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HEART ATTACK DETECTION AND HELTH MONITORING OF PARALYSIS PATIENT

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ABSTRACT

In today's world, many people are losing their lives due to heart attacks and the shortage of specialist doctors available to take immediate action. Hence this system provides the implementation of heart rate monitoring and controlling of a patient. For this, we have used the technology called the "internet of things" to detect and monitor the heart rate of a patient. In this system, the patient will be equipped with the hardware consisting of sensors and other devices for measuring the heartbeat along with the notification unit to notify and provide data in real-time. The heartbeat sensor with advance measuring technique will calculate the heartbeat of the patient, and transmit it over the internet that can be easily accessed by the patient itself. It also calculate the sweat through sweat sensor, which is beinged considered considered in case of heart attack. The heartbeat limits are set on a system that informs about the high and low rate of heartbeat. It also provides continuous data foe analyzing the chance of an attack on a patient.

We all know that the paralysis condition is a loss of muscle function in the body parts. These people in most cases are not able to convey their needs as they are neither able to speak properly nor do they convey through sign language due to loss in motor control by their brain. so, to overcome such type of difficulties we come up with the system that help disable person in displaying a massage over the LED by just simple motion of his hand or any part of his body which has motion ability. The user just needs to tilt a device in particular angle to convey a massage. Tilting a device in different direction convey different massage.

In this way the automated paralysis patient care system truly automates the care taking ability of the patient which ensure a timely attention to the patient and thus for a good health of the patient.

Keywords: Arduino, Heart Beat Sensor, Sweat Sensor, Liquid Crystal Display, Accelerometer, Audio Module, Gsm Modem.

I. INTRODUCTION

The heart is an important organ in the human body. It is used to pump blood and oxygen in the entire body through the circulatory system, keeping the functionality of the body organized. It has been found that about 1 million people die due to heart diseases every year. A heart attack generally occurs when a particular part of the heart dies resulting in the blockage of blood flow to the heart muscle. It has been observed that the heart attack takes 3 attempts to kill people and is considered to be a serious medical emergency and needs immediate medical action. Owing to late diagnosis of heart attack we are inadequate to save the lives of man humans. For healthy adult, ordinary heart is 60 to 100bpm. If a person's heart rate is constantly over 100 beats per minutes, then the person is said to be having higher pulse rate which is dangerous. This causing chest pain and strong headedness to the person. Many people are losing their lives due to the heart attack which is the major issue to think over. If a heart rate is increasing constantly and at a same time, he has continuous sweating then there is about 70% chances of heart attack, due to this anyone can lost their life. So, to overcome this we use a kind of advancement technology, in which we monitor the patient's heart rate and by using sweat sensor we can detect seat. If pulse rate is high and at a same time, he has continuous sweating and if these two conditions are met then we can say that there is a chances of heart attack. So due to this detection we can save the life of anyone.

The paralysis patient are unable to move their muscles for their purposes. If a person is suffering from paralysis attack in all or any part of the body can be turned off in order to move in, which means that their movement is restricted and they can barely communicate with anyone at all, because they can't talk like a normal person. Rather than it is difficult to understand what they are saying. So, to overcome such type of difficulties we come up with the system that help disabled person in displaying a message over the LCD by just simple motion of his

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hand or any part of his body which has motion abilities. The user just needs to tilt a device in a particular angle to convey a message. Tilting a device in different direction convey different message. In addition, if there was no one to attend to the message display on the LCD, the patient can choose to tilt the device for some more amount of time which will trigger an SMS to be sent through a GSM modem to the registered care taker of the patient.

II. LITERATURE SURVEY

HEART ATTACK DETECTION

Sr.no	Title of Papers	Year	Sensors and Technology used
1	IOT Based Heart Attack Detection, Heart rate and Temperature Monitor	2017	Pulse Sensor,LM35, Temperature sensor, Arduino Uno
2	IoT Based Heart Attack Detection And Alert System	2017	Analog Sensor, Wireless Module, ECG leads, AVR microcontroller
3	Heart Attack Detection using Android Phone	2016	ECG Monitor, Android Phone
4	Heart rate monitoring system and heart attack detection using Wearable Device	2016	Smart band, Android Phone
5	Heart Attack Detection and Medical Attention using Motion Sensing Device – Kinect	2014	Kinect, Xbox one

The main goal of this massive connectivity is to make it possible to access information about any object from anywhere. IoT, the objects are integrated with some intelligent sensors, these sensors, sense the environment in order to get the meaningful information, after receiving this data they examined and processed further for the necessary action . The Internet of Things is also used in health-care systems. Sensors keep an eye on the patient whether he or she is in the hospital, at home, or elsewhere. There is a persistent need for continuous interaction with the technologies, it is not possible for every paralyzed patient to connect and interact with these gadgets. To solve this difficulty, the scientists developed "Eye-com," a retina-controlled gadget. This device is made out of low-cost IoT components such as an Arduino microcontroller, an accelerometer, an X-bee wireless sensor, and IR diodes. This apparatus climbs the glasses with ease. With this technology, paraplegic patients can readily interact with equipment by moving their heads and blinking their eyes. The proposed prototype includes three health sensors: Galvanic Skin Response Sensor, Heart Pulse Sensor, and Body Temperature Sensor. These sensors are combined into a system with Arduino UNO to sense the patient's health parameters, and Raspberry Pi collects the data and then sends it to the cloud server.

Health Monitoring of Paralysis Patient

According to a survey, nearly 1 in every 5000 people are paralyzed. Fully paralyzed patients require 24-hour support. But in these days, it is not possible to constant monitor patient. So, they need a person which take care's movement disabled or paralyzed patient. And appliances cannot be handled by them. So, they need constant help and they cannot work independently there are various applications which can be drive from eye blink detection and these are not limited. An efficient, real time blink detection can be used for almost any purpose. It can be used for on/off appliances such as lighting devices, fan, television or a microwave oven. Electrooculography direction of a wheelchair utilizing eye development A convenient remote eye development controlled Human Computer Interface (HCI) for debilitated individual Eye controlled turning on and off the electronic gadgets Launching the rocket utilizing look in war field A few inquiries about have been done as of late to develop Human Computer Interface [HCI][4].Human Computer Interface as an assistive innovation helps the general population with engine incapacities and who can't move their arms thus mind boggling human PC

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interface must be more developed, specific to that of the information charges, adjusted to the in capacity of the user, designed in a sheltered and straightforward way.

In another research Abhinandan Das et.al proposed ISLR system is considered as a pattern recognition technique that has two important modules: feature extraction and classification. The joint use of Discrete Wavelet Transform (DWT) based feature extraction and nearest neighbor classifier is used to recognize the sign language. The experimental results show that the proposed hand gesture recognition system achieves maximum 99.23% classification accuracy while using cosine distance classifier [2].In their research Anetha Ket.al. presented a scheme using a database driven hand gesture recognition based upon skin color model approach and thresholding approach along with an effective template matching with can be effectively used for human robotics applications and similar other applications. Initially, hand region is segmented by applying skin color model in YCbCr color space. In the next stage thresholding is applied to separate foreground and background. Finally, template based matching technique is developed using Principal Component Analysis (PCA) for recognition [3]. Aarthi M et.al. Presented the static hand gesture recognition system using digital image processing. For hand gesture feature vector SIFT algorithm is used. The SIFT features have been computed at the edges which are invariant to scaling, rotation, addition of noise [4]. Priyanka Lokhande et.al proposed a method for automatic recognition of signs on the basis of shape-based features is presented. For segmentation of hand region from the images, Otsu's thresholding algorithm is used, that chooses an optimal threshold to minimize the within-class variance of threshold black and white pixels. Features of segmented hand region are calculated using Hu's invariant moments that are fed to Artificial Neural Network for classification. Performance of the system is evaluated on the basis of Accuracy, Sensitivity and Specificity [5].

Another Authors Anetha K et.al presented various method of hand gesture and sign language recognition proposed in the past by various researchers. For deaf and dumb people, Sign language is the only way of communication. With the help of sign language, these physical impaired people express their emotions and thoughts to other person [6]. Priyanka R Postwar et.al. Proposed a system to aid communication of deaf and dumb people communication using Indian sign language (ISL) with normal people where hand gestures will be converted into appropriate text message. Main objective is to design an algorithm to convert dynamic gesture to text at real time. Finally, after testing is done the system will be implemented on android platform and will be available as an application for smart phone and tablet pc [7]. Another Author proposed a real time vision-based system for hand gesture recognition for human computer interaction in many applications. The system can recognize 35 different hand gestures given by Indian and American Sign Language or ISL and ASL at faster rate with virtuous accuracy. RGB-to-GRAY segmentation technique was used to minimize the chances of false detection. Authors proposed a method of improvised Scale Invariant Feature Transform (SIFT) and same was used to extract features. The system is model using MATLAB. To design and efficient user-friendly hand gesture recognition system, a GUI model has been implemented [8].

One of the researcher Sachin Bhatt et.al. Presented the recent research and development of sign language based on manual communication and body language. Sign language recognition system typically elaborate three steps pre-processing, feature extraction and classification .Classification methods used for recognition are Neural Network (NN), Support Vector Machine (SVM), Hidden Markov Models (HMM) [9]. Mukul Singh Kushwah et.al. Presented application that helps the deaf and dumb person to communicate with the rest of the world using sign language. The key feature in this system is the real time gesture to text conversion. The processing steps include: gesture extraction, gesture matching and conversion to speech. Gesture extraction involves use of various image processing techniques such as histogram matching, bounding box computation, skin colour segmentation and region growing. Techniques applicable for Gesture matching include feature point matching and correlation-based matching. The other features in the application include voicing out of text and text to gesture conversion.

III. SYSTEM DESIGN

While developing any Arduino based electronic system, there are some steps which must be followed. These steps are:

1. Deciding system specifications i.e., Block diagram
2. Selection of system components

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3. Design of circuit diagram
4. Design of PCB layout
5. Manufacturing of PCB layout
6. Component mounting & soldering
7. Testing and troubleshooting of hardware
8. Design of enclosure or structure.

Block Diagram

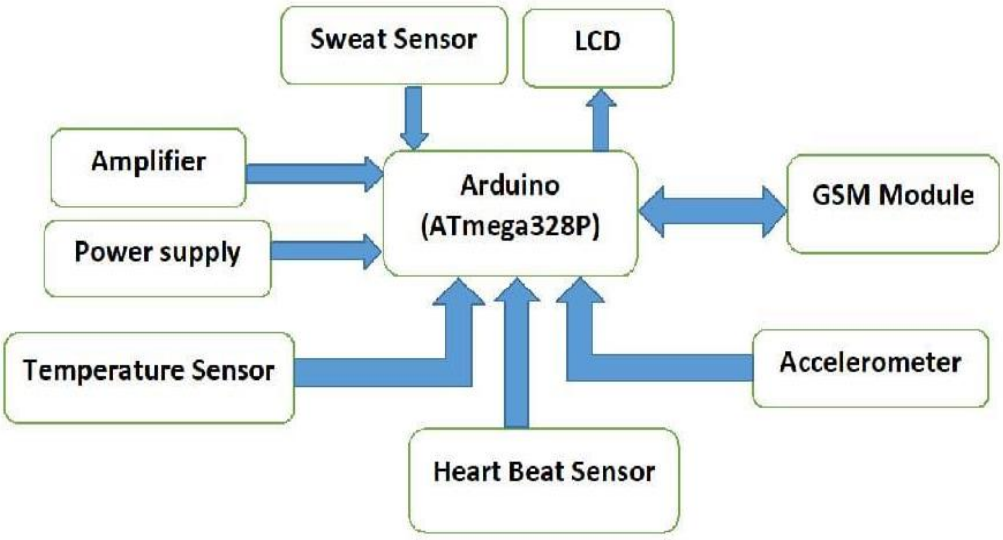

Fig 1: System Block Diagram

Selection Criterion of Components

Selection criterion for Arduino:-

- Processor – At mega 328p
- Operating voltage – 5V
- Clock speed – 16MHZ
- Digital I/O – 14
- PWM – 6

Selection criterion for accelerometer sensor:-

- Based on application- motion , vibration
- Based on type of sensor – capacitive , piezoelectric , piezoresistive
- Based on operating – 3.5-5.5V
- It is compatible for Arduino and Sensitive
- Frequency response

Selection criterion for GSM module:-

- Speed
- Power requirement-3.3V
- No. of channel – 12/ 14
- Selection criterion for amplifier :-
- Based on no. channel- 8 channel
- Based on recording time- each channel store 1.5 min recording
- Based on operating voltage.

Selection criterion for LCD:-

- Based on operating voltage.
- Based on types of LCD.
- Based on display character.

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Selection criterion for temperature sensor:-

- Types of sensor.
- Operating voltage- 1.7 – 2.5v
- Temperature range.

Description of Components

Microcontroller ATMEGA 328:

Features:

- 28 pin IC with 20 GPIO pins
- Inbuilt 6 channel ADC
- 2kb SRAM, 1kb EEPROM
- 32 General purpose registers
- Works on 5V
- Low power Sleep mode
- Multiple software tool support

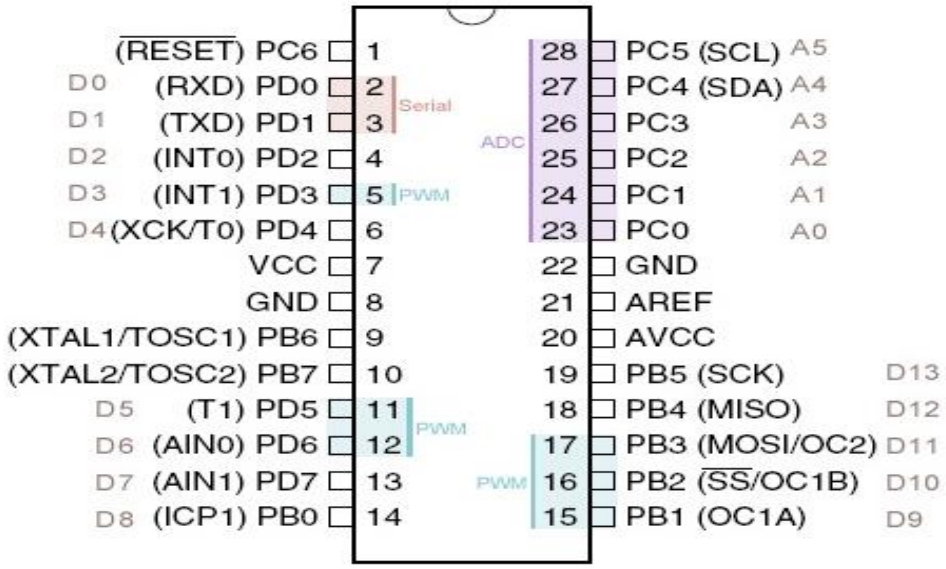

Fig 2: Pin diagram of Atmega328 microcontroller

Liquid Crystal Display

Fig 3: LCD

This is a high quality 16 character by 2-line intelligent display module, with back lighting, Works with almost any microcontroller. This is a popular 16x2 LCD display. It is based on the hd44870 display controller hence it is easy to interface with most micro controllers. It works of 5v and has a green back light.

Specifications:

- Operating Voltage is 4.7V to 5.3V

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- Current consumption is 1mA without backlight
- Alphanumeric display module, meaning can display alphabets and numbers
- Consists of two rows and each row can print 16 characters.
- Each character is built by a 5×8-pixel box
- It can also display any custom generated characters
- Available in Green and Blue Backlight

GSM Module

Fig 4: GSM Module

A GSM modem is a device which can be either a mobile phone or a modem device, can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection. This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

Features of GSM module Compatibility that we can use the same mobile to make calls in several countries, Flexibility and increased capacity due to equipment is smaller in size, Improved spectrum efficiency, International roaming, Compatibility with integrated services digital network (ISDN), Support for new services, SIM phonebook management, Fixed dialing number (FDN), Real time clock with alarm management, High-quality speech, Uses encryption to make phone calls more secure and Short message service (SMS).

Accelerometer

Accelerometers are instruments that measure a structure's vibration or acceleration of motion. They have a transducer that converts mechanical force induced by vibration or movement into electrical energy. Changes in the locations of these devices are detected using micro- electromechanical systems (MEMS). Accelerometers offer a wide range of applications in industry and science.

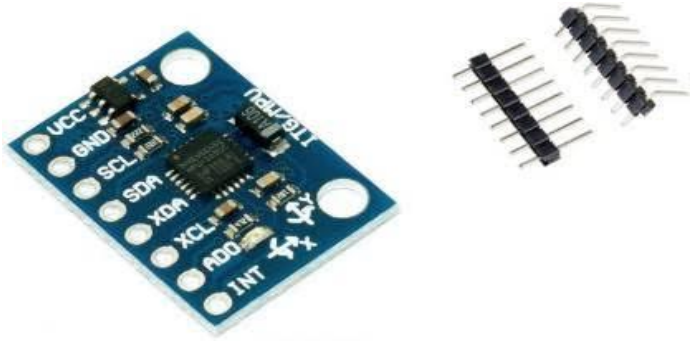

Fig 5: Accelerometer

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Pulse Rate Sensor

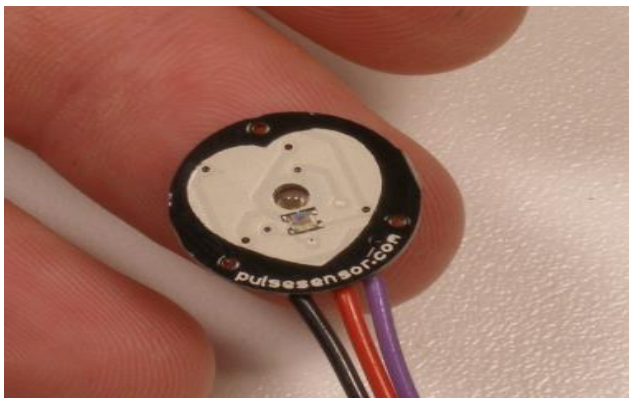

Fig 6: Pulse Rate Sensor

Pulse Sensor is a well-designed plug-and-play heart-rate sensor for Arduino. It can be used by students, artists, athletes, makers, and game & mobile developers who want to easily incorporate live heart rate data into their projects. The sensor clips onto a fingertip or earlobe and plugs right into Arduino with some jumper cables. It also includes an open-source monitoring app that graphs your pulse in real time.

The Pulse Sensor Kit includes

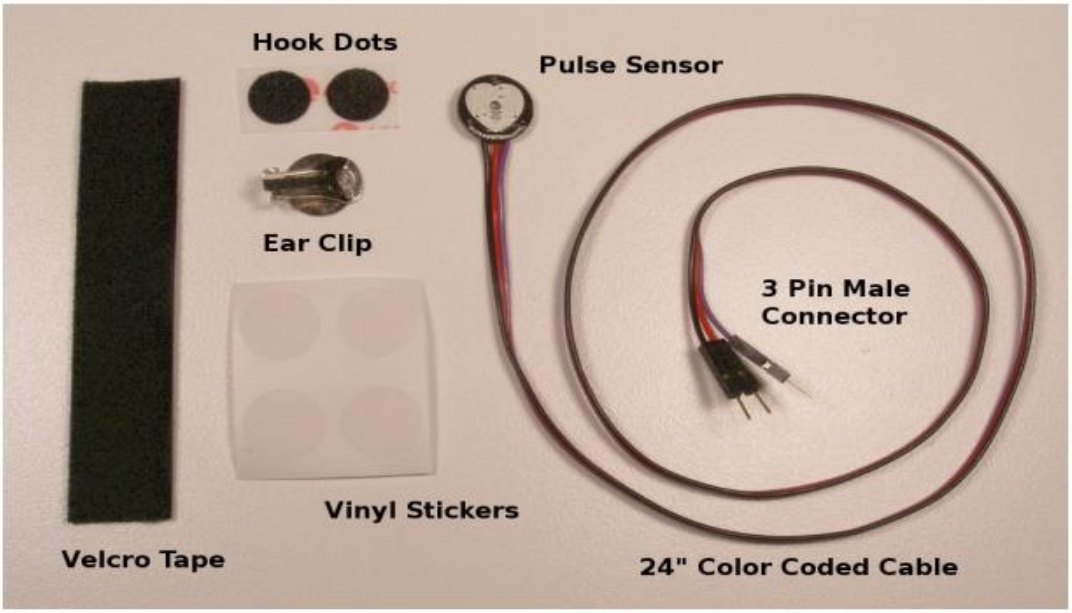

Fig 7: Pulse Rate Sensor Kit

- A 24-inch Color-Coded Cable, with (male) header connectors. You'll find this makes it easy to embed the sensor into your project, and connect to an Arduino. No soldering is required.
- An Ear Clip, perfectly sized to the sensor. We searched many places to find just the right clip. It can be hot glued to the back of the sensor and easily worn on the earlobe.
- 2 Velcro Dots. These are 'hook' side and are also perfectly sized to the sensor. You'll find these Velcro dots very useful if you want to make a Velcro (or fabric) strap to wrap around a fingertip.
- Velcro strap to wrap the Pulse Sensor around your finger.
- 3 Transparent Stickers. These are used on the front of the Pulse Sensor to protect it from oily fingers and sweaty earlobes.
- The Pulse Sensor has 3 holes around the outside edge which make it easy to sew it into almost anything.

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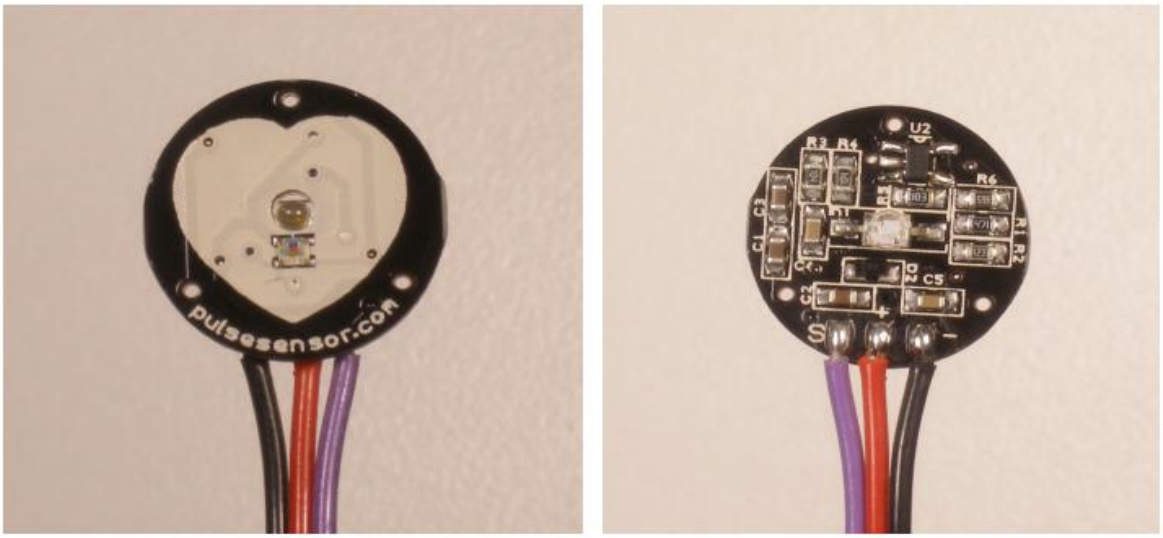

Fig 8: Front and Back Side of Pulse Sensor

The front of the sensor is the pretty side with the Heart logo. This is the side that makes contact with the skin. On the front you see a small round hole, which is where the LED shines through from the back, and there is also a little square just under the LED. The square is an ambient light sensor, exactly like the one used in cell phones, tablets, and laptops, to adjust the screen brightness in different light conditions. The LED shines light into the fingertip or earlobe, or other capillary tissue, and sensor reads the light that bounces back. The back of the sensor is where the rest of the parts are mounted. We put them there so they would not get in the way of the of the sensor on the front. Even the LED we are using is a reverse mount LED. For more about the circuit functionality, check out the Hardware page. The cable is a 24" flat color-coded ribbon cable with 3 male header connectors.

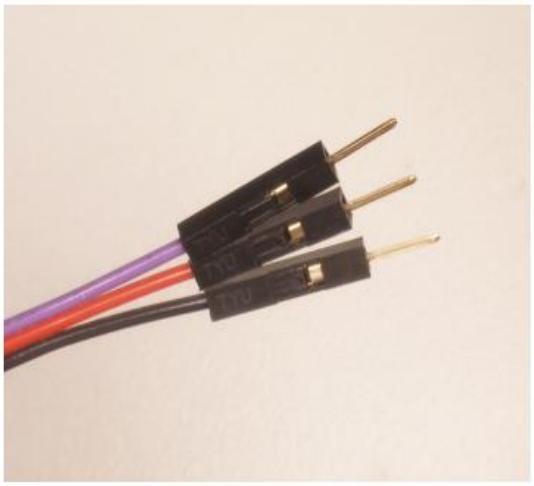

Fig 9: Male header connectors.

RED wire = +3V to +5V

BLACK wire = GND

PURPLE wire = Signal

The Pulse Sensor can be connected to Arduino, or plugged into a breadboard. Before we get it up and running, we need to protect the exposed circuitry so you can get a reliable heart beat signal.

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Sweat Sensor/ Raindrop sensor

Fig 10: Sweat Sensor/ Raindrop sensor

The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and also for measuring rainfall intensity. The module features, a rain board and the control board that is separate for more convenience, power indicator LED and an adjustable sensitivity though a potentiometer. The analog output is used in detection of drops in the amount of rainfall. Connected to 5V power supply, the LED will turn on when induction board has no rain drop, and DO output is high. When dropping a little amount water, DO output is low, the switch indicator will turn on. Brush off the water droplets, and when restored to the initial state, outputs high level.

Specifications

- Adopts high quality of RF-04 double sided material.
- Area: 5cm x 4cm nickel plate on side.
- Anti-oxidation, anti-conductivity, with long use time.
- Comparator output signal clean waveform is good, driving ability, over 15mA.
- Potentiometer adjust the sensitivity.
- Working voltage 5V.
- Output format: Digital switching output (0 and 1) and analog voltage output AO.
- With bolt holes for easy installation.
- Small board PCB size: 3.2cm x 1.4cm.
- Uses a wide voltage LM393 comparator.

Zero PCB

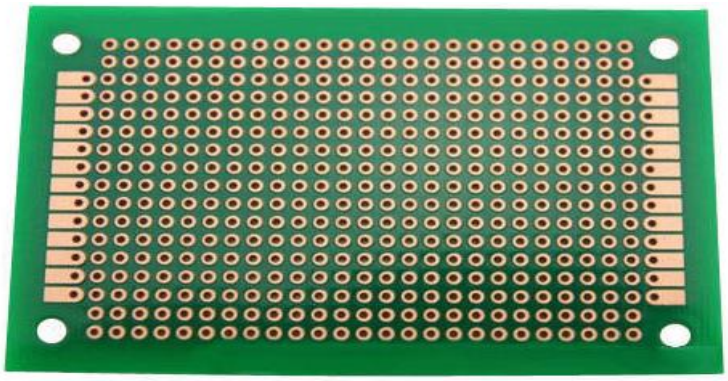

Fig 11: Zero PCB

Zero PCB is basically a general-purpose printed circuit board (PCB), also known as preboard or DOT PCB. It is a thin rigid copper sheet with holes pre-drilled at standard intervals across a grid with 2.54mm (0.1-inch) spacing between holes. Each hole is encircled by a round or square copper pad so that component lead can be inserted into the hole and soldered around the pad without short-circuiting the nearby pads and other leads. For connecting the lead of component with another lead, solder these together or join these using a suitable conducting wire.

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Jumper Wires

Fig 12: Jumper Wires

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire.

Audio Playback Amplifier

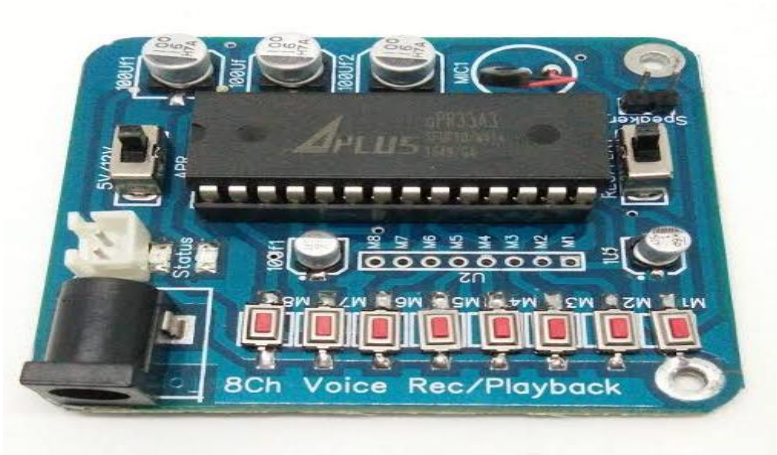

Fig 13: Audio Playback Module

APR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). The aPR33A series are a fully integrated solution offering high performance and unparalleled integration with analog input, digital processing and analog output functionality. The aPR33A series incorporates all the functionality required to perform demanding audio/voice applications. High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

Specifications

- Operating Voltage DC Socket :7V-12V
- No. of channel :- 8
- Loading capacity :- 4 ohm – 32 ohm
- Storing capacity for each channel – stored 1.5min
- Total storage capacity is – 11 min

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- Operating Voltage 2pin RMC Socket : 5V DC
- On board Power : Led Indicator
- On-board : Switch
- On-board MIC will automatically be used for recording.

IV. SYSTEM DEVELOPMENT

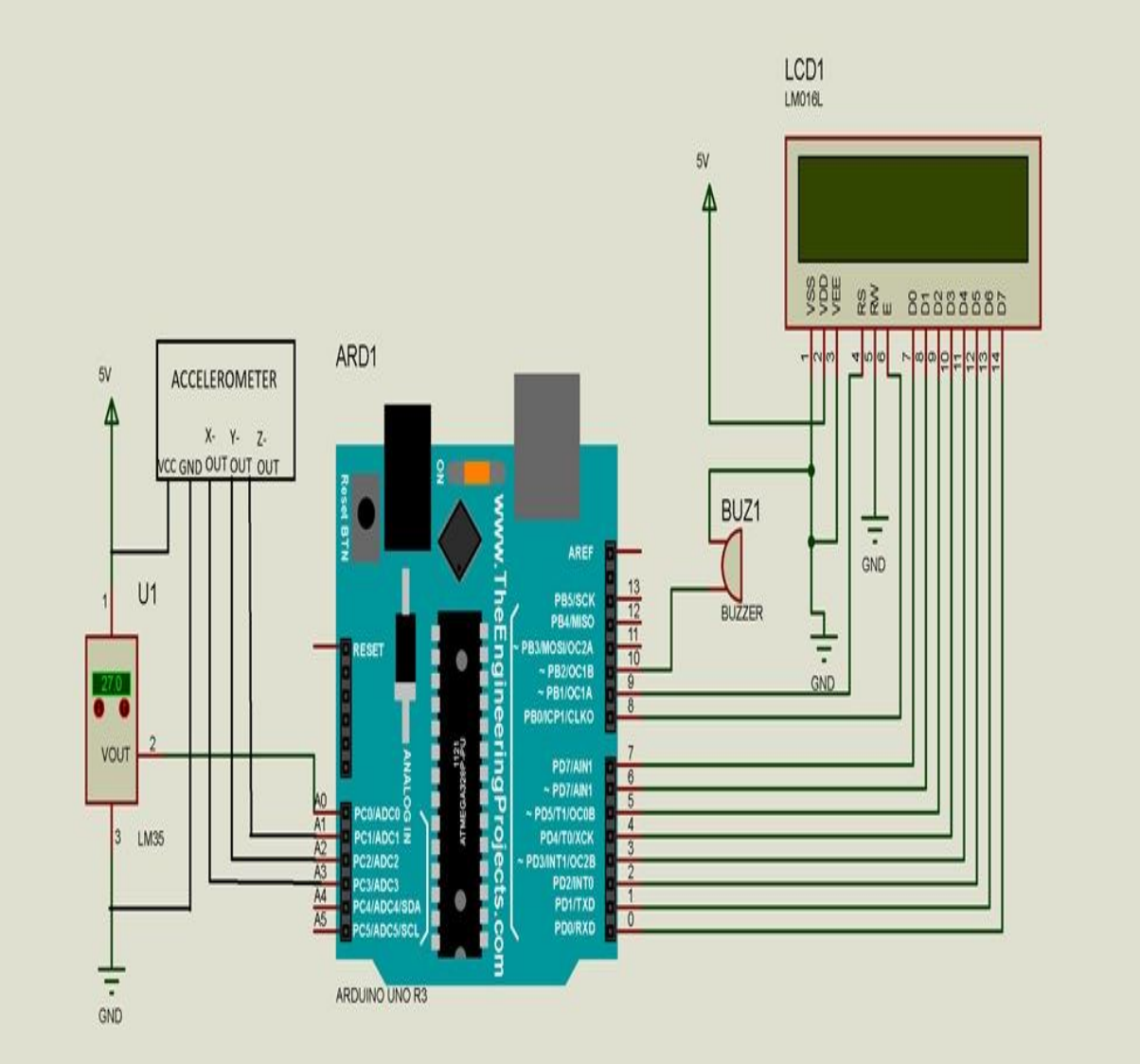

Fig 14: Circuit Diagram of System

V. RESULT

In today's time, the heart attack is one of the major problems faced by the people. Due to the low availability of doctors, heat patients can't get the proper treatment and care. Thus the technology like the internet of things has made it possible that people can keep their health records and also maintain it regularly by making use of the above-proposed system.

Paralyzed individuals have trouble interacting with caregivers to satisfy their requirements since they are unable to properly express their concerns and needs. We developed a GSM-based paralysis patient healthcare system to assist paralyzed people in overcoming this obstacle. In this recommended approach, the paralyzed patient transmits signals to the caregiver using a glove. The GSM module transmits a message to the preprogramed caregiver phone numbers when the patient's hand is tilted. We want to integrate this method into desktop screens and an Android app for remote monitoring in the future. The proposed approach allows for the evaluation of hospital doctors' performance, as well as the true treatment of patients and the saving of their lives.

This system is really helpful for paralyses patients. When they need help then they can ask by using some movements they can also survive in this world like normal people by using this movement detection. This is not a trivial task just because it varies from person to person in its nature and type. Therefore, different methods are essential to support these people, and it is our duty, as future engineers, to develop new technologies to help paralyzed patients.

VI. CONCLUSION

Though there already exists a several systems to monitor the paralyzed patient's health, there are not many systems that focuses on communication of them. But this system bridges the gap between the patient and others via communication and helps the paralyzed patient to relieve their stress by revealing their thoughts and help them to motivate as much as possible. And this system is cheap enough to afford without much debt and is useful also. In this exploration we have attempted to propose a total paper on detecting heart attack by monitoring the Heartbeat of person. The heart beat sensor which is interfaced with microcontroller senses the heartbeat of person And transmits them over internet using Wi-Fi module. System allows setting limits of heart beat. After setting These limits person can start monitoring the heart beat and whenever the person's heart beat goes above certain Set point they can get an alert on high heart beat and also about chances of heart attack. Also the system alerts For lower heartbeat.

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[8] Using IOT, design and implement a monitoring system for paralysis patients. Fakeha Nasir, Ahsan Sheikh, Fakeha Nasir, Fakeha Nasir, Fakeha Nasir Hira Beenish3 is a character in the game Hira Beenish. Muhammad Fahad4 is a fictional character.

[9] Biomedical sensors are used in a GSM-based patient monitoring system. 2K.Swarna Madhuri1Assistant professor in the department of ECE, RECW, and Kurnool 2Assistant professor in the department of ECE, GPCET, and Kurnool GSM based Health Care Monitoring System.