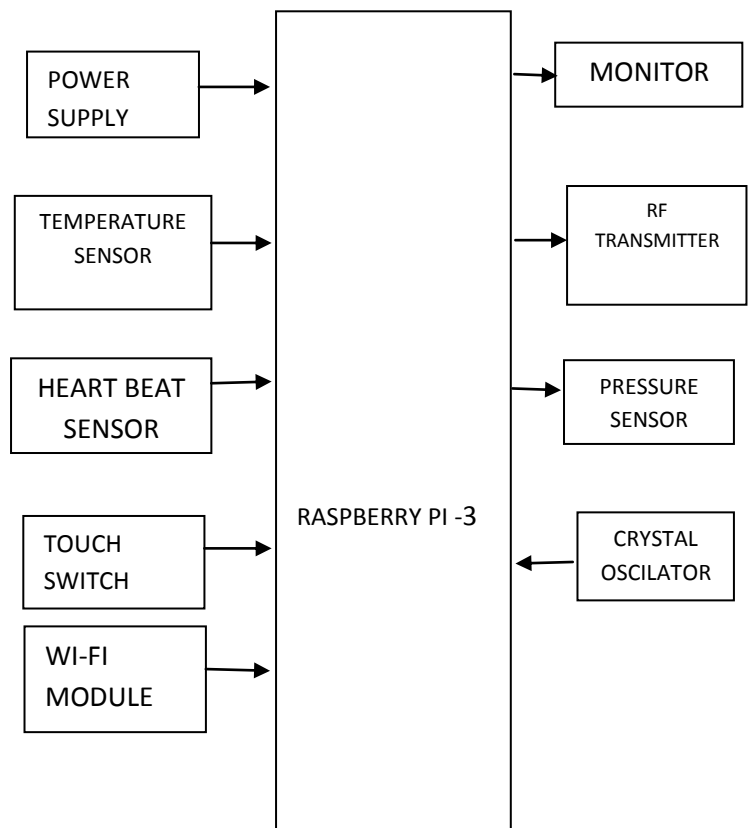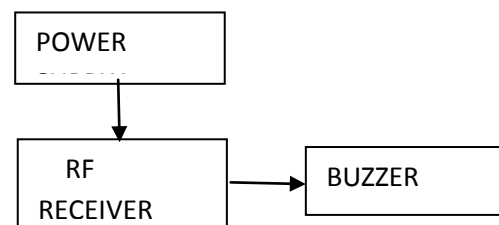

Figure 1. Transmitting section block diagram.

Figure2. Receiving section block diagram.

4. HARDWARE COMPONENTS

4.1 Temperature sensor:

LM35 is used as temperature sensor in this project, which is Analog. This sensor has an Analog to Digital converter which converts the output in digital form. It mainly measures the temperature of the patient as input and finally displays it on the monitor as output.

4.2 Pressure Sensor:

Pressure is measured in terms of force per unit area. Piezo (pressure sensor) is used to measure the fluid of blood flow and acts as a transducer. This transducer will have constant area and this will result to fluid pressure. Pressure sensor is designed to produce output for applied pressure.

4.3 Heart beat sensor

Heart beat sensor used in this project is pulse sensor. Here, psycho -physiological signal is the principle for measuring the Heartbeat [7]. This sensor has light lobe through ear and measures light which gets transmitted to the Light Dependent Resistor. A sensor which is named Heart rate sensor is assembled with the help of LM358 op-amp for monitoring the heartbeat pulses [5]. The varied detector signal is converted into electrical pulse. This signal gets amplified and triggered which gives output of +5v logic level signal. [2]

4.4 Touch Switch Sensor

Touch switch sensor is mainly used for people who are paralyzed and the people who are completely bedridden. This is used to notify the family members when in emergency with the help of a buzzer. An RF signal is passed through the RF modules which instantly results to a buzzer sound [6].

4.5 RF Module

RF module is a mode of communication for all types of wireless technologies. It has the frequencies range of about 3Hz to 300GHz. This will have alternating electrical signals to detect radio waves. The transmitter input is taken from the touch witch sensor and the signal is sent to the receiver and when the receiver receives signal, buzzer is produced.

4.6 Buzzer

Buzzer is used to notify the surrounding members with the help of an alarming sound, when the patient is in emergency (this happens when the threshold values of the parameters gets increases).

4.7 Crystal oscillator

Crystal oscillator is used to generate electrical signals by utilizing crystal's mechanical resonance made of piezoelectric material. In 8051 it has external circuit of 12MHz.Even though it is capable to run 40MHz it requires only 12 clock cycles for one machine cycle so as to give 1MHz to 3.33MHz.

4.8 Monitor

Monitor is used to display he readings of the patient every time.it takes the readings from cloud through Wi-Fi module.

5. OBJECTIVES

The main aim of this project is to develop a low power design and a low cost which is helpful for both patients and doctors. It monitors the data and analyses when it is within the normal range. This data can be obtained through wireless network [3]. It will have real time parameters from patient to the family member i.e. the source side is linked with the destination side. It also has an emergency alarm if any of the parameter is out of range. Here single touch sensor is also provided if the patient cannot give the information from the remote place [6]. The main disadvantage of this system is the RF signals can be transmitted and received in a certain distance only.

6. WORKING OF THE SYSTEM

When 5v of power supply is given to the microcontroller, the AC current is converted into purified DC current with the help of ADC converter. There are three basic health basic parameter sensors converted to Raspberrypi-3 board which are heartbeat sensor, Pressure sensor and temperature sensor which monitors the three parameters of the patient respectively, these three parameters along with an emergency touch sensor is converted to the Raspberrypi-3 as input. As the heartbeat sensor is already digital, we need not attach any converter to it [7]. These sensors sends the values to RaspberryPi-3 board and that data is send to ADC converter for converting Analog signals into Digital signals. These digital signals are sent to cloud through Wi-Fi module present in it and the cloud data can be viewed by doctor at any point of time [3].
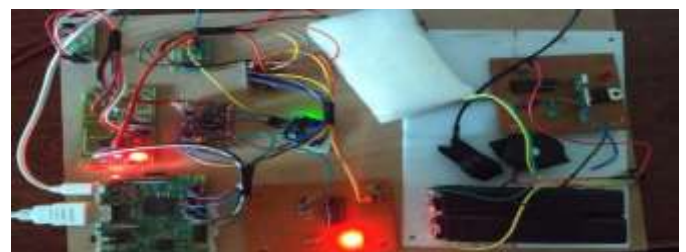

Figure3. Hardware Setup of the proposed system

In addition to this, a threshold value is given to the sensor, If the value of the sensor increases, there is an RF module connected from which the Transmitter transmits the RF signals to the RF receiver and when the Receiver receives the signal, a buzzer sound is produced which indicates the family members that the patient is in emergency . If at all the patient needs anything as in emergency, there is a switch (touch switch sensor) and if at all the patient touches the switch, RF signals are sent from transmitter to receiver, which again results to buzzer.

7. EXPERIMENTAL RESULTS

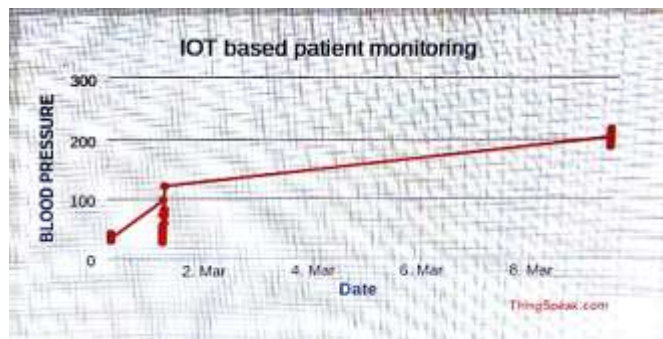The output of heartbeat, pressure & temperature sensor is shown in the figure below
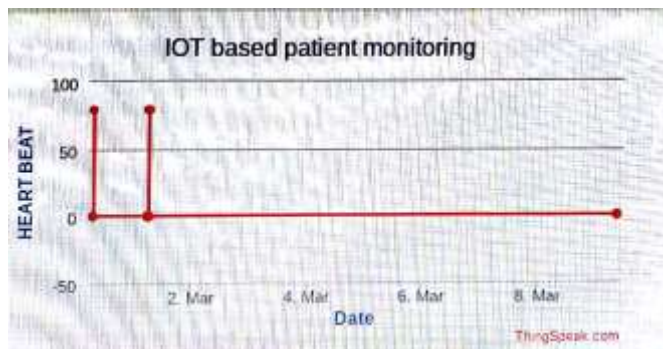

Figure1. Blood Pressure Output
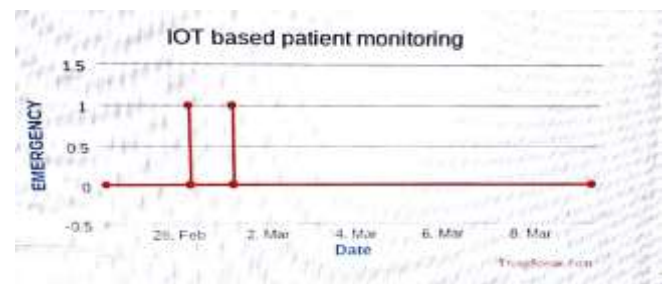

Figure.2 Heart Beat Output
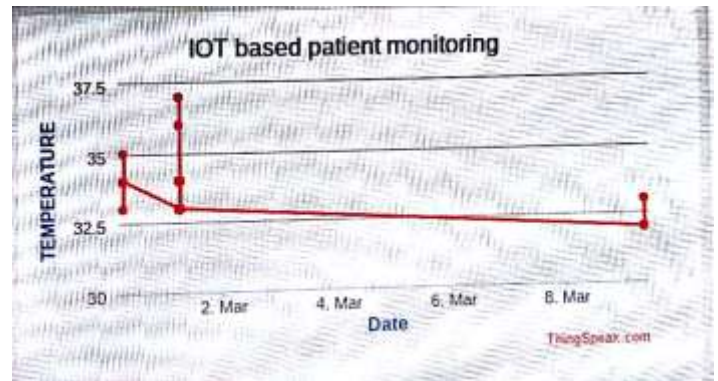

Figure.3 Buzzer Output

Figure.4 Temperature Output

Finally, the patient's temperature, blood pressure and heartbeat readings are analyzed by a physician at anywhere in the world. This helps both the doctors and the patients to save their time, money and energy, it also records the previous day data and can be viewed anytime they want.

8. FUTURE SCOPE

Keeping the basic parameters in mind, we can install a camera in additional to the present design which will continuously record the patient's situation and send the data to the cloud provided to it through Wi-Fi[1]. This will help the doctor to get a visual of the patient's condition.

9. CONCLUSION

Going to hospital for daily check-ups and paying lots of money, So as to overcome this, we came up with a design which monitors the basic health parameters such as temperature, heartbeat and pressure at home itself and also sends the report of these to the doctor in the hospital.

REFERENCES

[1] Healthcare Data Challenge, available on line: http://www03.ibm.com/press/us/en/pressrelease/40788.wss, Last accessed Jan. 2014.

[2] B..G Lee, W.Y. Chung, "A Smartphone-based Driver Safety Monitoring System Using Data Fusion", *Sensors*, *12*, 2012,pp. 17536–17552.

[3] P. C. Hii,, S.C. Lee, T. H. Kwon, W. Y. Chung, "Smart Phone Based Patient-Centred Remote Healthcare Monitoring Application in WSN", *Sens. Lett.*, *9*, 2011, pp. 791–796.

[4] L. C. Jersak, A. C. da Costa, D. A. Callegari, "A Systematic Review on Mobile Health Care", Tech. Report 073, Faculdade de Informática PUCRS – Brazil, May 2013.

[5] E.-M. Fong and W.-Y. Chung, "Mobile Cloud-Computing-Based Healthcare Service by Noncontact ECG Monitoring", Sensors, 13(12), Dec. 2013, pp. 16451-16473.

[6]]FensliR. Gunnarson E., and Gundersen T.,"a wearable ECG-Recording system for continuous arrhythmia monitoring in a wireless tele-home-care situation", Computer based medical systems, 2005. Proceedings, 18th IEEE Symposium

[7] Kothari M.," Microcontroller Based Heart Beat Monitoring and Alerting System", IOSR Journal of Electronics and Communication Engineering (IOSR-JECE) e-ISSN:2278-2834.p-ISSN:2278-8735.Volume 9, Issue1, Ver.1(Jan 2014), pp 30-32.

[8] Singh N.Mishra R."Microcontroller Based Wireless Temperature and Heart Beat Read-Out". e-ISSN:2250-3021, p-ISSN: 2278-8719 Vol.3, Issue 1(Jan.2013), ||V5||PP 01-06.

[9] Hazri M.r, jahan E. Amin M.R, Alam M.A" design and implementation of heart rate measurement device using wireless system", IEEE international conference on informatics, electronics and vision (ICIEV), 2014

[10] C.K. Das, M.W. Alam and M.I. Hougue" A wireless heartbeat and temperature monitoring system for remote patients" International Conference on Mechanical Engineering and Renewable Energy 2013.

[11]Wahyu Kusuma R., Ridha I., Yasman R., Swelandiah E.P," Fpga based heartbeats monitor with fingertip optical sensor", International journal of computer science, engineering and information technology(UCSEIT), vol. 4, no.5, October 2014

[12]Fezari M., Bousbia-Salah M., Bedda Mouldi., "Microcontroller based heart rate monitor", The international Arab journal of information technology, vol.5, No.4, Oct 2008.pp 153-157