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SMART HEALTH CARE SYSTEM USING INTERNET OF THINGS

Sumit Holey
RMD SSOE
Pune, India
sumitholey@gmail.com

Prof. Mrs. Snehal Bhosale
Assistant Professor
RMD SSOE, Pune, India
snehalbhosale@sinhgad.edu

***Abstract* — In today's era the fastest growing technology is Internet of Things. The Internet of Things is an information network consists of object connected through internet like RFID's, actuators and sensors. It allows access and monitoring of an object from any point on this world which can be possible due to internet of things. Internet of thing basically network of an object which can be used to collect and exchange the data between them.**

This paper proposes smart healthcare architecture for automatic tracking and monitoring of patients health anywhere in the world. This can be possible with the help of various sensors and actuators. The parameters like Blood Pressure, ECG, Heart rate and temperature can be easily monitored through this system. Sensor sensed data easily delivered to control centers where the received data is monitored at local and remote user with the help of Internet of Things.

Keywords—Internet of things (IoT), Blood Pressure, Electrocardiogram (ECG), Heart Rate, Temprature.

I. INTRODUCTION

The Internet of Things (IoT) is a concept of connection of anyone, anything, anytime, anyplace, any service and any network. It is the future concepts of next-generation technologies that can impact the whole lifestyle of human being through interconnection of uniquely identifiable smart objects with more benefits [1]. The Internet of Things (IoT) is a fastest growing technology in the wireless communication. IoT connects the real world objects to everywhere.

Through IoT devices or the object are always stay connected to the real word means we can physical devices stay connected to the virtual word and can be accessed remotely through anywhere from the world and that physical object can behave like physical point to service provider. IoT has several uses in our day to day life, the most significant domestic application are smart media, environment monitoring, smart infrastructure, smart manufacturing, smart medical and healthcare, smart building and home automation, smart energy management, smart transportation etc. Smart home automation raises a few possible applications like Surveillance cameras, vehicle detection, lightings, telephones etc. Similarly business user uses automation in individual and smart transportations of goods and assets.

There are various smart applications in media like they can be implanted their cameras at various locations so as to get live video of the news or get news faster than the current reporting time. In smart environment monitoring the applications like air, water, noise pollutions [2] can be monitored on particular time intervals. More applications like Forest fire, tsunami, earthquake, tornado etc detections and alerting system can be developed. The Smart Infrastructure management used to monitor and develop structural life or changes in old buildings, dams, bridges [3], roads, forts etc and provide more safety and risk management. The Smart manufacturings have various applications like if new product gets developed, the developer can get the information about developed part which is going to be introduced while manufacturing remotely and developer can easily correct the fault coming at the manufacturing line. Another application in manufacturing is like after few running cycles of product or lifetime of a product we can remotely manipulate the changes happening in the product and by considering those errors one can easily developed new product better than before. It can also be used to keep eye on Vendor Company for their manufacturing process and asset management.

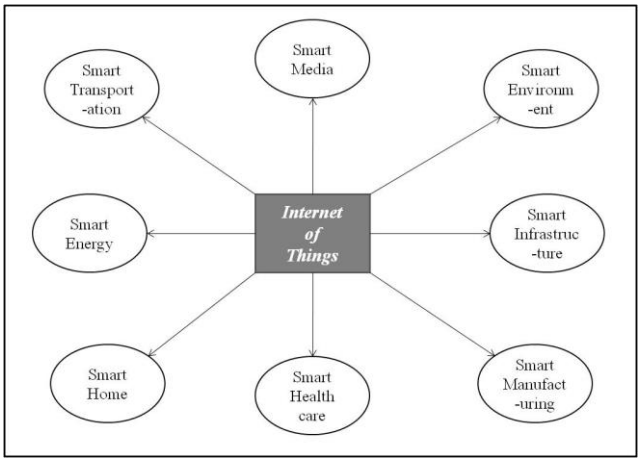

Figure 1: Internet of Things

In smart healthcare system also helpful to monitor patient's dieses like blood pressure, heart rate, temperature, body glucose, electrocardiogram etc [4]. In smart home automation applications like television set, air conditioner, water heater, oven, watching machine, fan, surveillance camera etc. can be easily control and monitor. In Smart energy system can be

used for automatic metering system, controlling of electrical and electronic devices. In transportation the IoT can be used for applications like Smart parking, traffic controlling, logistic detailing, driver assistance system etc. Like this Internet of things can be used in every day to day life appliance to ease the life of human being.

McKinsey global institute announced by 2025 internet endpoint will connect every physical object around the world through Internet of things (IoT) with interactive of human background "Smart" object plays the important roles in the IoT vision. Whereas the embedded technology gets connected to the digital objects by using uses sensor actuators, RFID's etc. Objects like washing machine, running machine, electronic meter that also connected with internet network interfaces. Another IoT applications like objects tracking, ticket collection machines with the help of smart devices [5].

II. PROPOSED SYSTEM

The main source of smart health care system at present stage is that when patient is at the rest position. The phenomenon like blood pressure, ECG, Heart rate and temperature can only possible to measure while the patient is in hospital or at rest position. So this paper presents an efficient system to overcome the drawback whichever is present in previous systems.

The proposed system consists of Raspberry pi model, blood pressure measurement sensor, ECG Circuitry, heart rate, temperature sensors and power supply unit. The block diagram for the health care system is as follows,

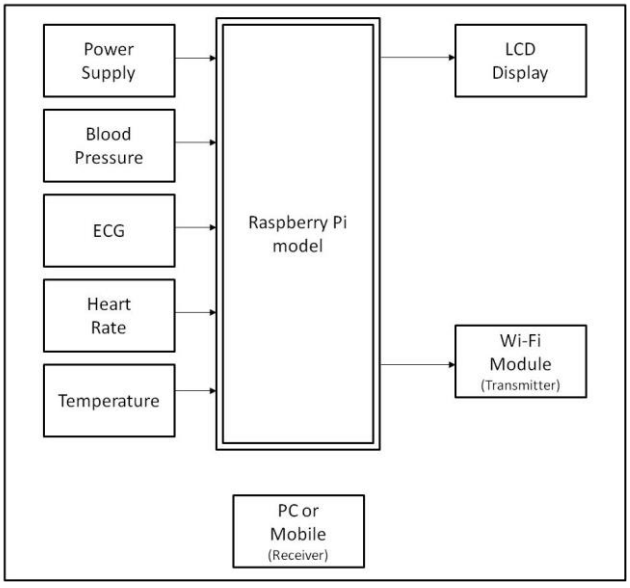

Figure 2: Proposed Smart Health care System

A. Raspberry Pi:

As stated by the raspberry pi organization it is a series of credit card size single board computer developed in UK by raspberry pi foundation.

The raspberry pi is based on Broadcom BCM2836 processor which include ARM Cortex-A7 based quad core processor which runs on 900 MHz and has RAM of capacity 1GB. Raspberry pi required 5V 2A power supply. It has graphic processing unit Dual Core Video Core IV multimedia Co-Processor which provides Open GL ES 2.0, hardware-accelerated OpenVG, and 1080p30 H.264 high-profile decode Capable of 1Gpixel/s, 1.5Gtexel/s or 24GFLOPs with texture filtering and DMA infrastructure.

It also have one audio output, four USB connector, forty pin GPIO connector, camera connector, one display serial interface and one High-Definition Multimedia Interface to connect to various peripherals [6].

B. Blood Pressure Measurement:

Blood pressure measurement can be possible with the help of two different techniques which are Auscultatory technique and Oscillometric technique. In Auscultatory technique is listening of korotkoff sound which gets created by body during the blood pressure measurement with the help of stethoscope. The correct measurement is depending on cuff size, wrapping technique and release of the pressure. The first time korotkoff sound refers to systolic blood pressure and at the second time korotkoff sound refers to as diastolic blood pressure.

Figure 3: Auscultatory technique

The oscillometric technique depends on measuring oscillation signals in the cuff. Basically it is measure by oscillometric ratio; systolic blood pressure can be measure by systolic ration and diastolic pressure measure as a diastolic ratio [7]. The oscillometric technique is quite easy and automated technique. Auscultatory technique is more accurate than that of oscillometric technique.

Figure 4: oscillometric technique

C. Electrocardiogram (ECG) & Heart rate Measurement:

The basic block diagram for electrocardiogram measurement consists of an electrode, instrumentation amplifier, low pass filter, amplifier, microcontroller and a LCD display [8].

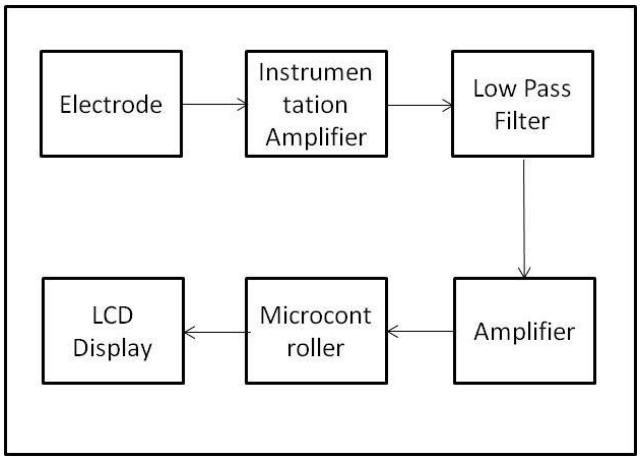

Figure 5: ECG Block diagram

1. Electrode:
It is used to convert patient's physical signal into electrical signals. The electrode get stick to the right arm and left arm of patient on cuff and one electrode on the right leg of patient. For measurement of ECG we are using Wilson Electrode System.

2. Instrumentation amplifier:
It is followed by electrode to amplify the output ECG signal of electrode.

3. Low pass filter:
It is used to remove unwanted signals which occurred by previous two stages.

4. Amplifier:
It is basically used to amplify signal is then provided to microcontroller for heart rate count.

5. Microcontroller:
It is used to count pulse rate which is generated by the amplifier for one minute.

6. LCD display:
It is used to display the result of the system.

As shown in fig. 5 Electrode, instrumentation amplifier and low pass filter is used to calculate the ECG of patient and amplifier uses the signal generated by electrode and amplified by low pass filter to measure the heart rate by counting square wave for 60 sec, which is heat rate count.

D. TEMPERATURE MEASUREMENT :

Body temperature of the patient can be calculated using LM35 sensor. It can operate on for full −55°C to 150°C range with accuracy of ±0.2°C.

III. INTERFACING OF SENSORS

Interfacing of the sensors carried out with the help of operational amplifier and the raspberry pi and the output of the various sensors like Blood pressure, ECG and heart sensor and temperature collected up to raspberry pi and then resultant output is transferred to various locations wherever required.

IV. CONCLUSION

The objective of smart healthcare through Internet of things to provide low cost solution with high reliability and real time data transfer at various points and almost negligible cost. This low cost solution on the one hand would save the user from high one time and running costs and on the other hand provide a reliable, efficient and real time monitoring system.

Another strong factor regarding our Internet of things system is the extent of coverage it can provide i.e. anywhere in the world-it can connect wherever Internet facility is present.
The objective of system is to monitor and intimate critical surveying patient's health directly to doctor and Emergency contact number to save patients life.

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