ISSN (Online) 2394-2320

International Journal of Engineering Research in Computer Science and Engineering (IJERCSE)
Vol 5, Issue 4, April 2018

IoT-Temperature and Heart Beat Detection over the Internet using Arduino

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Abstract: Recent developments in the Internet of Things has interconnected all the objects and determined as the next technical revolution .In this paper Internet of Things is playing a vital role in the medicine's to tract the patients' Health which in terms called as Health Monitoring System. Health factors related to temperature, pulse rate, Heartbeat detection etc. are mainly concern for the health monitoring of the risked patient. Keeping the track of the patient reception may be troublesome specially maturity patients. Our task is to track patient's health wirelessly over internet. Since we are dealing with clinical area, this falls under the category of Healthiiot. Healthiiot is the graphical records to the attentional patient so a proper professional can instigate those patients. Thus Internet of Things in the medical field brings out the solution for the effective patient monitoring at reduced cost and also reduces the trade-off between the patient outcome and disease management. In this paper our focus is on Heartbeat (pulse rate), Temperature detections using Arduino or Raspberry Pi.

Keywords—Temperature sensor, Heartbeat, Pulse rate, Internet of Things, Arduino, Raspberry pi, ZigBee, ThingSpeak

1. INTRODUCTION

Internet of Things is rapidly growing and changing the world in the form of typical IoT components allowing public to innovate new designs and products at home. Because of innovative ideas IoT is been used in Medical areas which reduces the time to patients visit. IoT is helping the Medical areas in Health Monitoring issues. In this paper specialized sensor is used to monitor patient's heart rate. Body temperature, body movement, breathing rate and Oxygen Saturation of Blood (SpO2). Many patients die all over the world due to lack of timely and proper help. A portable system for continuous physiological parameter monitoring is essential for elderly and ill patients who are not in the hospital. A web-based patient health monitoring system will enable the doctor to view patient's health status online so that necessary treatment can be given.

Raspberry Pi and IoT OR Arduino and IoT has become a new innovative health technology in healthcare system. In this paper, Arduino and Raspberry Pi are acting like microcontrollers which are used to collect data and transfer wirelessly transferred to IoT website. Sensors output is connected to the IoT website. Based on sensors touched to body, patient's abnormal or normal values are calculated in which category it falls. Since our project resides on medical field that is Health monitoring, Healthiiot is the category where Clinical and IoT are mixed.

Healthiiot are the combinations of communication technologies interconnected apps, devices and sensors. With the help of Healthiiot we can collect graphical records to the attentional patients so that high professional Doctors can attend to the emergency patients. In the absence of the patient in hospital, system will enable the doctor to monitor physiological parameters online and taking necessary action in emergency.

Physiological parameters are

- Blood Pressure
- Heart beat
- Oxygen Saturation in Blood (SPO2)
- Body Temperature and
- Fall Detection
-

Arduino is a microcontroller which requires a Cloud services to share as well as to detect or to display about patients state if he or she is in Hospital or not. Working of the two microcontrollers i.e. Arduino and Raspberry Pi at the same time needed a software known as ZigBee and the common language used is Python. With the above, new entry can be updated within 60Seconds .In normal human being, Body temperature should be 98.6oF or 37.0oC. Pulse rate should be 60-100bpm and after exercise 200-220bpm. Blood pressure should be 120/80. If these exceeds above the levels an emergency display will pop to take some medical action.

Microcontrollers, which is Arduino and raspberry pi has some differences which the cloud services. Raspberry pi

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has its independent cloud service and cloud storage but when compared to Arduino, Cloud storage are created based on the project demand.

2. BASIC PHYSIOLOGICAL PARAMETERS

A)Blood Pressure

Blood pressure results from the force created by the pumping action of the heart that drives blood into the arteries then into the circulatory system. As the blood flows into the arteries, they offer some resistance to the flow of blood. Nearly 10 percent of the deaths in India are caused due to hypertension. The early detection and control of hypertension can reduce the risk of heart diseases and kidney failure. The normal bold pressure for a healthy person is 120/80 mmHg. If BP is above 140/90, it is known as hypertension.

B)Pulse rate

Frequency of Heartbeat is normally indicated by the pulse rate. In a healthy adult at rest, normal pulse rate can range from 60-100bpm. But during sleep, this is as low as 40bpm and during strenuous exercise, it rise to as high as 200-220bpm. Irregular or rapid heartbeat shows cardiac abnormality. Dizziness, fainting, cheat pain or breathlessness can be correlated with affected pulse rate.

C) Body Temperature

The normal body temperature of a human being is around 98.6oF or 37.0oC. Body temperature higher than 37.8oC (100oF) is considered as fever.

D) SpO_2

Arterial oxygen saturation provides early information related to transportation of oxygen to the tissues in the human body which is an important indicator of the patient's health. It gives the percentage of oxygenated haemoglobin in the blood. The SpO2 value is represented as a percentage. Normal SpO2 of healthy person is in the range of 95 to 100%. If it is below 95% it indicated poor blood oxygenation and considered as hypoxia.

3.LITERATURE REVIEW

A. PIC Controllers and Sensors:

PIC is the family of microcontrollers made by Microchip technology which is based on a modified RISC architecture which provides migratory paths from 6 to 80 pins and from 384 bytes to 128 kilobytes of program memory.

B. ARM (Advanced RISC Machine):

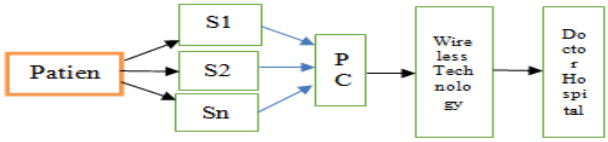
ARM is the most licensed and widespread processor cores in the world and it is a 32-bit processor. It is used majorly in portable devices due to its low power consumption and reasonable performance. ARM is a RISC.

C. Wireless Sensor Networks:

It refers to a group of dedicated and spatially dispensed sensors for recording the physical and biological conditions of the patients and the data is collected with the microcontroller can be viewed or reviewed at a central location.

D. Wireless Monitoring System via Bluetooth:

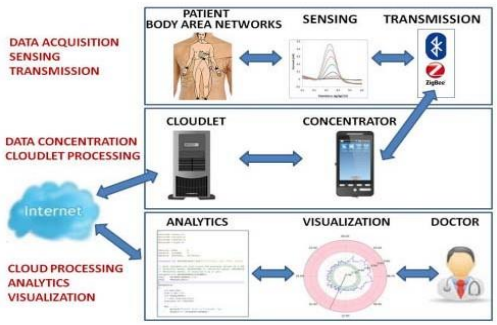
There is extensive interest in using wireless technologies in patient monitoring in various environments including hospitals and nursing homes. Due to wireless technology it provides better treatments to patients though they are physically not present in hospital. This system is more useful for elderly people as they are more prone to chronic dieses and need continuous health monitoring. Now a day there are different products are developed which supports the wireless health monitoring system.



Where S1, S2….Sn are the various medical devices or sensors.

E. ECG (Electro Cardio Graph):

Electrocardiography (ECG) is the process of recording the electrical activity of the heart over a period of time using electrodes placed on the skin. These electrodes detect the tiny electrical changes on the skin that arise from the heart muscle's electro-physiologic pattern of depolarizing and repolarizing during each heartbeat. It is a very commonly performed cardiology test.



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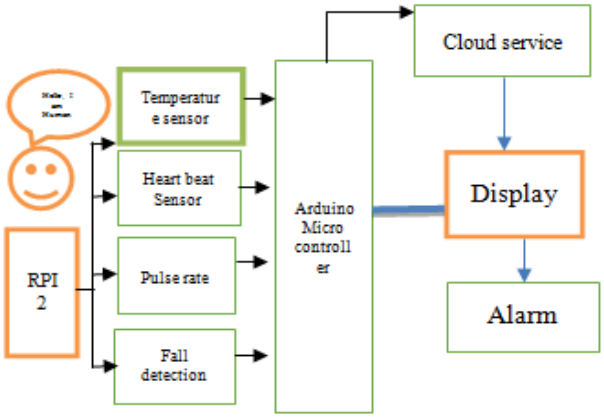
Geographical working Diagram for the project

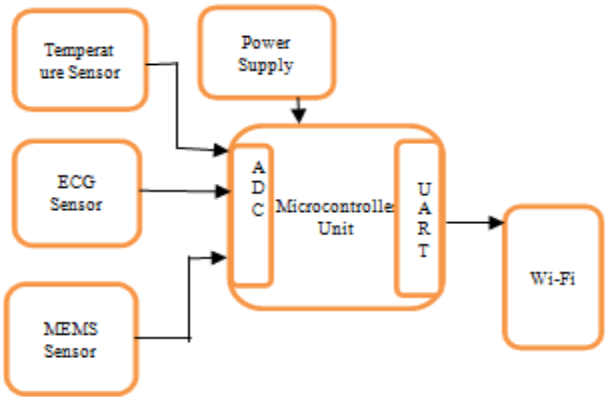
4. HARDWARE IMPLEMENTATION

The block diagram shows the prototype of the implementing system. In this system we are using RPI2 (RISC Peripheral Input/output Controller) works with a KeilIDE and Embedded C for interfaced three sensors like temperature, heartbeat, fall detection and BP sensor's through SIP(Sharing Inter process) communication to RPI. We use an Ethernet network connection for upload in data of sensor into webserver, which is getting from patient node. ECG (Electro Cardio Graph) detects the Heart pumping in the form of Graph which reports about the working stability of the heart.



(Block Diagram of patient monitoring system using Arduino)

Sensor section



CENTRAL NODE

To upload the data into server Arduino processor is used. This processor consists of GPOS and RTOS, we used KeilIDE and Embedded C operating system which has the capacity to perform multi stack support. KeilIDE and Embedded C operating system is used for live streaming the patient condition. The prototype hardware is used for central node is Arduino processor which is manufactured by raspberry pi. This processor is chosen because it is low cost than compared to another device which need to perform Raspbain operating system. The utilities of this processor are raspberry pi model name is Broadcom BCM 2835 system-on chip. Its architecture is arm11. The CPU configuration is 700MHz power low ARM1176JZFS processor, memory is 512MBSDRAM. It has inbuilt Ethernet, HDMI, 4 Usb ports with Usb2.0 connector, the GPIO connector is 40 pin and the power consumption is +3.3V, +5V and Ground.

DOCTOR NODE

Doctor node is connected to an Ethernet, when doctor check the results of the patient and in this we are sending all of these health conditions through PHP web page so the doctor compare's both values like sensor and patient condition then doctor prescribes the medicine to the patient in the webpage.

5. CONCLUSION

In this paper, implementation details of a web based automatic physiological parameter monitoring system using Arduino is presented. The physiological parameters are updated within 60 seconds on the webpage which is the default action. This paper is mainly created for the ill patients who are rarely or unable to visit hospitals during emergency. Arduino here act like a server which automatically sends health status to the screen and health status. Now it will be easy to give first aid at any time. Arduino acts like a microcontroller so it is flexible in nature that is to attach many number of devices. In future, Medical teams are working to get the results within a second where the technology will combine Arduino and Raspberry Pi.

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