e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Issue:05/May-2020 www.irjmets.com

AN IOT HEART RATE TRACKING SYSTEM

Puneeth M S[*1], Prof. Vibha M B[*2]

[*1] Post Graduate Student, MCA, D.S.C.E

[*2] Assistant Professor, MCA, D.S.C.E

ABSTRACT

As day by day the technology has evolved the IoT became more popular in daily life. Today there is a lot of demand for internet application development. Hence the IoT is gaining more popularity we choosed to develop heart rate tracking system with the help of IoT. The purpose of this system is to track the heartbeat of a user or patient and monitor it to provide the emergency message when variation occurs in the specific level of heartbeat. Now a days, heart attack is one of the main cause of death in the world. Heart attack is not easily noticeable. To overcome this, heart beat tracking system is developed which helps in early detection of heart attack and reduce death rate.

KEYWORDS: ECG (Electrocardiogram), Microcontroller, IOT(Internet of Things).

I. INTRODUCTION

At present generation we can see heart diseases which also includes risk of heart attacks. The proposed system detects heart rate of a person using sensors even if the person is at home or any place. This sensor transmits signal to a microcontroller which allows checking of heart rate readings and send them over the internet. Generally the normal heart beat of an adult ranges from 60 to 100 beats per minute. The user may set their normal heart beat boundaries. After setting these boundaries, the system starts tracking the user's heart beat and when the user's heart beat goes above or beyond the certain boundaries, this system sends a signal to controller which then sends alert message to the doctors as well as concerned person of the user through the internet. This system also alerts for lower heartbeats. Doctor or concerned person can log on for monitoring; the system also displays the live heart rate of the user. Also user can monitor their own heart beat through mobile. Hence, the concerned person can get an alert message of heart attack and the location of user immediately through GPS and the person can be saved on time. These days Cell phones are the most useful and common device which is available for most of the person across the world. The recent cell phones have enough available memory, good battery backup and processing power. So this advantage of cell phone technology can be used to overcome the problems of wireless sensor network which help for transmission and processing of the data. This system uses wireless network technology of mobile phone that is cellular network for efficient and fast delivery of health alert messages. The proposed system consists of a wearable device which have electrodes, sensors, amplifier, microcontroller, Bluetooth and SD card. This provides the Electrocardiogram (ECG) signal of the user and sends warning to a doctor and concerned person if there is more variation in the user's heartbeat. This system can be useful for those places which are facing the shortage of efficient doctors so that the one can be aware of their heart condition before causing severe problem.

Heart Rates and Ranges:

As we know the normal heart beat of an adult ranges from 60 to 100 heart beats per minute, also there are many factors that influence heart rate of a person. Factors are:

- Age
- Fitness and activity level
- Smoking
- Having disease like B.P, Diabetes or high cholesterol
- Position of body(standing or lying down)
- Emotions
- Body size

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Issue:05/May-2020 www.irjmets.com

- Medications

Likewise there are also other factors which influence the heartbeat. Tachycardia is a condition when heart beats faster than 100 beats per minute and Bradycardia is a condition when heart beats slower than 60 beats per minute. But we should be knowing that faster heart beat can also occurs in healthy person due to exercise, excited, anxious or if the person is pregnant etc. Also slow heart beat occurs in healthy person if they have slept or took any drug to treat hypertension etc. These types of abnormal heart rhythms are called Arrhythmias. The condition which occurs in many people but they are harmless but some of them can be due to serious heart issues or other health problems.

Acceptable Ranges of Heart Rate	
Age	**Heart Rate (Beats per Minute)**
Infant (6 months)	120-160
Toddler (2 years)	90-140
Preschooler	80-110
School-age	75-100
Adolescent	60-90
Adult	60-100

II. EXISTING SYSTEM

The existing system already have home-based mobile cardiac monitoring system, which includes a 10-12 electrodes, amplifiers, temperature sensors, batteries and user display. During an ECG check the body must be at relaxed state. The electrodes are attached to some parts on the body like chest, arms and legs, which are connected to the ECG machine via cable. These electrodes detects the electrical tension that occurs in cardiac muscle depolarization followed by repolarization during each cardiac cycle (hearbeat), which is then transformed into graph paper to produce an ECG. There are three main components to an ECG: the P wave, which represents the depolarization of the atria; the QRS complex, which represents the depolarization of the ventricles; and the T wave, which represents the repolarization of the ventricles[5].

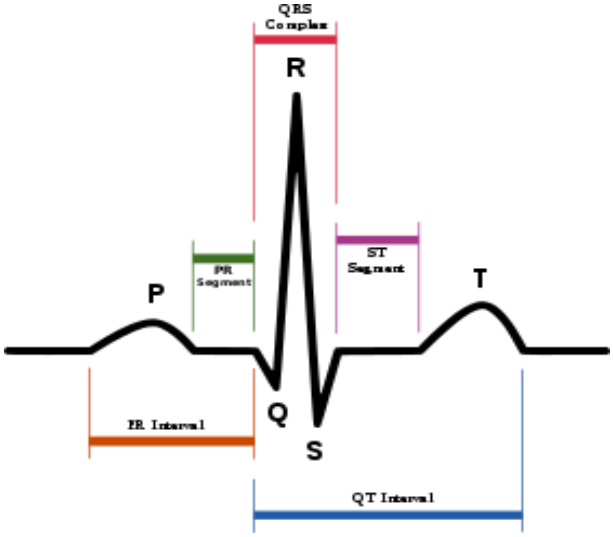

Fig-1

The disadvantage of this system is it can only monitor the ECG of the user only if the user is at rest state. Whereas the proposed system is having a capacity to continuously monitor patients in all states such as mobile or immobile.

III. PROPOSED SYSTEM

This proposed system is proficient to use for continuous monitoring of the user's heart rate at different environments such as home, work place or any other place and while resting. This wearable device consists of 2 lead chest electrodes, sensors, amplifiers, transmitter and Bluetooth feature. The electrical signals which are developed from the heart are captured by the lead chest electrodes, amplified and filtered using amplifiers and microcontroller. The ECG signals are transmitted to the mobile phone through Bluetooth then to the server or cloud and then to the monitoring system. When there is high variation in the user's heart beat compared to his/her normal heart beat an emergency message with heart beat per minute and live location will be sent to the Doctor or concerned person so that they can easily track the user and can be saved on time.

The main advantage of this proposed system is cable movement since the electrodes are only connected to the body there is no restrictions for body movement or any muscle activity, Also doctor can access the ECG graph anywhere anytime across the world.

IV. LITERATURE SURVEY

Now a days there are more number of heart attacks take place so this proposed system may help to reduce them by its real time monitoring of user's heartbeat. In this paper a real-time heart beat tracking system is developed. Internet Of Things has become a main stage for many services & requests and also using raspberry pi microcontroller act as a controller here. [1] Heartrate of the user can be seen by the guardian or concerned person without visiting patient so this will play a very important role when the user and doctor are at different place.

The technology for monitoring heart rate using the wearable device is designed and performed in this paper. [2] The idle or normal heart rate of the user is previously stored in the database. Then the live heart rate and previously stored heart rate at database both are compared which helps to determine the abnormal heart rate variability.

Many countries are facing the problem to maintain and monitor the health based issues of the aged people. To overcome this selected people can be at their home and be monitored using wearable device which is proposed in this system, which helps in saving hospital resources. With respect to heart beat monitoring, there are other wearable devices which use optical techniques by shining light through the skin [4]. These type of gadgets use a method called photoplethysmography (PPG) to measure heart rate. However, this is not so accurate so doctors won't recommend it.

Disease	Heart Rate
Bradycardia : Slow Heart Rate	Less than 60bpm
Atrial Fibrillation	300-400 times a minute
Atrial Flutter	300 times a minute
Ventricular Tachycardia	Greater than 170bpm
Long QT Syndrome	Less than or equal to 110bpm
Heart Attack	Greater than 100bpm

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Issue:05/May-2020 www.irjmets.com

V. ARCHITECTURE

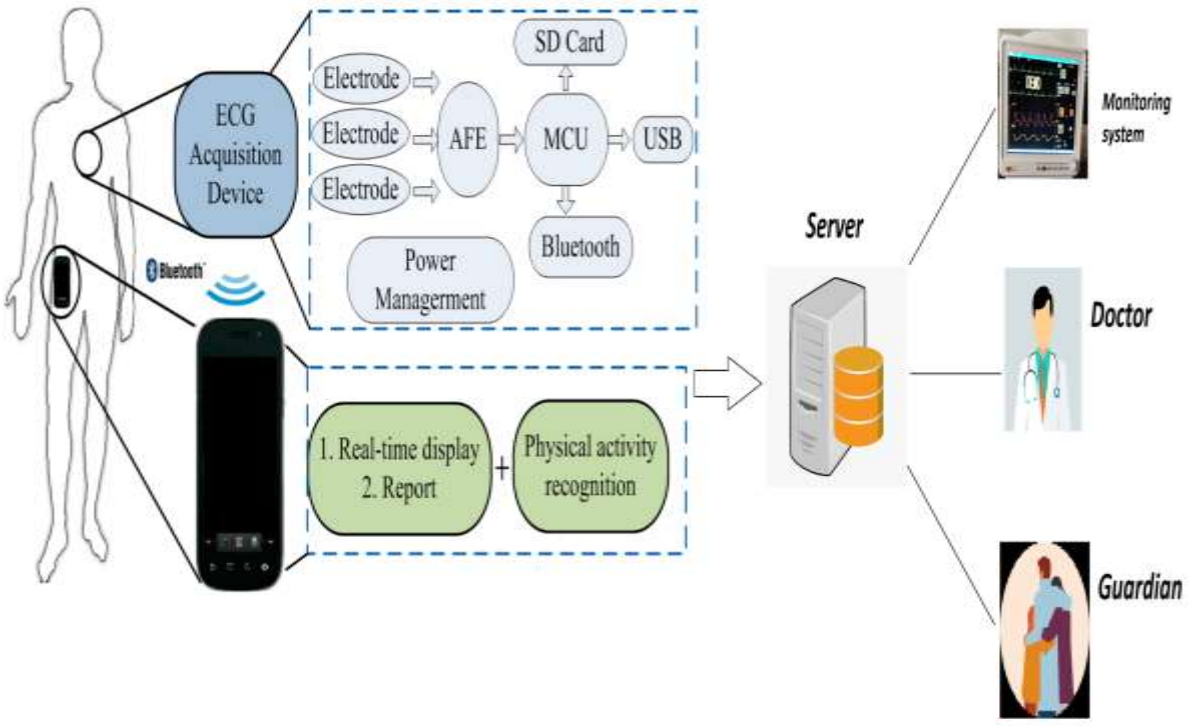

Fig-2 : Architecture of heart beat monitoring system.

VI. METHODOLOGY

The System consists of Internet OF Things (IoT) based wearable hardware device which mainly consists of 3 electrodes which is to be placed on chest. Here the electrical signals from the electrodes are input to this proposed system. These electrical signals which are generated in our body are not in a pure electrical form. They are ionic currents of positive and negative ions from one point to another. Electrodes convert ionic conduction in the tissue to the electronic conduction, which is necessary for making measurements. Basically, ECG signal which are obtained from an electrode is very small in amplitude, and it ranges around ± 2.5mV, a weak signal. To amplify these low ECG (Electrocardiogram) signals this system uses variable gain amplifiers. Gain amplifiers convert weak signals into strong signals. Here the AD620 is used as a gain amplifier which has high accuracy, high CMRR, adjustable gain and high input impedance. High CMRR of the AD620 reduces the interference caused due to common mode voltages.

Here we used ARM Cortex M3 LPC1768 microcontroller which is considered as heart of the system. This controller has in built ADC for converting signals from analog to digital. From microcontroller the digital samples are sent to mobile phone via Bluetooth. Programming of the microcontroller is done in embedded C language code. For converting analog signals of ECG into digital the LPC1768 has an in built 12-bit successive approximation ADC which is multiplexed among 8 input pins. It has several features which are useful to us. It is very useful for digitizing the bipolar ECG signals. It gives parallel 12-bit output for further processing. This data is transferred to mobile phone which is connected via Bluetooth. Then the mobile sends the data to the server/cloud and it is stored. Further server sends this data to monitoring system to monitor the ECG graph of the user and If there is abnormal variation in heartbeat of the user, the web services invokes the SMS module to send alert message along with the heart beat per minute and live location to the doctor and the guardian of the user.

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:02/Issue:05/May-2020 www.irjmets.com

CHEST STRAP:

Fig-3

This chest strap consists of electrodes which are also connected to ECG amplifier and LPC1768 ARM Cortex M3 Development Board as shown in the figure. Here the signals from the electrodes are taken as input and these signals are processed.

AD620:

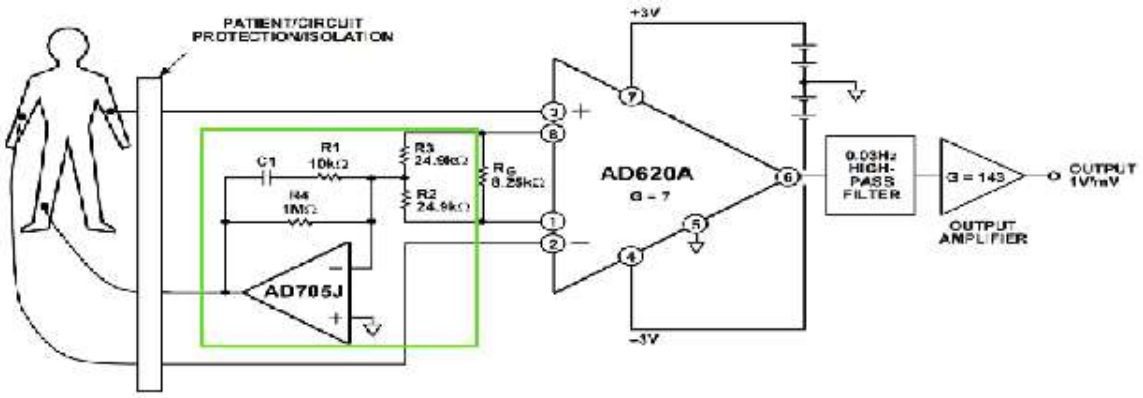

Fig-4

The AD620 is a low cost, high accuracy instrumentation amplifier that requires only one external resistor to set gains of 1 to 10,000. Furthermore, the AD620 features 8-lead SOIC and DIP packaging that is smaller than discrete designs and offers lower power (only 1.3 mA max supply current), making it a good fit for battery-powered, portable applications.

ARM Cortex M3 LPC1768:

Fig-5

The LPC1768 is a Cortex®-M3 microcontroller for embedded applications featuring a high level of integration and low power consumption at frequencies of 100 MHz. It includes 512 kB of flash memory, 64 kB of data memory, Ethernet MAC, USB Device/Host/OTG, 8-channel DMA controller, 4 UARTs, 2 CAN channels, 3

SSP/SPI, 3 I2C, I2S, 8-channel 12-bit ADC, 10-bit DAC, motor control PWM, Quadrature Encoder interface, 4 general purpose timers, 6-output general purpose PWM, ultra-low power Real-Time Clock with separate battery supply, and up to 70 general purpose I/O pins.

VII. RESULT

Wireless ECG Monitoring System is successfully designed and constructed. Below is the ECG waveform which is recorded from this system. The signals are recorded into mobile phone via Bluetooth and further mobile sends these data to the server/cloud. Further the signals are processed into monitoring system to get ECG graph as shown below. So that the doctor can easily monitor the user's heart rate without having the user in person.

Fig-6

If there is more variation in the user's heart beat above or beyond the range then alert message will goes to doctor and guardian of the user.

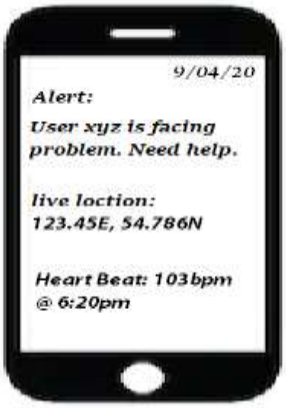

Fig-7

VIII. CONCLUSION

This proposed system is a simple solution for real time heart rate tracking and abnormality alerting. The system can be used to determine and monitor the idle heart rate for each and every person which creates an emerging awareness in a secure way. By this system one can check the user's heart rate at any place even if the user is in mobile state. Heart rate of the user can be seen by doctor or guardian without visiting the user. The normal heart rate of the user is stored in database so that it can determine the normal and abnormal heart rate variability and send alert message.

IX. REFERENCES

[1] An intelligent sensor based system for real time heart rate monitoring by N J Farin, SMA Sharif in 2016.
[2] FPGA Based Heartbeats Monitor with Fingertip Optical Sensor by W Kusuma, Y Rianto in 2014.

[3] The Real Time Wireless sensor Network for Heartbeat Monitoring Using Zigbee Module by S Singh, R Singh in 2012.

[4] Energy efficient heart rate sensing using a painted electrode ECG wearable by S Krachunov, C Beach in 2017.

[5] Lilly, Leonard S, ed. (2016). Pathophysiology of Heart Disease: A Collaborative Project of Medical Students and Faculty (sixth ed.). Lippincott Williams & Wilkins. p.74.