

Automatic Cardiac Rhythm Monitoring System Using Internet Of Things

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ABSTRACT

Various people among us lose their life to heart attack. At present in India, the coronary episode passing rate is 34%. This is an aftereffect of their eating routine, age, less actual development and various parts. The primary driver of death during respiratory failure isn't giving prompt assistance to the patient. By constantly observing the beat rate and sweat of a patient, respiratory failure can be distinguished. The goal of this suggestion is to build up a high-profitability and minimal effort contraption which gauges the quantity of heart thumps every moment of the patient and recognizing the heart attack by putting sensors on any of the fingers (with the exception of thumb because of nonappearance of hairlike tissues) or at any spot on the body that the beat can be assessed from, and subsequently indicating the result on the chronic screen of the Arduino IDE. To build the precision of the framework, a dampness sensor is utilized to distinguish sweat cold. In the event that any irregularities happen, the GSM (Global System for Mobile Communications) module is actuated and it sends an alarm message to the versatile numbers which are as of now gave in the Arduino code. Utilizing the Google Maps API the closest clinic to the patient is found and the subtleties are shared to the closest rescue vehicle and relatives. The Electronic Health Records (EHR) is shared to the particular medical clinic before the appearance of the patient. The structure performs exact distinguishing proof and hint of messages to the unmistakable supervisors of the patients. Various lives may be saved in the short length by using this made structure.

Keywords—HER, Heart monitoring system, Arduino IDE, GSM, Google API.

I. INTRODUCTION

Cardiovascular failure happens because of the blockage of coronary vein halting the gracefully of blood. The quantity of beats every moment (BPM) will either be very low or high. Perspiring will be caused because of complex territorial agony disorder (CRPS) which

happens during a heart attack. The delay in the treatment of blockage prompts harm in the heart muscles. Fig. 1 shows the plaque arrangement on the dividers of the conduit subsequently diminishing progression of blood to the heart causing blood clump.

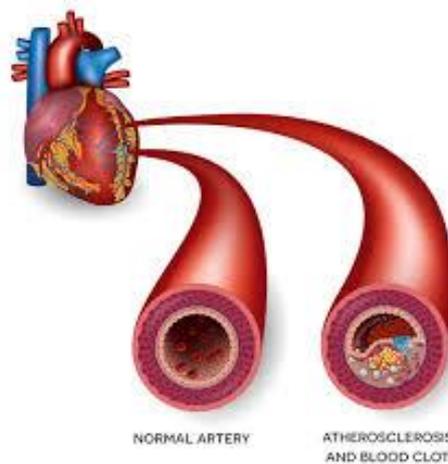


Fig. 1. Narrowed artery due to plaque arrangement.

Then the blood stream to the heart must be reestablished rapidly so as to spare the individual. On the off chance that the individual is in the crisis setting for manifestations of coronary failure he/she will go through certain tests like Electrocardiogram test (ECG), blood tests. Some extra tests like chest X-beam, Echocardiogram, Coronary Catheterization (angiogram), Exercise pressure test, Cardiac CT or MRI are taken. These tests postpone the treatment. It is imperative to look for guaranteed crisis help during a coronary episode to begin treatment at the earliest opportunity since a great many heart cells pass on consistently the blood stream is halted so it is significant give snappy treatment to the respiratory failure endured individual.

The web of things (IOT) has various applications in medical care applications like distant observing with assistance of the savvy sensors. These days there is an expansion in the quantity of heart illnesses which significantly incorporates coronary episodes. Consequently with the assistance of IOT savvy the coronary failure can be effectively recognized and the treatment can be given quicker.

Our framework screens the patients who have heart issues by consistently perusing the heart beat and detecting the dampness substance of the patients. At the point when the detected worth crosses as far as possible which is set, at that point an alarm message will be shipped off the given relatives. Closest rescue vehicle and medical clinic is found and quick assistance is given to the patients.

II. RELATED WORK

Arulananth.T.S, B. Shilpa [1] 2017, proposed a technique which measures the heart rate of a person through an optical sensing mechanism and Arduino. It uses Photo Plethysmo Graphy (PPG) to measure the variation in the blood volume. The infrared (IR) sensors are used to detect the density variation in the blood.

N.T. Bugtai, S.U. Chan-Siy, J.E. Chua, J.A. Flores, J.L. Wang [2] 2012, proposed a system to monitor and alert the patient and the people around him if there occurs any

abnormalities. The unusual behavior is detected by attaching ECG cables and electrodes to the patient's vest to detect the electrocardiograph signals. Temperature is monitored and these values are processed in the microcontroller and the result is displayed in the output.

Puneet Bansal, Meenal Malik, Ricktam Kundu [3] 2018, in this system an infrared transmitter and receiver circuit is used to implement Photo Plethysmography (PPG) to measure real time heart rate. The values are sent to Raspberry Pi which is used as a gateway. The Message Queuing Telemetry Transport (MQTT) protocol sends the data to the cloud. Alert messages are sent as mail and SMS to the user.

Marius Valerian Paulet, Oana Maria Neacsu, Andrei Salceanu [4] 2014, proposed a system to monitor remote patients. A specialized person is connected via a router to the IP address of the wireless monitoring system. The biomedical signal can be monitored easily.

Jatin Arora et al [5] 2014, developed a Heart Beat (HB) sensor which is accurate, less cost and an easy way to monitor the heartbeat. The user should keep one finger in between a Light Dependent Resistance (LDR) and a Light Emitting Diode (LED), the intensity of light falling on the LDR varies and these variations are amplified using LM324 and converted into pulses.

Valliappan.Sp, Prithvi Raj Mohan B, Rakesh Kumar S [6] 2017, proposed a system to monitor and provide help to the elderly people who are mostly alone. This system monitors the body temperature using temperature sensor, pulse rate using Photo Plethysmography (PPG) to detect arrhythmia, high blood pressure and sweating to monitor the Galvanic Skin Response (GSR) of a person.

Md Asaduzzaman Miah, Mir Hussain Kabir, Md Siddiqur Rahman Tanveer, M. A. H. Akhand [7] 2015, developed a system to monitor heart rate and temperature using portable devices. It then processes the data in the Arduino UNO microcontroller system and shows it on the Android application instantly. This is mainly developed for rural areas where there is no doctor nearby.

III. PROPOSED SYSTEM

A. *System Architecture*

The base of the Cardiac Rhythm Monitoring System comprises of Arduino UNO microcontroller. It has three segments: beat rate sensor, dampness sensor and GSM module. The beat rate sensor is connected to any of the fingers or any piece of the body where the heart beat can be detected. The dampness sensor is joined to the pieces of the body where there are more number of sweat organs.

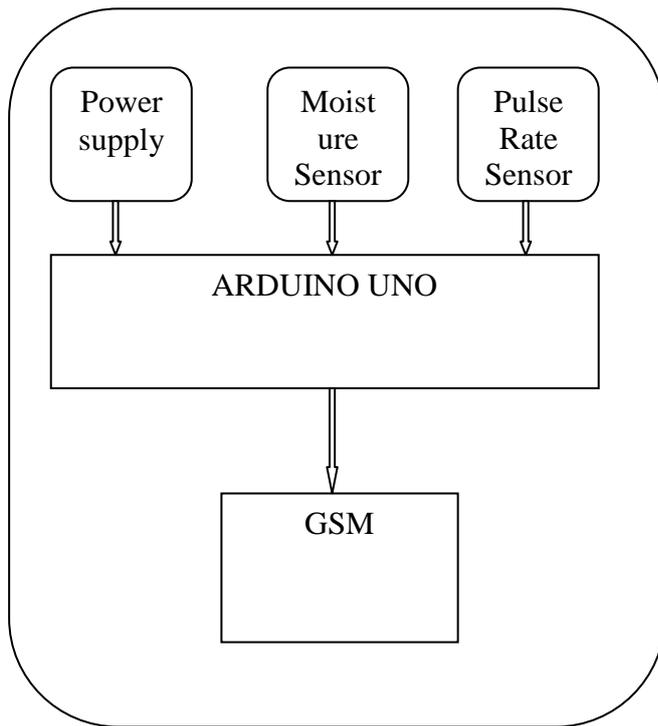


Figure 2: The Block diagram heart monitoring system

The block diagram of the proposed framework (Cardiac beat observing framework utilizing geolocation and computerization) is appeared in Fig. 2. This block comprise of five working squares which incorporates power gracefully, beat rate sensor, dampness sensor, Arduino UNO board and a GSM module. The heart beat sensor and the dampness sensor are straightforwardly appended to the body of the patient. Code is written in the Arduino IDE and transferred in the Arduino UNO board which checks for the variation from the norm in the heart beat rate and furthermore the perspiration level of the body. In the event that the calculation finds any anomaly, at that point it enacts the GSM module and sends alarm to close by emergency clinic, rescue vehicle and furthermore to the individuals whose contact numbers are enlisted as the gatekeeper of the patients. Accordingly this framework gives assistance at the ideal time and spares the life of the patient.

B. Power Supply

Computer using the USB connector (5V) to provide the power supply for the Arduino UNO. Despite the fact that there are different methods for providing voltage to the load up utilizing a controller, it isn't fitting since it could now and then harm the board. So power flexibly utilizing USB is ideal for the framework to work effectively. And furthermore subsequent to controlling the Arduino board power flexibly for different parts like GSM module, sensors can be shared from the 5V pin present in the Arduino board itself.

C. Pulse rate sensor

Heartbeat rate sensor is considered as a minimal effort gadget that will function admirably on the standard of optoelectronics. A heart beat is a development and compression of vein when blood enters and leaves the heart. A heartbeat rate sensor comprises of 2 parts: LED and LDR. To distinguish the beat LED passes the light from one side of the finger and LDR identifies it from the opposite side. At the point when heart siphons the platelet watches all

the more light bringing about less force proportion of LDR and furthermore increment in obstruction of LDR. In this way a total estimation for a moment is taken and beats every moment is determined.

D. Moisture sensor

A moisture sensor is utilized to gauge the measure of sweat present in the outside of patient's body. It comprise of anodes that decides the measure of dampness present. The anodes present in the sensor comprise of helpless electric stream without sweat on the body. In the event that there is an expansion in the measure of sweat level, at that point the measure of power builds which bring about expansion in estimation of the yield.

E. Arduino UNO

The Arduino UNO is microcontroller board dependent on the ATmega328P. It has an IDE to code the rationale of the software engineer. In this proposed framework an anomaly indicator calculation is coded and transferred in the board. The board gets the contribution from the sensor and tests for irregularity. On the off chance that any discovered, at that point it actuates the GSM and sends alert. It additionally processes the closest medical clinic and rescue vehicle as for the patient's present area utilizing Google Maps API.

F. GSM module

SIM800C is a quad-band GSM/GPRS module which chips away at GSM850MHz, EGSM900MHz, DCS1800MHz and PCS1900MHz frequencies. SIM800C has GPRS multi-space class10/class12 (discretionary) and underpins the GPRS coding plans CS-1, CS-2, CS-3 and CS-4. It is utilized to send the cautions in type of an instant message, including the Electronic Health Record (EHR) connection to the closest medical clinic. The area of the patient and the close by clinic is shipped off the closest emergency vehicle and the emergency clinic's subtleties are imparted to the guardians.

IV. SOFTWARE DESCRIPTION

The algorithm consists of the sequential steps that occur in the implementation of this system.

Algorithm

Stage 1: Start.

Stage 2: The beat rate sensor connected to the finger examinations the beats every moment of the patient.

Stage 3: The yield of the beat rate sensor is given as contribution to the calculation that checks for irregularity.

Stage 4: If calculation distinguishes irregularity, continue with the subsequent stage else go to Step 2.

Stage 5: The dampness sensor examinations the perspiration substance of the body and sends the information to the irregularity discovery calculation.

Stage 6: If irregularity found in the contribution from the past advance then cardiovascular failure is distinguished and proceeded with the further advance, else go to Step 2.

Stage 7: The current area of the patient is taken and the closest medical clinic and emergency vehicle is figured utilizing Google Maps API.

Stage 8: GSM module is enacted.

Stage 9: An alarm to the medical clinic is sent alongside the Electronic Health Record of the patient.

Stage 10: The emergency vehicle driver gets an alarm joined with the subtleties of the medical clinic and patients ebb and flow area.

Stage 11: An alarm is shipped off the patient's watchman pinged with clinic area.

Stage 10: Stop.

V. RESULTS AND DISCUSSION

The IOT Based Cardiac Rhythm Monitoring System is designed and implemented. Fig. 3 shows the physical view of the system. It comprises of four components namely pulse rate sensor, moisture sensor, Arduino UNO and GSM module. A bread board is used externally to connect the devices with one another.

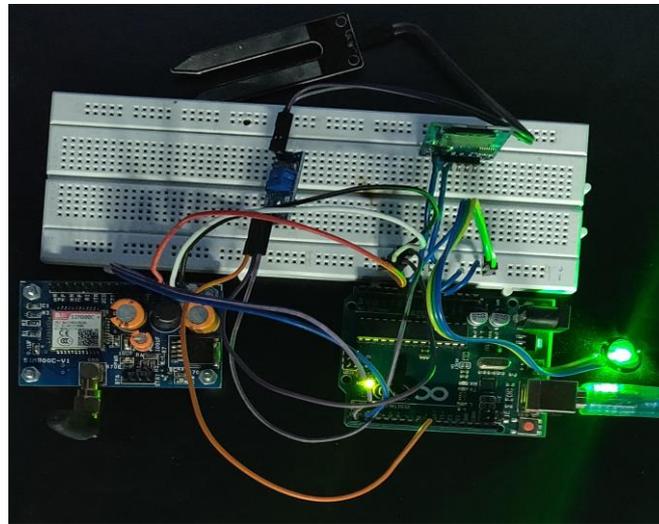


Fig. 3. Cardiac Rhythm Monitoring System.

The pulse rate sensor shown in figure 4 has three pins: 'S' is the signal pin which can be connected to any digital pin on the microcontroller, '+' is the power supply pin which can support 3V to 5V and '-' pin is connected to the ground.



Fig. 4. Pulse rate sensor.

Code is written in the Arduino IDE to read the input from the pulse rate sensor. The values are sensed from the patient's body and sent via the Arduino board to the IDE. The number of heart beats per minute (BPM) is displayed in the serial monitor as shown in figure 5.

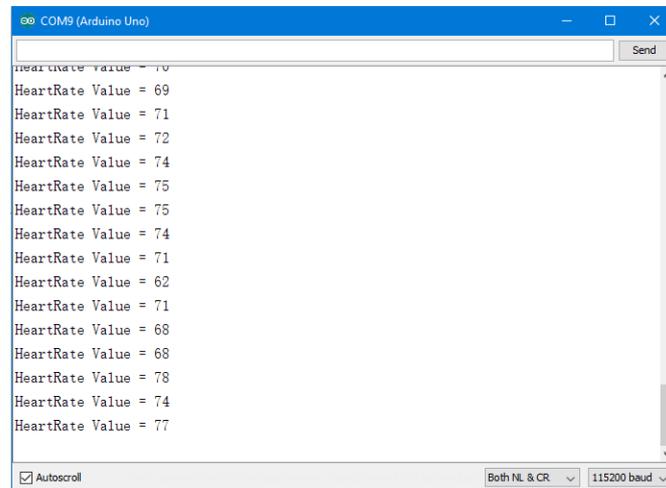


Fig. 5. Heart beat values per minute.

The alert message is sent using the GSM module shown below in figure 6, by a mobile number SIM card inserted in it. The location is tracked and the nearest hospital and ambulances are found using the GPRS technology.



Fig. 6. GSM/GPRS SIM800C module

When the heart beat sensed is above the given threshold value and the moisture level is also higher than the given normal value then it is an abnormal behaviour if the patient's body. An alert message is sent along with the Electronic Health Record text file link to the nearest hospital and the guardians in charge as displayed in figure 7.

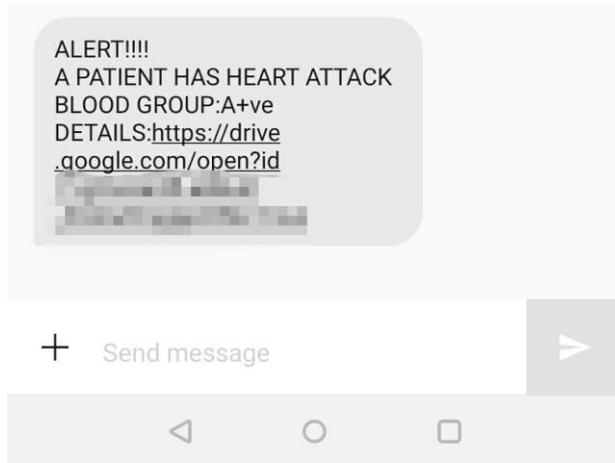


Fig. 7. Alert message sent as SMS.

By using the Google Maps API the patient is located and the nearest ambulance is found by calculating the smallest distance between them as shown in figure 8. The nearest hospital to the patient is also located and the location of the patient and the hospital are sent to the ambulance driver via google map link as SMS.

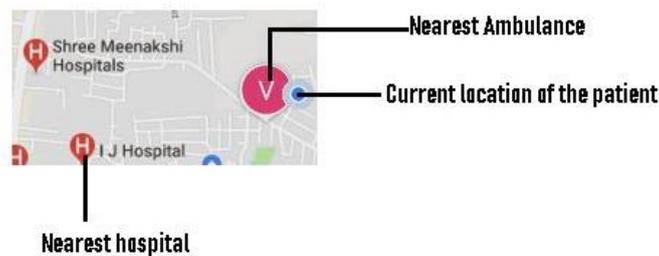


Fig. 8. Tracking the patient.

VI. CONCLUSION

IOT based Cardiac Rhythm Monitoring System utilizing geolocation and computerization is planned and actualized. It has furnished with 90% precision in the discovery of a coronary episode. It is in every case best to remain preventive of the results. It is smarter to check our body when little side effects show. This proposed framework gives an approach to check to the little problems ahead of time. The fundamental objective of the framework is to give an ease and precise gadget to screen the cardiovascular mood and caution the patient. This framework can be made as a ring and worn without any problem. This gadget screens the pulse and dampness level ceaselessly and underwear the individual people for help in the event of a crisis. Accordingly numerous lives can be spared and the treatment for coronary episode can be given inside brief span.

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