Heart Attack Intimation and Easy Monitoring System using IoT

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Abstract: IoT is a system of connecting things (Computing Devices, Objects, Peoples, Animals etc) to the internet and transfers the data over the network without the human to human and human to computer interaction. The idea behind the IoT is to design smart devices in such a way to utilize every bit of data that we use and share in our everyday life. IoT connected in various applications as smart home, wearable, connected cars, Industrial internet, Smart cities, Agriculture, Smart Retail, healthcare etc. This paper utilizes the application of healthcare for monitoring the heart attack symptoms and intimating to their family/friends circle. Wearable sensors were used to monitor the parameters like glucose level, pressure, heart beat and display the symptoms in LCD. When the abnormal condition is detected the alert message is send to the health care center with the location of the person using GSM/GPS technology and to family/friend circle. The main purpose of GSM/GPS is to provide the easy healthcare for patients in remote areas. The proposed work reduces the time, easy to reach the patient, helps to track the patient current condition by the doctors, and creates self-awareness for the individual. A heart attack is a world 'It helps to save many lives by alert messages whenever the abnormality is observed and reaches the patients.

Introduction

Numerous patients in the remote region facing difficulties and die due to long distance traveling to the hospitals. The telemedicine evacuated this obstruction utilizing of progressed IoT innovation. Telemedicine is totally dependent on IOT, this IoT development gives a phase to progression and change of tele-social protection and telemedicine. IoT innovation is nothing yet, a large number of entities around us are interconnected and interface between each other. The objects can detect information and share them. IoT idea was fundamentally developed from the RFID advancement group in the time of 1999. As of late, this innovation is ending up more prominent because of a lot of use of cell phones, implanted framework correspondence, and database distributed computing Anandakumar & Umamaheswari (2017). IoT innovation has incredible future in up and coming days.

Now a day's IoT is a growing up technology on earth. It connects the all over the things together to access from we are located. The Internet of Things is creating a new world, a quantifiable and measureable world, where people and businesses can manage their assets in better informed ways, and can make more timely and better informed decisions about what they want or need to do. This new connected world brings with it fundamental changes to society and to consumers Anandakumar & Umamaheswari (2017)a. By sensing our surrounding environment, the IoT will create many practical improvements in our world, increasing our convenience, health and safety, while at the same time improving energy efficiency and comfort.

The IoT will be a new source of wealth creation. It has numerous applications in healthcare, from remote monitoring to smart sensors and medical device integration. It has the potential to not only keep patients safe and healthy, but to improve how physicians deliver care as well Anandakumar & Umamaheswari (2017)b. Healthcare IoT can also boost patient engagement and satisfaction by allowing patients to spend more time interacting with their doctors. In this project, we're going to use this technology for heart attack. The goal is to simulate the usual appearance of papers in Conference Proceedings or Journal Publications of the McGraw-Hill Press. We are requesting that you follow these guidelines as closely as possible.

The average annual morality rate for congestive heart failure is 10% per year with a 50% five-year survival rate. Our project is to monitor blood pressure and heart beat. Determine the risk and hospitalize victim immediately. In the recent year, technologies have been used for health care. This technology is based on various types of devices, such as embedded environment, the personal device like cell phones, tablets etc. The main cause of death in the world is Cardio-vascular Disease (CVD), representing 30% of all global deaths. Worldwide about 17.5 million people die of Heart Attacks or Strokes each year, according to the World Health Organization (WHO) . After a sudden death of any person from a heart attack, it is

often heard that the family members could not understand that the pain was a heart attack. Most of the people consider the pain of heart attack as a pain from some other physical problem or disease like gastric.

Tele-health can be characterized as gadget which conveys human services and clinical information of the patients to the remote wanted areas. Tele-health is affirmed by FDA. Tele-health has different stages which interface patients to specialists 24*7 intelligently utilizing web, IoT innovation, video meetings, Arulmurugan et al.(2017) keen mobiles and database distributed computing.Tele-health is an incredible answer for development in wellbeing organization in the 21st century. Tele-health frames an umbrella which incorporates a few administrations, which are given below:

- Telemedicine: Telemedicine is the binding mobile communication and clinical data innovation which gives clinical counsel in any remote area or any crisis treatment. It is triumphs in dealing with 78% critical cases proficiently
- Telemonitoring: Using IoT innovation collecting patient parameters like temperature, pulse, BP, ECG, and SPO2 and so on and sending that gathered information to medical hospitals for remote examination and treatment. Telemonitoring administration encourages that ready framework that sense data of patient's body parameters to significant specialist/nurture, if threshold limits of parameters goes below.
- Telemonitoring Using Android Technology: Patient telemonitoring system using Java engaged 3G cell advanced mobile phone enables experts to screen fundamental parameters like ECG, Respiration rate, heart rate SPO2, temperature etc, of patients in ICU using the continuous waveform and data checking limit of presented Java build application in light of the advanced cell.

The proposed system is to monitoring the person continuously from remote areas using wearable sensors. This system consists of many sensors such as pressure, heart beat. The Pressure sensor is used to find the pressure level of a person. Heart beat sensor has calculated the pulse rate of the person. Data are collected and analysed using Arduino Uno microcontroller. Based on the predefined values it compares and displays the information about the person with stage in liquid crystal display using embedded c coding. If it exceeds that condition immediately send the information message service (SMS) alert to the mobile phone of healthcarecenter with the location of the person and the condition of the person that abnormal details via SMS by SIM908 GSM/GPS.

In this paper, literature survey is conducted for better development of heart rate monitoring system by considering drawbacks of existing systems. Later section discussed with proposed works that gives accurate heart rate which are periodically update lively with patients through IoT.

Existing System

There are some drawbacks in existing systems. The patient is checked in ICU and the data traded to the PC is wired. Such structures get the opportunity to be troublesome where the detachment among System and PC is more. The available structures are huge in size. Standard monitoring of patient is unreasonable once he/she is discharged from specialist's offices.

HU (2008)., proposed a heartbeat monitoring system and alert system that is able to monitor the heart beat rate condition of patient. The system determines the heart beat rate per minute and then sends short message service (SMS) alert to the mobile phone of medical experts or patient's family members, or their relatives via SMS. Thus, doctors can monitor and diagnose the patient's condition continuously and could suggest earlier precaution for the patients themselves. This will also alert the family members to quickly attend to the patient. But this system only monitor the heart beat so there's way to send the alert message during the exercise time also, because it only focuses on the heart rate and the main problem in this system is, the system only sends the persons condition to the doctor, it's impossible to listen and obey their precautions on that situation.

In Malhi et al (2012), proposed a system to recognize their own body conditions at any time along with first aid facilities and also gives solution by medications for temporary purpose under emergency conditions. This project helps in diagnosing the health of both in and out patients. In this system monitor the heart beat rate and whenever the heart beat rate is getting higher it sends the message to the doctor and gives some medical advices through the audio, and it first aid the person for the emergency condition. The main drawback from this system is that it doesn't share the location and only share the patient's body condition to the doctor. The system will not able to give first aid the patient through the wearable devices which has space and size complexity.

In Rahman & Kubota (2016), proposed a system for monitoring a health continuously without hospitalization using wearable sensors. Wearable sensors monitor the parameters of the human body like temperature, pressure, heart beat by using sensors and also display the symptoms in the LCD Reztsov (2015).. For emergency the alert message is send to the ambulance or to the doctor's mobile phone using GSM technology. But lack of interaction with patient and doctor during emergency .so we need to share the location of the person by using GPS tracker.

In Sandhu (2015), proposed a system to monitor continuously by using the sensors and GSM technology. This project deals about the implementation of GSM technology in Medical applications. This wireless communications would not only provide them with safe and accurate monitoring but also the freedom of movement. In this, heart beat and temperature of patient are measured by using sensors as analog data, later it is converted into digital data using ADC which is suitable for wireless

transmission using paging messages through GSM modem. But the problem of this proposed system just senses the body condition and if any critical sends the message to the doctor, that's not enough to prevent the patient from the heart attack.

In Sawaguchi et al (2016) developed a system to measure vital signs of the body. The main vital signs routinely monitored by medical professionals and health care providers include the Body temperature, Heart rate, Blood pressure. Vital signs are useful in detecting or monitoring medical problems. Vital signs can be measured in a medical setting, at home, at the site of a medical emergency, or elsewhere. The emergence of wireless technologies and advancements in on-body sensor design can enable change in the conventional health-care system, replacing with wearable health-care systems, centered on the individual. Wearable monitoring systems can provide continuous physiological data, as well as better information regarding the general health of individuals. Thus, such vital-sign monitoring systems Silva et al (2016) will reduce health-care costs by disease prevention and enhance the quality of life with disease management. But the drawback of this proposed system is just share the body condition of the patient by GSM technology; we need to share the location of the person by using GPS tracker attached with the wearable devices for easy tracking. The data about the person should store in the database for analyzing the patient conditions.

Proposed Methodology

The proposed framework main goal is to observe the patient health status continuously and notification will be send to the specialist or nurse at the right time if the patient is a hazard. The entire working principal is given in stepwise:

      Step 1: Pulse sensors are connected to the patient and collect data through transmitter to the central health station.

      Step 2: When the parameters such heart rate transmitted using PC based application via receiver, parameters are updated into database through IoT

    Step 3: Android application is developed that fetches parameters for every change and send SMS to the smart phone application.
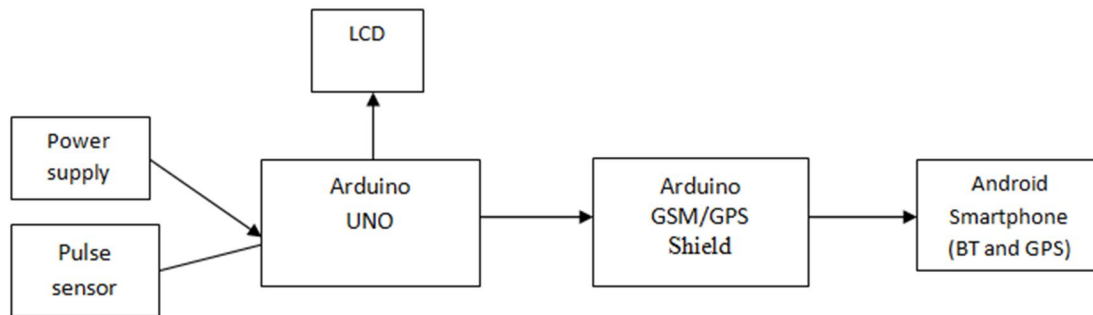

Figure1. Block diagram of the heart attack intimation system

In this proposed method "Heart attack intimation and easy monitoring system" as shown in block diagram **Figure1**, the heart beat rate is detected using photo plethysmo graph (PPG) technique. This signal is processed using a PIC16F87 microcontroller to determine the heart beat rate per minute. It senses the heart beat rate and pulse rate of the person continuously. Whenever the heart beat rate and pulse rate goes higher and lower than the certain level of limit the SIM908 GSM/GPS module sends the alert message to the healthcare center and family members that the abnormal body condition level with the location to find the person easily. In this method, the pulse sensor uses the PPG method to sense the pulse rate. PPG is a simple and low-cost optical technique that can be used to detect blood volume changes in the micro vascular bed of tissue. Frequently, it is used non-invasively to make measurements at the skin surface. A PPG is often obtained by using a pulse oximeter which illuminates the skin and measures changes in light absorption. Typically, a PPG tools use an emitter-receiver pair to determine blood flow. It consists of a matched infrared emitter and photodiode, which transmits changes in infrared reflectance resulting from varying blood flow.

This sensor is mainly used to measure the pulse rate of the heart in digital output when a finger is placed on it. LED is used to detect the heart rate. The normal heart beat of the person is 78 BPM. It is measured based on the beats per minute. If the heart beats more than 100 BPM causes Tachycardia. If the heart beats less than 60 BPM causes Bradycardia(slow heart rate). Whenever the heart beat level is crosses these levels the alert intimation function will be turn on.

Experiment And Results

From this proposed system the pulse rate sensor and heart beat sensor sense the pulse rate and heart beat rate after take the data from the person and the data are analysed then the body condition is critical the system will take the next step that sends

the SMS to the healthcare centre/doctor and the family members with the location of the person. Figure 2-4 shows the GUI of Arduino for displaying the heart rate.
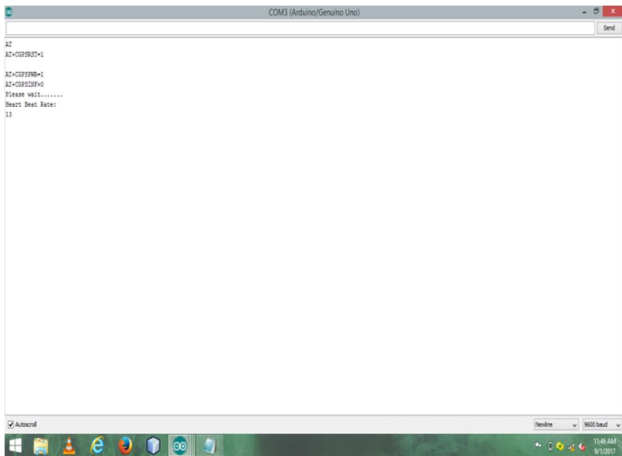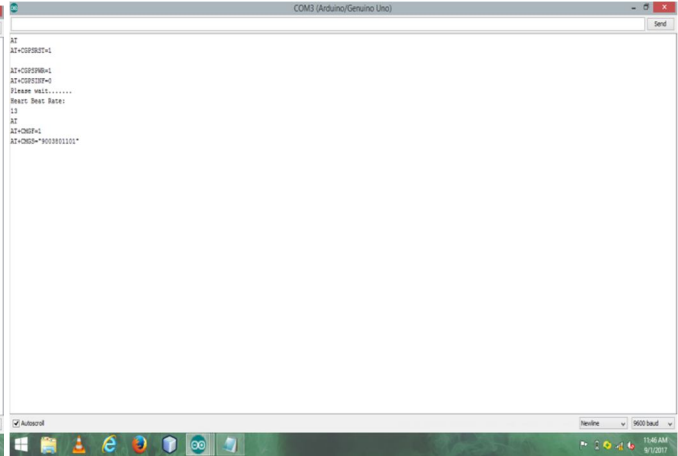

Figure 2. System sense the heart beat rate

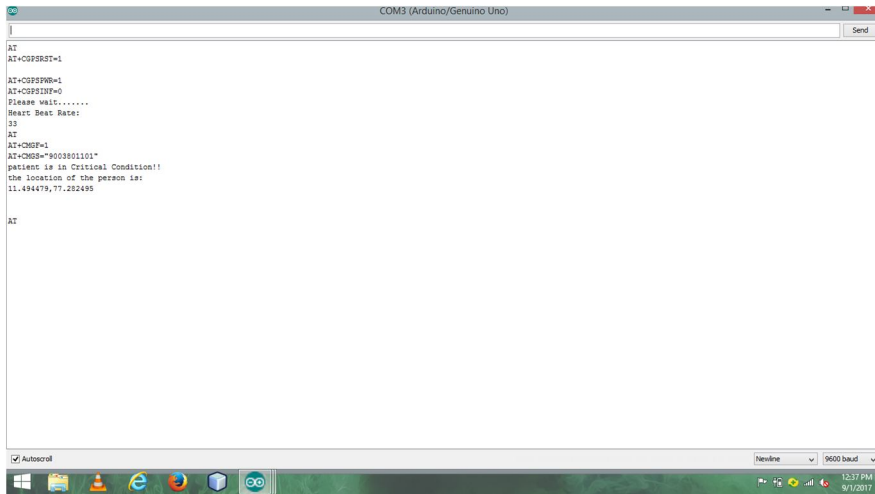Figure 3. System sends the message to the required person

Figure 4. System also sends the location and condition of the person

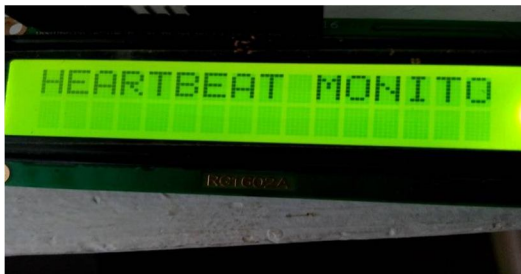By using LED display (Figure5-6) which gives visual rate of heart beats in counts.

Figure 5. Display Screen

Figure 6. Display Heart Beat rate

Through Figure7 the SMS message display confirms that patient condition anytime to doctor and also location can be easily identified with this message. So doctors can reach quickly reach the patient without delay.
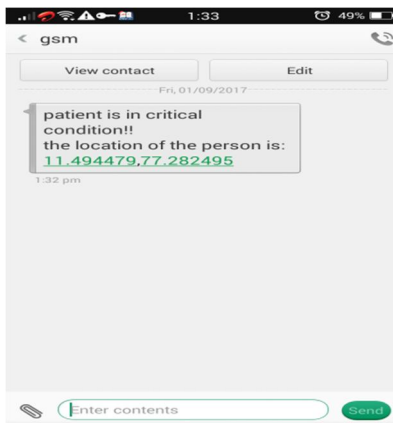
Figure 7. Mobile screen SMS content

Conclusion

This work proposed and focused on the heart attack monitoring and alert system by monitoring the heart beat rate and relevant parameters of the patient. The system monitors the heart beat rate per minute, pulse rate with the fixed parameter value and if any variation observed then the system will send the short alert message (SMS) to the mobile phone of medical experts (family doctor) or patient's family members, along with the location of the patient. Hence doctor can monitor and diagnose the patient's condition continuously and could suggest precaution measures which will help to save the patient life till the patient reaches the hospital. This will also alert the family members to quickly attend to the patient. The system is designed with cost-effective and user-friendly manner; in-order to make any class of users utilizes the system to save their precious life. It is a very efficient system and very easy to handle and thus provides great flexibility and serves as a great improvement over other conventional monitoring and alert systems. The heart attack monitoring system will create a revolution in the healthcare sector.

Future Scope

For project demo concern, we have developed a prototype module. In future, this project can be taken to the product level. To make this project as user-friendly and durable, we need to make it compact and cost-effective. Going further, most of the units can be embedded along with the controller on a single board with the change in technology, thereby reducing the size of the system.

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