A Survey on Tracing Heart Attacks by Pulse Monitoring in IoT

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ABSTRACT - Safeguarding one’s health is optimal for longevity and a good life. Heart attacks have become so common amongst the public due to the lifestyle and food habits being followed. Early detection of an oncoming heart attack can help reduce seriousness of the incident and safeguard the patient’s health. Technology has always been used in healthcare and has proved to be extremely beneficial. Internet of Things is a phenomenon that is utilized in day to day human activities. It is an interlinked collection of hardware devices, home appliances that are interfaced with electronics, software, sensors, and actuators. Internet is the backbone of connectivity and Things mean objects or devices. Sensors play a vital part in the field of IoT. To provide a system where heart attacks can be detected early, heart beats of the patient are monitored using a pulse sensor and a temperature sensor, which is then interfaced with a microcontroller. This sensor will be installed in a wearable device. When the heartbeat of the patient exceeds a certain threshold value, an alert will be sent to the remote family, and the medical authorities with the help of the Internet. Sensor is used for sensing the heart beats. The microcontroller receives these beats and evaluates pulse. If the pulses are above or lower than the threshold value, the microcontroller initiates WiFi module and sends out distress message to mobile contacts previously stored inside microcontroller.

1. INTRODUCTION

Internet of Things is a widespread concept in the technological domain now. It supports a large system of devices that are connected to the Internet as well as other devices in a real time environment. It is about collecting and sharing data in regard to the way they are used and the environment around them. Most IoT activities in human services spun around the improvement of care with the service of remote observing and telemonitoring as principle applications. Numerous activities exist that utilize interned and RFID. This is done on the dimension of technologically driven gadgets and human services resources, the general population level and the nonmedical resource level (for example emergency clinic building resources). By 2019, 87% of social insurance associations will have received IoT innovation. Heart attack prediction is a boon to save lives and follow the rule of prevention over cure. Heart attacks can be detected by analysing the number of times the heart beats in sixty seconds, that is, in technical terms – beats per minute (BPM). If the pulse rate deviates from the upper and lower limits (60-90), it is considered as a sign of an oncoming heart attack. A pulse rate
2. LITERATURE SURVEY

Peter Leijdekkers et al. [1] of University of Technology, Sydney proposed an arrangement of individual trial application, which diminishes defer time between beginning of heart assault and a notification to the crisis administrations. The individual test comprehends these issues by utilizing inescapable innovation: a cellular device and a little ECG sensor which can be worn and is effectively conveyed by the individual. By soliciting a set from inquiries, the individual acknowledges what they went through can be a heart assault. The application additionally investigations two ECG chronicles on the cellular device for heart assault signs to affirm this. In this way, the application can rapidly survey the client's condition and give suitable exhortation without the intercession of a therapeutic expert. It additionally directs the client and spectators in getting the correct help via computerizing the call. The ECG is recorded and dissected progressively on the cellular device utilizing a 2 terminal, 1-lead heart monitor. The calculation utilized here can identify the heart beat anomalies, for example, ventricular tachycardia. In the event that the application finds out that the user is in danger it encourages the user to notify the authorized administration right away. In a situation that user has a heart failure the system consequently decides the present area of the user and alarm the emergency ambulance and other required people to the user's area.

Dr.A.A.Gurjar et al. [2] of Sipna COET, Amravati, proposed a framework where heartbeat is checked and heart assault location is noted. The sensor used is interlinked to a microcontroller that allows reading pulses and sending them over Internet. The user may set the high and low limits of heartbeat. Later, monitoring begins to check if the heartbeats are crossing the limits either way. The transmitting circuit with the patient and the other circuit with the authorized personnel are used. Heartbeat sensor is used to identify the current pulse rate and display it on the LCD screen. This suggested system can be used in all places without any constraints. There is no obligation to stay at home and use the device.

Nikunj Patel et al. [3] of CSPIT, CHARUSAT proposed a framework which has a distinction of identifying heart assault with assistance of watching pulse dependent on web of thing. Our strategy utilizes a heartbeat sensor, Arduino board and a Wi-Fi module. In the wake of setting up the framework, the beat sensor will begin detecting pulse readings and will show the heartbeat of individual on LCD screen. Likewise, with the utilization of Wi-Fi module it will transmit the information over web. Framework permits a set point which can help in deciding if an individual is sound or not by checking his/her pulse and contrasting it and set point. In the wake of setting these limits, the framework will begin checking the pulse of patient and quickly the pulse goes above or beneath as far as possible the framework will send an alarm message. As a piece of this undertaking we are executing an android application show that will follow the heartbeat of specific patient and screen it effectively and give the crisis message on odds of heart assault.

K.S.Abbirame et al. [4] of KVCET, Chennai, Tamil Nadu, India proposed a developing framework which will diminish the demise rate because of heart assault by early location of heart assault. In our framework we are utilizing pulse sensor, GSM and GPS to quantify the pulse and offer the data. The pulse sensor will ceaselessly screen pulse of a client. We effectively set the edge an incentive in the framework. When it goes beneath or over the edge esteem, the microcontroller will initiate the GSM and GPS to share the data with area of the client to the closest wellbeing division and to the relatives. The structure will create a message at whatever point the client's pulse ends up unusual, with his/her area to the closest wellbeing area and to the recently put away relatives number.

A.Dutta et al. [5] of Institute of Engineering and Management, Salt Lake, Kolkata, built up a gadget
utilizing miniaturized scale controller and heart beat sensor. It identifies beat rate as well as demonstrates the infection suggested by the example portrayed by the pulse. The client first sets his age and sexual orientation before running the machine. The miniaturized scale controller checks the bit rates consistently and passes on the patient through its presentation and alert segment the state of the patient. Understanding is additionally guided for the need of any crisis drug or discussion with a specialist. There will likewise be arrangement for demonstrating the client his/her most extreme work force with the goal that they can push their limits prompting a sound way of life. Gadget is utilized for 24 hours and recorded information stays accessible for examination. The client can comprehend what is the genuine state of the working of his heart without relying upon doctors. This gadget is a stage forward to bio-electro joint effort. This is a wired gadget further act of spontaneity of remote element can be introduced to it. Direct specialist video connection can be give or appended to it. Wi-Fi association with the Smart gadgets can be set up in it. This gadget all in all substance can not just control (to some degree) essential heart issues which is an issue of each family unit yet can likewise give an inspiration to expanding working limit by demonstrating the individual the degree of his pulse. This gadget can even control demise the same number of individuals bite the dust on their approach to clinics since they can't be furnished with the essential controlling drug which can deal with their circumstance for some additional time.

Samar Ali et al. [6] of Abu Dhabi University, UAE, they proposed a system that checks for vehicle impact through the identification of heart assaults that drivers may experience the ill effects of. They introduced the system of the administration empowered through a technology for IoT systems and two varieties. They proposed a voice controlled mobile heart attack detection service display and a motion-controlled show. Both fuse sensors from savvy; provided its fame with clients and expanding accessibility. The principal variety of real time mobile heart detection system just thinks about what the client could utilize administration in vehicles, while second variety helps the client outside vehicular system settings. They additionally talked about the system and presented associated work and foundation data of the innovations that it uses. They likewise wanted to consider programmed recognition of heart assaults through the usage of the heart's movement when solid FDA-endorsed ECG sensors are fused in wearable gadgets.

Pughazendi N et al. [7] implemented a system where protection evaluative measures for both driver and the vehicle are enhanced. The paper suggests the usage of sensors. Heartbeat sensor is utilized for screening heartbeats in 60 seconds of the driver continually and keeps mishaps from occurring by controlling through internet. Internet is connected to various devices and thus passes on the crisis notification to the required authorized people. Traffic light sensor is utilized to pursue the traffic principles and guidelines by the driver. In the event of the red light being ON, at that point the vehicle consequently stops before it reaches the said fixed line. Fuel level sensor is utilized to quantify fuel level of the vehicle and figure if accessible fuel is sufficient to achieve to goal or not, in the event that it isn't sufficient, at that point guide will recommend the driver to achieve the close-by petroleum bunks.

Arulananth T.S et al. [8] suggested in the respective paper that heart rate is measured by either the ECG waveform or by sensing the pulse of the user. The cadenced development and withdrawal of a supply route of blood is constrained through it by the customary withdrawals of the heart. The beat can be felt from those zones where the course is near the skin. Portrayal of a method of estimating the pulse through the tip of the finger and Arduino microcontroller is performed. It depends on the chief of Photo-Phelthysmography, which is non-intrusive strategy for estimating the variety in blood volume in tissue utilizing a light source and indicator. While the heart is pulsating, it is siphoning blood all through the body, and that makes the blood volume inside the finger course to change as well. This variance of blood can be distinguished through an optical detecting instrument put around the fingertip. The flag can be enhanced and is sent to Arduino with the assistance of sequential port correspondence. With the assistance of preparing and programming, pulse observing and tallying is performed.
D. Selvathi et al. [9] argues that there is no particular dedicated system for heart attack prediction and that a patient is monitored only after he/she has suffered a heart attack. Heart attack can be detected by observing the pulse rate of the patient, that is, the beats per minute of the patient’s heart. At an incident that the beat rate other than the limit fluctuation (60-90) occurs, it is treated as a sign of heart assault. A heartbeat sensor is utilized for detecting the heart rate signals. The microcontroller tallies these results and verifies the beats. At an occurrence where the beats are more prominent or below than specific dimensions, the microcontroller enacts mobile communicative module and transmits alarm indication to important contacts stored in a mcu. The created framework is tried with estimation of both genders.

Ponugamatla Kalyan et al. [10] discusses about the accurate and exact prediction of a heart disease by observing ECG and patient clinical data. This paper proposes a heart detection and monitoring system using Arduino and Raspberry Pi 3. An AD8232 heart rate sensor module is interfaced to the Arduino board, and Arduino board serially communicates to the raspberry pi board. NEO6MV2 GPS module is interfaced to PL2303 USB to TTL for performing a function of USB to UART in between the raspberry pi and GPS. The software sketch we used here is python to control the entire system and to store all the sensor data in the cloud using the HTML and Wi-Fi. It offers security and facility for retrieving all the sensor information, and subject heart condition can monitor from at any time and any place in the world over the internet or mobile phone. This design system which is very helpful to patients produces, if there are any, changes in the condition of the health. We have to immediately alert the corresponding doctor or the referring physician for further treatment processes and notifications about the medicines, location change, etc.

Lei Song et al. [11] of Institute of Interdisciplinary Information Sciences, proposes technologies wherein sensors that are portable and can be put on as well as devices such as mobiles can help maintain a record of the user. It screens the ongoing body states, stores, or sends the outcome to remote relatives or specialists. Along these lines, it can either help individuals to give more consideration to the ignored wonder, for example, the sign of hazardous sickness, or on the other hand help individuals to issue alarm ready when crisis occurs. To coax out the innovative favourable circumstances that difficulties and challenges, this paper displayed an overview on the best in class of well-being detecting advancements utilizing body sensor systems and cell phones.

It additionally directs rundown what's more, examination of related detecting frameworks and calculations, to uncover the advancement lines in each subarea.

Ufoaroh S.U et al. [12] presents a system equipped for giving continuous remote checking of the heartbeat with enhancements of a caution and SMS alert. This venture goes for the plan and usage of a minimal effort yet productive and adaptable heartbeat checking and ready framework utilizing GSM innovation. It is structured so that the beat rate is detected and evaluated by the sensors used that send the signs to the control unit and the results are shown on a LCD, it at that point continues to caution by an alert and SMS sent to the cell phone of the restorative master or wellbeing work force, if and just if the limit estimation of the heartbeat rate is maximally surpassed.

3. SURVEYED TECHNIQUES

A. Heart beat sensing

A heartbeat sensor evaluates the heart rate through the beats retrieved from fingertip. When the heart beats, it pumps blood into the artery of the tested fingertip.
This action results in a change in the blood volume which is then noted by heartbeat sensor. The finger has two sides where infrared light source from the sensor resides on one side and a photon detector on another side to measure change in the blood flow. A PPG waveform is detected in this process. This PPG waveform is in sync with the heartbeat. The patient’s heart beat is monitored and recorded to keep checking for any abnormal condition. 60-110 is the ideal range of heart beats per minute. Heart beats per minute exceeding or lowering this range can indicate a risk of a heart attack. These values are interfaced with the microcontroller.

B. Sensor Interfacing

The microcontroller controls the entire procedure of framework like perusing beats from the sensor module, computing pulse and forwarding this information to the liquid crystal display. It stores information got from the sensor and is essentially interfaced with it.

C. WiFi Interfacing

In the case of an abnormal heart beat reading, an alert message is sent through this module to the respective persons like the doctor/nurse and the remote family of the patient/user.

4. FUTURE SCOPE

1) An LCD screen to be utilized to display a variations in heart rate over a period of time
2) Sound to be added to the device so that a sound signal is outputted every time a pulse is received.
3) The maximum and minimum values of heart rates over a duration of time can be shown.
4) Serial output heartbeats to be attached to the device so that the heart rates can be sent to a PC for future analysis.

Most importantly, primary focus is on extending the functionalities of the prototype by adding a GPS tracker. The GPS tracker will alert the user/patient with a list of hospitals near him so that he can seek immediate help. This list of hospitals and clinics will be sent with the alert message through internet or GMS module when the pulse rate falls short of 60 bpm or crosses 110 bpm. GPS follows distance measurements to satellites. The system requires utilizing four satellites to locate the user’s position. The last, that is, the fourth satellite determines the target location whereas the other three satellites are used to track the location place. GPS will track the user’s latitude and longitudinal positioning. Using this principle, the location of the patient can be determined and the addresses of the nearby hospitals can also be determined.

5. CONCLUSION

It can finally be concluded that a prototype has been created that senses the pulse rate of a patient in need by using a heartbeat sensor that is wearable. The beats per minute are calculated and stored in the microcontroller which then transmits the stored value to the LCD screen for the user to view. This value is also transmitted over the internet to an open sourced platform using a WiFi module. When the pulse rate falls below 60 bpm or crosses over 110 bpm, an alert is sent to the required people that vie patient is in danger. In future, a GPS tracker can also be added in order to transmit addresses of nearby hospitals to the patient at the time of danger or immediate assistance.
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