Heart Beat Monitoring System And Alerting Indicator For Driver's Safety

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Abstract- *Now a days we have an expanded number of mishaps on street. Old and heart patients have a danger of falling in the driver's seat which can cause deadly mishaps. Through this paper, we are proposing a system to caution the driver before mischance caused by arrhythmia (irregular heartbeat). For observing the heart beat we used the IR Pulse sensor, Arduino Uno. The IR beat sensor is connected to Arduino that allows monitoring and analysing pulse. The system will monitor pulse all throughout the driver's trip. If driver's pulse rate goes below or above the threshold limit, the system alarms the driver by demonstrating buzzer and cautioning light, so drivers can get cautioned and continue with alert*

Keywords- Heart beat, Infrared light emitting diode, Arduino , Arrhythmia, Buzzer.

I. INTRODUCTION

It always been a known concern that, there is an alarming increase in vehicle usage with increasing population. As a result, the rate of accident also increased.

Among these, accidents caused by heart issues while driving has become an important factor.

Abnormal heart rate or Arrhythmia depends on many factors. They could be individual's age, heart condition, and even specific medications taken recently.

Even emotions and stress can have tremendous effect on pulse rate. But most importantly, having good diet and proper fitness keeps the pulse rate strong and steady[1]. Knowledge about individual's heart condition can help them monitor their fitness level. Hence a system for monitoring the driver's heart rate throughout the trip has been proposed.

The concerned ones are notified about the driver's condition by activating the GSM module and sending emergency message.

This project is basically done using Arduino. It has the capability to sense and process the change in the environment [1]. Thereby, Arduino is the base part of this project. Other integral part will be IR pulse rate sensor with infrared light emitting diode and photo diode.

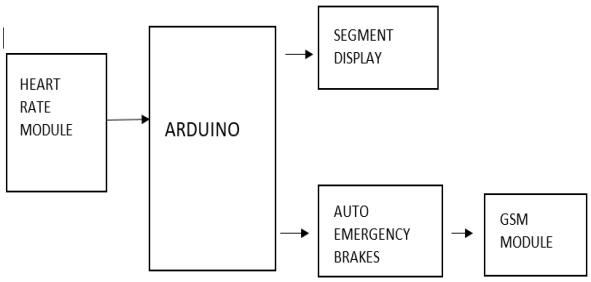

FIG:- 1 Block Diagram

II. PROPOSED SYSTEM

The Block outline of the proposed system (fig.1), represents the heart rate detection by taking input from heart rate sensor. This design uses miniature pulse sensor(IR sensor),that is improved for correct sensing and monitoring the changes in the pulse rate. This system calculates beats per minute(BPM) with the assistance of Arduino, and displays the deliberate pulse rate on 16x2 character LCD display and each time heart rate goes above or below a certain limit, a signal is set off alerting the user to proceed with caution. This system can be easily attached or implemented on any vehicle without taking much space in car's cabin and the system can continuously monitor the driver heart rate. The information can be shown on the multi information display(MID) which is one of the basic part of vehicle. Another interesting feature of this design is open source nature, which makes it easier to change the values, as this is important because every individual has different conditions and thus one can tune their pulse limits.

III. HARDWARE

Heart beat is one the most critical parameters of the human body and assumes a integral role in deciding aperson's

wellbeing. Various methods are used to measure pulse rate that includes **Electrocardiography, Photoplethysmograpy, Oscillometry**. Each and every method measures different phenomenon that occur in human body during the every beat. In proposed system, we will be using technique **Photoplethysmography** for measuring pulse rate. As appeared in the block diagram the heart beat sensor is utilized to sense beats per minute(BPM) and if the values goes past certain limit then signal is set off alarming the driver and passengers and a command is send to auto emergency brakes to slow down the vehicle. Through the use of GSM module an emergency message is sent to registered individual and doctor.

PHOTOPLETHYSMOGRAPHY:-

During each blood cycle, the blood vessels are throbbed(pulsate) with the end goal to convey blood to and from various parts of the body. At the point when Infrared light is passed through a blood vessels in the finger tip, the portion of light gets reflected, the received light from finger tip are periodical and vary due absorption properties of blood. This variation is recorded and computed by Arduino.

The IR sensors (FIG 2) in the sensor detects the change in the density of the blood and the photo diode sends signal to the lowpass filters. The signal is amplified and the measurement is given to an LED. As the heart beats the LED glows and the beats are recorded by the microcontroller and are displayed.

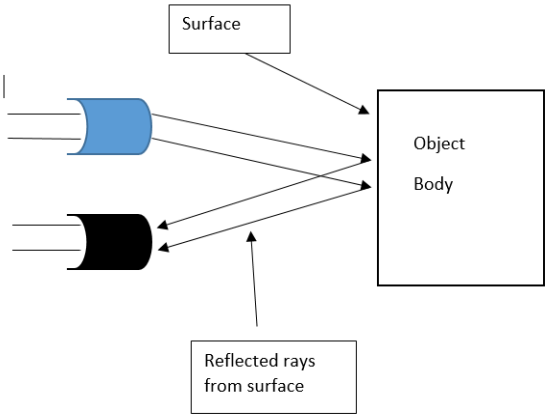

Fig 2. Operation of IR Sensor

ARDUINO UNO

Arduino Uno is a open source single board microcontroller based on ATmega328.

The board is all around outfitted with sets of pins that are interfaced to different sensors and different circuits. The board contains 14 advanced digital pins and 6 Analog pins. Arduino can communicate with computer system using programs that are programmed with ArduinoIDE(integrated development environment) by means of USB cable.

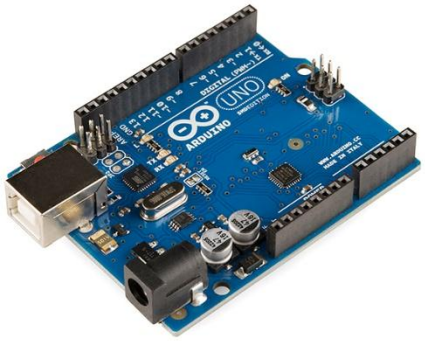

Fig 3 Arduino Board

HEART RATE SENSOR

For our project we utilizedfitting and play pulse sensor for Arduino. The pulse sensor can be implementedwith breadboard or directly plugged to Arduino pins. The sensor part consist of IR led and photo diode. The front side of the sensor that reaches the skin has LED that sparkles from the back, and there is a small square shaped sensor close to the LED. The square sensor is Ambient light sensor or photo diode exactly same as the one used in tablets and phones to adjust brightness of screen in various light conditions. The IR led transmits light to fingertip and the sensors reads the reflected light from the fingertip[2]..

Fig4. Heart rate sensor

ARDUINO IDE

To present the live heartbeat we used the Arduino IDE(FIG 5). It isaopen source cross-platform compilercoded in java. It provides medium for communication between the computer and Arduino boards. The Arduino IDE bolsters C

and C++ with special rules and special code structures. Programs written in Arduino IDE are called sketches.

The output will be shown in serial Monitor screen. This screen show data serial sent from Arduino board over USB.

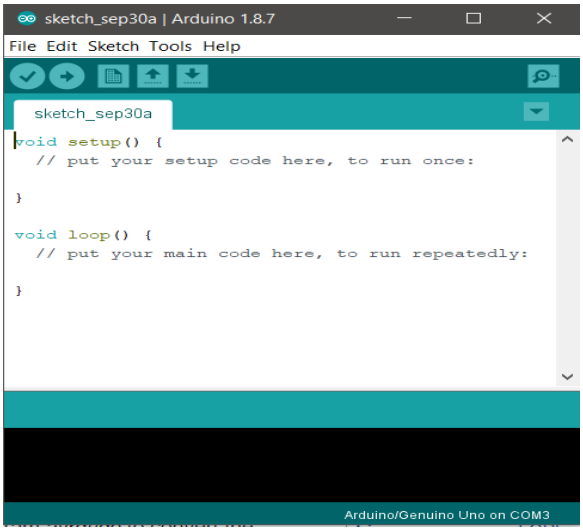

FIG 5:ARDUINO IDE

GSM MODULE

GSM module (FIG 6) can be connected with Arduino to establish the communication between the GSM system and the computer. It requires a SIM card for communication with the network. The emergency message can be sent to the pre-registered number and the doctor. [4].

FIG 6:GSM MODULE

AUTOMATIC BRAKING SYSTEM

Automatic braking is a safety feature available in many modern cars. The system is fundamentally used to lessen the collision damage by diminishing the speed of the car before a crash. Automatic braking system comes to play when the driver doesn't react in time for a sudden braking, the automatic braking system actuates the car's slowing mechanism, to slow down the car. Some system completely stops the car before a collision occur. It uses variety of sensors and computerized brake control system. FCA(Forward collision avoidance) system cautions the driver about the crash and applies the brake simultaneously. This system uses various form of general collision detection and warning system to accomplish full braking system. This system can be tuned with pulse sensor to stop the car in emergency situations.

IV. SYSTEM ARCHITECTURE

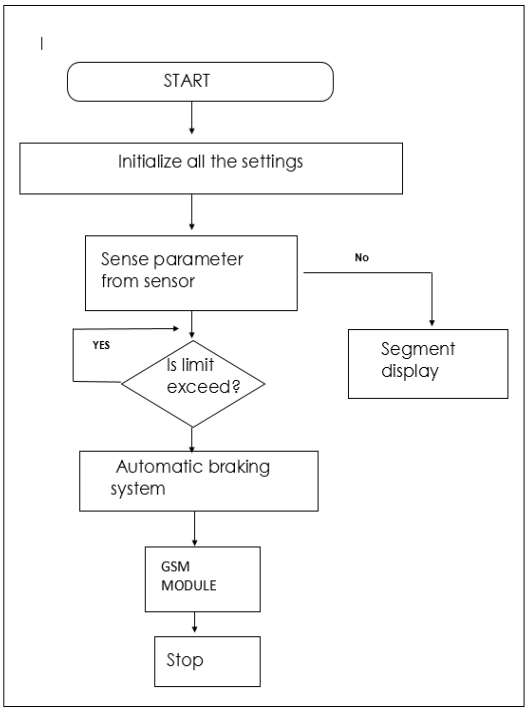

FIG: 6

The heart rate sensor is connected with Arduino UNO. The sensor used to monitor the pulse each and every minute. The led transmits the light tofingertip and some of the lights are reflected back. The photo diode senses the light and variation is recorded and BPM is calculated. If heart rate measured crosses the threshold limit then the buzzer is set of alerting the driver and a signal is sent to automatic braking system to slow down the vehicle and even come to halt, at that point with the assistance of GSM module the message is sent to preregistered number and doctor alerting them about the condition of the driver. If the heart rate is normal then the measured heart beat is shown on the MID (multi information display).

V. IMPLEMENTATION

The pins of pulse rate sensor is wired with the ports of arduino in the following ways

S of pulse sensor->A0 of Arduino
'-' of pulse sesnsor->GND of Arduino
'+' of sensor -> +5V of Arduino

The beats per minute(BPM) reading are shown on serial monitor of Arduino IDE. The pulse rate takes 10 reading and then it calculate the mean value of it to show the accurate reading.

The following table gives the data on overall pulse of women on different age groups.

AGE	18-25	26-35	36-45	46-55	56-65
Athlete	54-60	54-59	54-59	54-60	54-59
Good	66-69	65-68	65-69	66-69	65-68
Average	74-78	73-76	74-78	74-77	73-76
Poor	85+	83+	85+	84+	84+

The following table gives overall pulse ofmens on different age groups.

AGE	18-25	26-35	36-45	46-55	56-65
Athelete	49-55	49-54	50-56	50-57	51-56
Good	62-65	62-65	63-66	64-67	62-67
Average	70-73	71-74	71-75	72-76	72-75
Poor	82+	82+	83+	84+	82+

Each time a heart pumps blood, the amount of detected infrared light changes, which is detected by photodiode. With the assistance of high gain intensifier, the distinction in the amplitude of the reflected light can be changed over in to beat. The reflected IR signal is given to signal conditioning circuits that filters unwanted and waste signals and boost the required signal. This is comprised of two phase operational amplifiers configured as low pass filtersand the cutoff frequency are set to 2.5hz, [1].

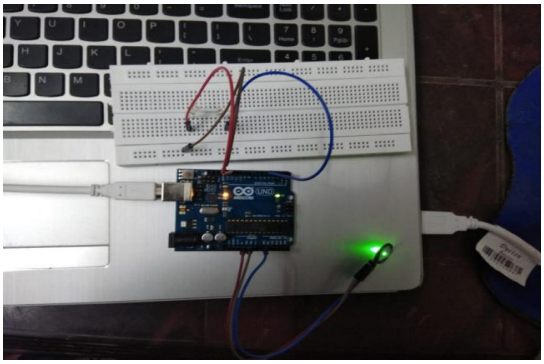

Fig 4. Heart rate monitor using IR.

The signal and leds is associatedwith Arduino board through breadboard. When BPM reading crosses the threshold limit. The ringer and leds are used to signal the user. The Arduino board takes 10 BPM reading and calculates the mean value in order to show the accurate beats per minute

VI. RESULTS

The following figure shows the two different case scenario of the project. Both the results show that the system works within the permitted heart-rate range. The abnormal heart-rate is recognized and the buzzer is heard

Fig 5. The BPM reading in normal heart condition

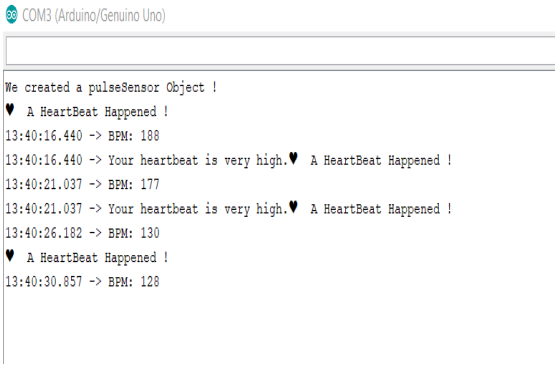

Fig 6. When the BPM crosses threshold value

Thus the results are well under the permitted heart-beat range and differentiates a patient from a driver.

VII. CONCLUSION

The paper proposes the idea of persistent pulse checking of the driver to predict possible accidents due to any heart conditions. The heart-rate monitor can be mounted on the steering wheel which ensures constant hand contact while driving. Once the threshold is reached, the driver is notified with a buzzer. This alerts the driver to seek medical attention. The results can be used in developing an intelligent vehicle that can detect drivers state, thus increasing safety of driver and passengers.

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