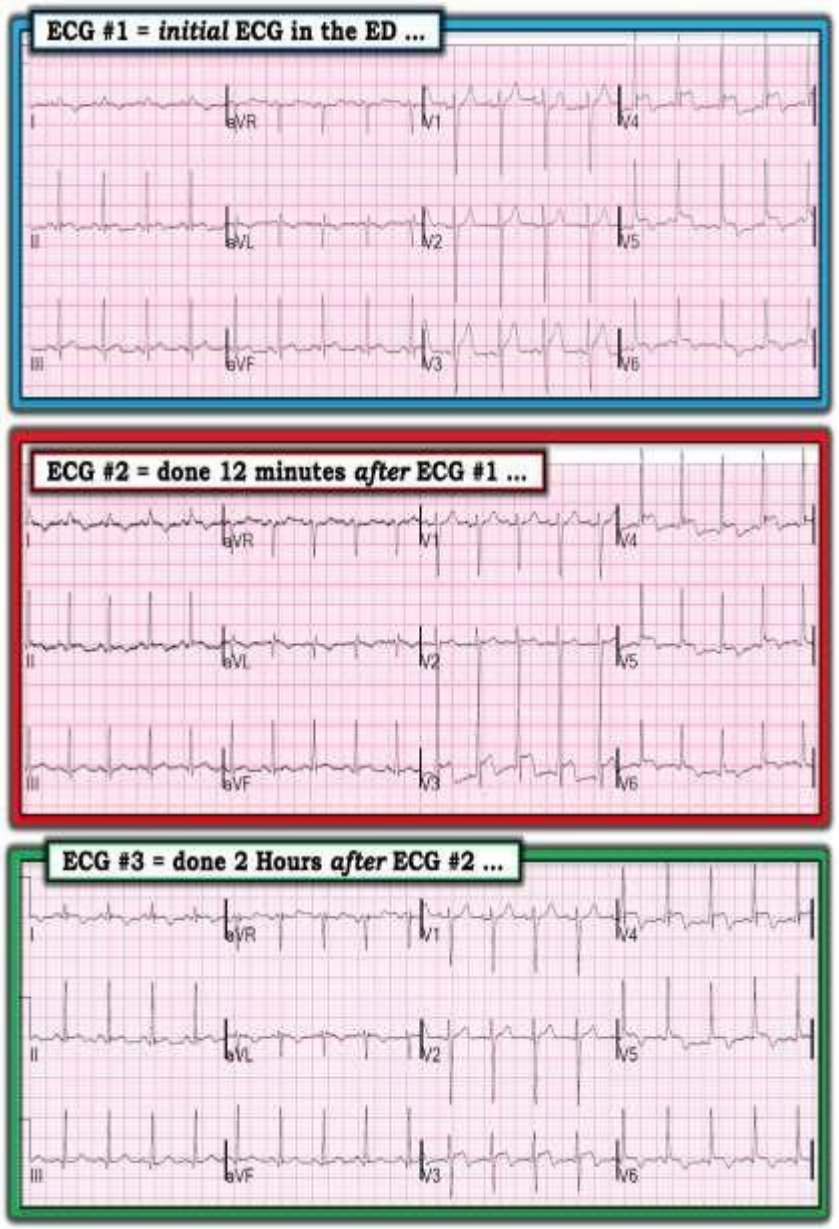
HEALTHCARE BOT:
HEART ATTACK RECOGNITION SYSTEM

BY: ADARSH MENON 20BCR7010, FAZAL K 20BCR7008, N K V MANASA 20BCR7035, GAUTHAM H S 20BCE7190, JUAN JOHNSON 20BEC7007, ALEN S 20BCR7018

GUIDED BY :DR. MUTHU KRISHNAMMAL



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PROBLEM STATEMENT

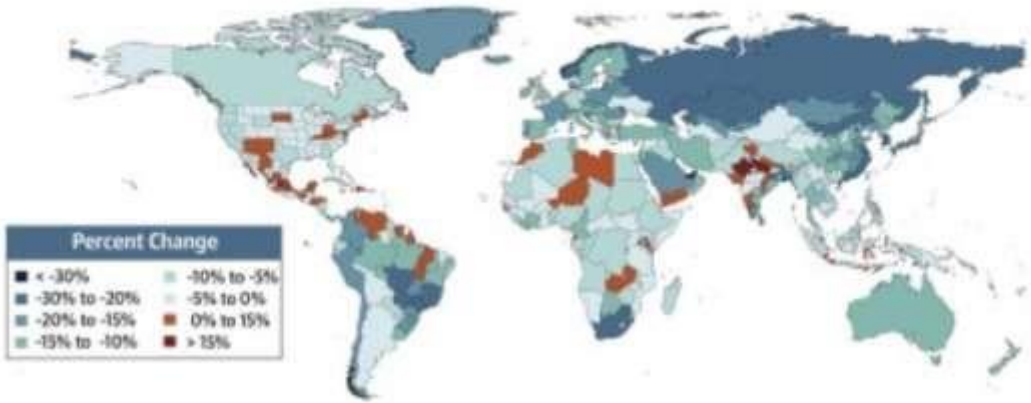
Nowadays numerous persons are mislaying their life owing to heart attack and shortage of medical attention to patient at correct stage. This attack cannot be predicted, but it can be known from the human heartbeat which is a very vital health parameter of the human cardiovascular system.

Heart rate reflects the health conditions of the human cardiovascular system that determined by such as stress at work, before or after sports and the psychology factor. Unfortunately, some people do not know their heart rate before or after doing an activity.

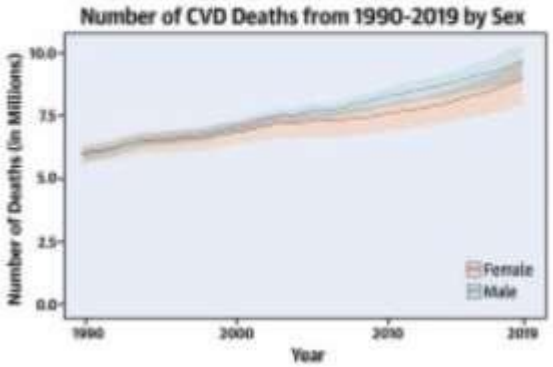
SURVEY:

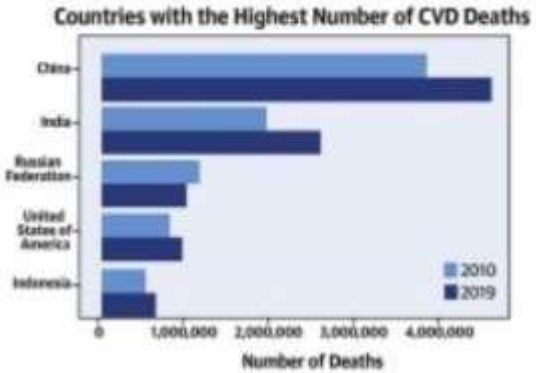
- Prevalent cases of total CVD nearly doubled from 271 million (95% uncertainty interval [UI]: 257 to 285 million) in 1990 to 523 million (95% UI: 497 to 550 million) in 2019, and the number of CVD deaths steadily increased from 12.1 million (95% UI:11.4 to 12.6 million) in 1990, reaching 18.6 million (95% UI: 17.1 to 19.7 million) in 2019.
- The global trends for disability-adjusted life years (DALYs) and years of life lost also increased significantly, and years lived with disability doubled from 17.7 million (95% UI: 12.9 to 22.5 million) to 34.4 million (95% UI:24.9 to 43.6 million) over that period.
- The total number of DALYs due to IHD has risen steadily since 1990, reaching 182 million (95% UI: 170 to 194 million) DALYs, 9.14 million (95% UI: 8.40 to 9.74 million) deaths in the year 2019, and 197 million (95% UI: 178 to 220 million) prevalent cases of IHD in 2019.
- The total number of DALYs due to stroke has risen steadily since 1990, reaching 143 million (95% UI: 133 to 153 million) DALYs, 6.55 million (95% UI: 6.00 to 7.02 million) deaths in the year 2019, and 101 million (95% UI: 93.2 to 111 million) prevalent cases of stroke in 2019.

Percent Change in Age-Standarized CVD Death Rate from 2010-2019

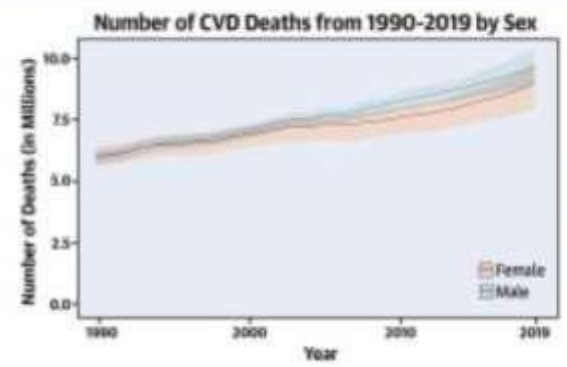


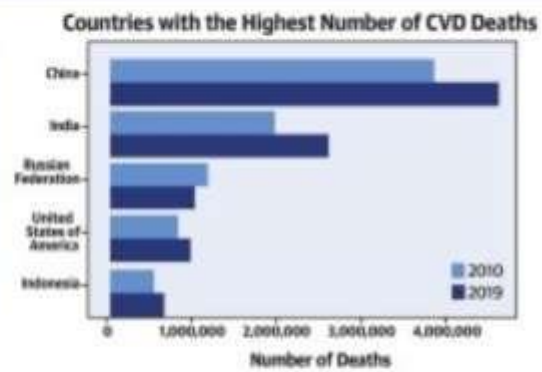
Number of CVD Deaths



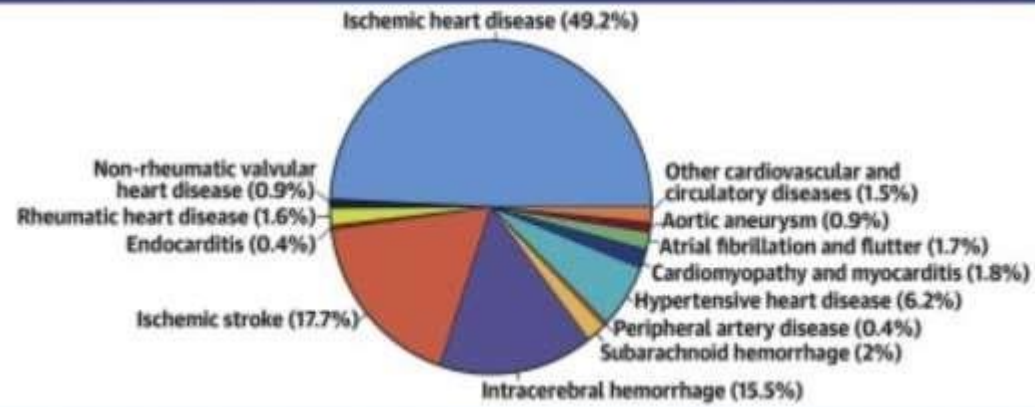


Number of CVD Deaths





Proportion of CVD Deaths by Cause (2019)



ABSTRACT

In this project we are implementing heart rate monitoring and heart attack recognition system using IoT. The system will carry hardware having sensors with android application. The heartbeat sensor will allow checking heart beat readings and store the data in the database which can be accessed by the health workers and the users using cloud technology. The developer may set the high and low level of heartbeat limits and the normal temperature range.

If the readings of both the sensor go higher than the specified range or below the specified range, the patient is more likely to get a heart attack.

We also measure the heart rate by using the ECG or EKG (electrocardiogram) waveform as the comparison result of the pulse sensor (pulse oximeter) with ECG waveform. The sensor consists of an infrared light-emitting-diode (LED) and a photodiode. The LED transmits an infrared light into the fingertip which is reflected back from the blood inside of finger arteries.

AUTOMATED PILL DISPENSER

The system also provides a pill dispenser machine which dispenses medicines according to our needs which is intact to the robot. It can also be controlled using a android application and sensors with microcontroller programming which makes it more automated and compact.

LITERATURE SURVEY

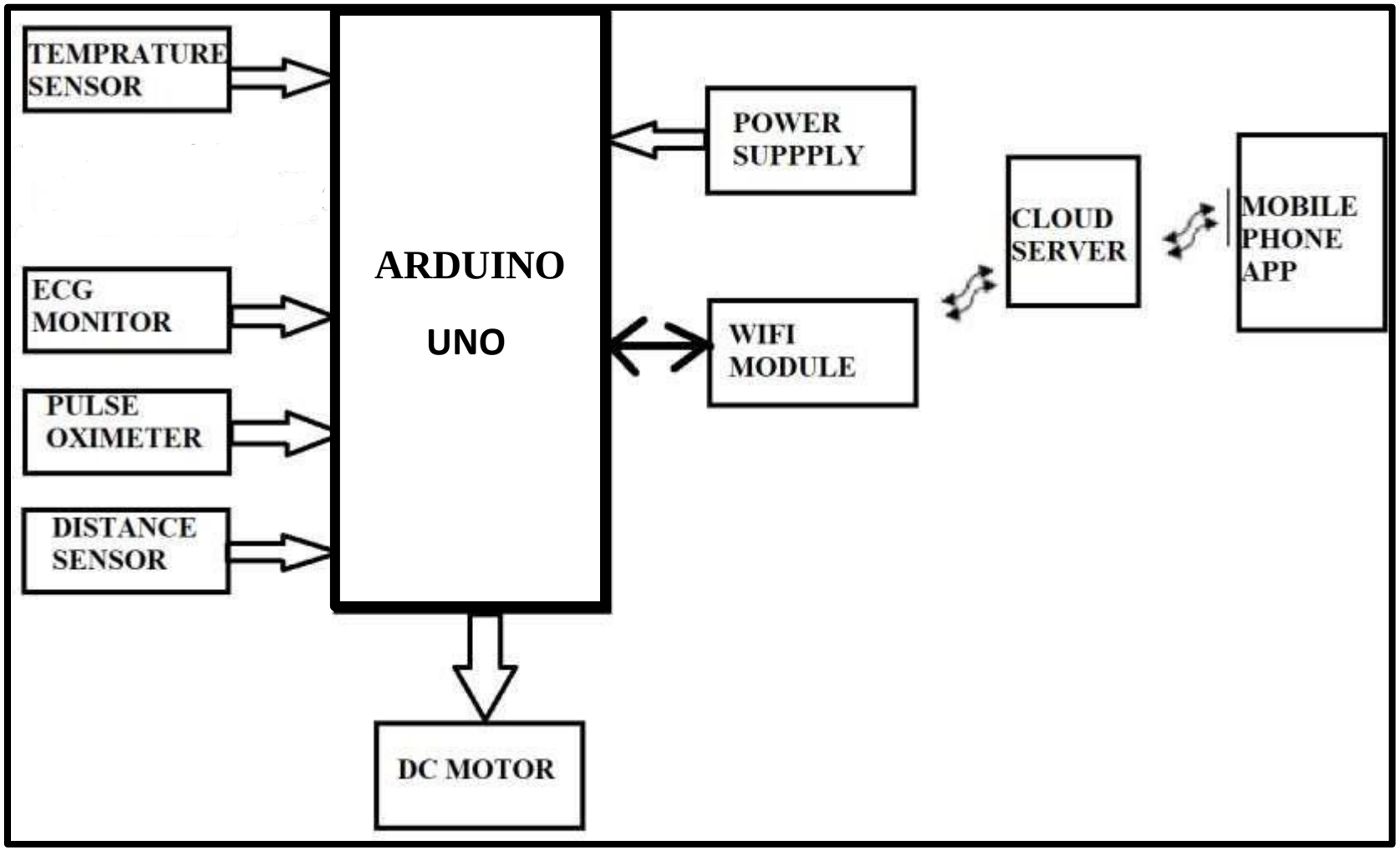
Comparison of diverse existing Garbage Monitoring System

Sr.No.	Title of Papers	Year	Sensors and Technology Used
1	IoT based Heart Attack Detection, Heart Rate and Temperature Monitor[1]	2017	Pulse sensor, ESP8266 wi-fi module, LM35 temperature sensor, Arduino Uno
2	Heartbeat Sensing and Heart Attack Detection using Internet of Things[4]	2017	Pulse sensor, wi-fi module, Arduino Uno
3	IoT Based Heart Attack Detection and Alert System[5]	2017	Analog sensor, wireless module, ECG leads, AVR microcontroller
4	IoT on Heart attack detection and heart rate monitoring[6]	2016	MI Band 2, android phone, Big Data Analytics
5	Heart attack detection using Android Phone[7]	2016	ECG monitor, Android phone
6	Heart rate monitoring and Heart attack detection using wearable Device[8]	2016	Smart band, Android phone
7	Heart rate monitoring system using finger tip through Arduino and processing software [2]	2016	Fingertip sensor, Arduino Uno, Nodemcu, Android Phone
8	Heart attack detection and Medical attention using Motion Sensing Device-Kinect[3]	2014	Kinect, Xbox one
9	Heart attack detection using Smart Phone[9]	2013	Smart Phone

METHODOLOGY

- The proposed system has ability of detecting and monitoring heart attack with help of heart rate readings of sensors based on internet of things and cloud computing. This method uses a **pulse sensor, ECG sensor, Arduino board, Bluetooth module and a Wi-Fi module.**
- There are four main ways to measure heart rate: electrocardiogram, photoelectric pulse wave, blood pressure measurement, and phonocardiography. Out of which the system uses the former two;
- After setting up the system, the pulse sensor will start sensing heart rate readings and will display the heartbeat of person on android application . Also, with the use of **Wi-Fi module it will transmit** the data over internet and the **Bluetooth module** enable to connect smart devices for easy transfer of incoming data.
- This system allows a set point which can help in determining whether a person is healthy or not by checking his/her heartbeat and comparing it with set point. After setting these limits, the system will start monitoring the heart rate of patient and immediately the heart rate goes above or below the certain limit the system will send an alert message.
- As a part of this project, we are implementing an android application model that will track the heartbeat of particular patient and monitor it correctly and give the emergency message on chances of heart attack.
- The bot which is a heath-care one is **line follower robot** which is controlled using android application using embedded programming and control. Each sensors are allotted separate I/O ports which are both digital and analog according to the needs. The Arduino UNO board used here, consists of ATmega328 chip which enables the developers to easily interface all the sensors using embedded C language.

BLOCK DIAGRAM



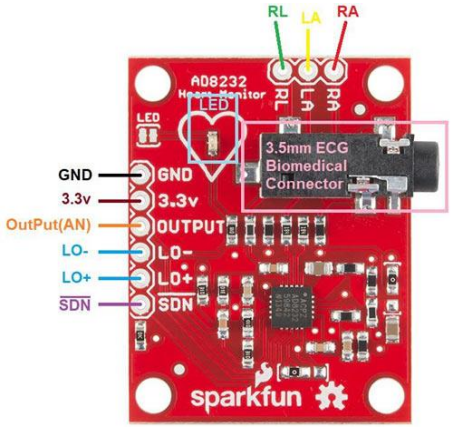
VARIOUS COMPONENTS USED IN THE ROBOT

1. ARDUINO UNO BOARD

- Arduino UNO is based on an ATmega328P microcontroller
- It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits and has a dedicated IDE to which it is programmed on.
- The Arduino UNO includes: 6 analog pin inputs, 4 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header.
  - •Operating Voltage: 5V
  - •Input Voltage (recommended): 7-12V
  - •Input Voltage (limit): 6-20V
  - • DC Current per I/O Pin: 20 mA
  - •DC current for 3.3V Pin: 50 mA
  - •Flash Memory: 32 KB (ATmega328P) of which 0.5 KB used by bootloader
  - •SRAM: 2 KB (ATmega328P)
  - •EEPROM: 1 KB (ATmega328P)
  - •Clock Speed: 16 MHz
  - •LED_BUILTIN: 13

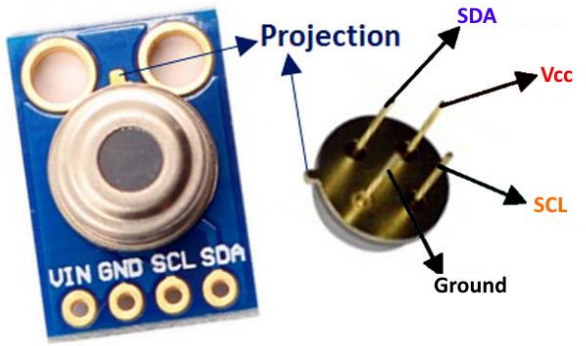
2. ECG SENSOR

- The electrocardiography or ECG is a technique which collects electrical signals which are generated from the human heart.
- When an physiological arousal experiences then the ECG sensor allows us to recognize the level.
- AD8232 sensor is used to calculate the electrical activity of the heart.
- Electrocardiography can be used to help in diagnosing different conditions of the hear
- Fully integrated single-lead ECG front end
- Common-mode rejection ratio: 80 dB (dc to 60 Hz)
- Two or three-electrode configurations
- Qualified for automotive application
- Single-supply operation: 2.0 V to 3.5
- Fast restore feature improves filter settling



3. IR TEMPERATURE SENSOR

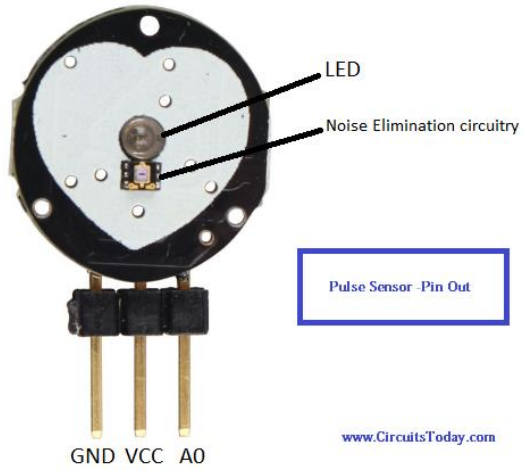
- The MLX90614 is a Contactless Infrared (IR) Digital Temperature Sensor that can be used to measure the temperature of a particular object ranging from -70° C to 382.2°C. It is used as thermometer for non-contact temperature measurements.
- The sensor uses IR rays to measure the temperature of the object without any physical contact and communicates to the microcontroller using the I2C protocol.
- .Due to its high accuracy and precision, it is also used in a wide range of commercial, health care, and household applications like room temperature monitoring, body temperature measurement, etc.
- Power: 3.3V ~ 5V
- Measuring range (area): 40°C ~ 85 °C
- Measuring range (object): -70°C ~ 380 °C
- Resolution: 0.02°C
- Precision: ±0.5°C (0~50°C)
- Field of view (FOV): 35°



4. PULSE SENSOR

The essence is an integrated optical amplifying circuit and noise eliminating circuit sensor. Clip the Pulse Sensor to your earlobe or fingertip. Then it into your Arduino, you are now ready to read heart rate. The pulse sensor has three pins: VCC, GND & Analog Pin.

- Its diameter is 0.625
- Its thickness is 0.125
- The operating voltage is ranges +5V otherwise +3.3V
- This is a plug and play type sensor
- The current utilization is 4mA
- Includes the circuits like Amplification & Noise cancellation



5. Other peripherals

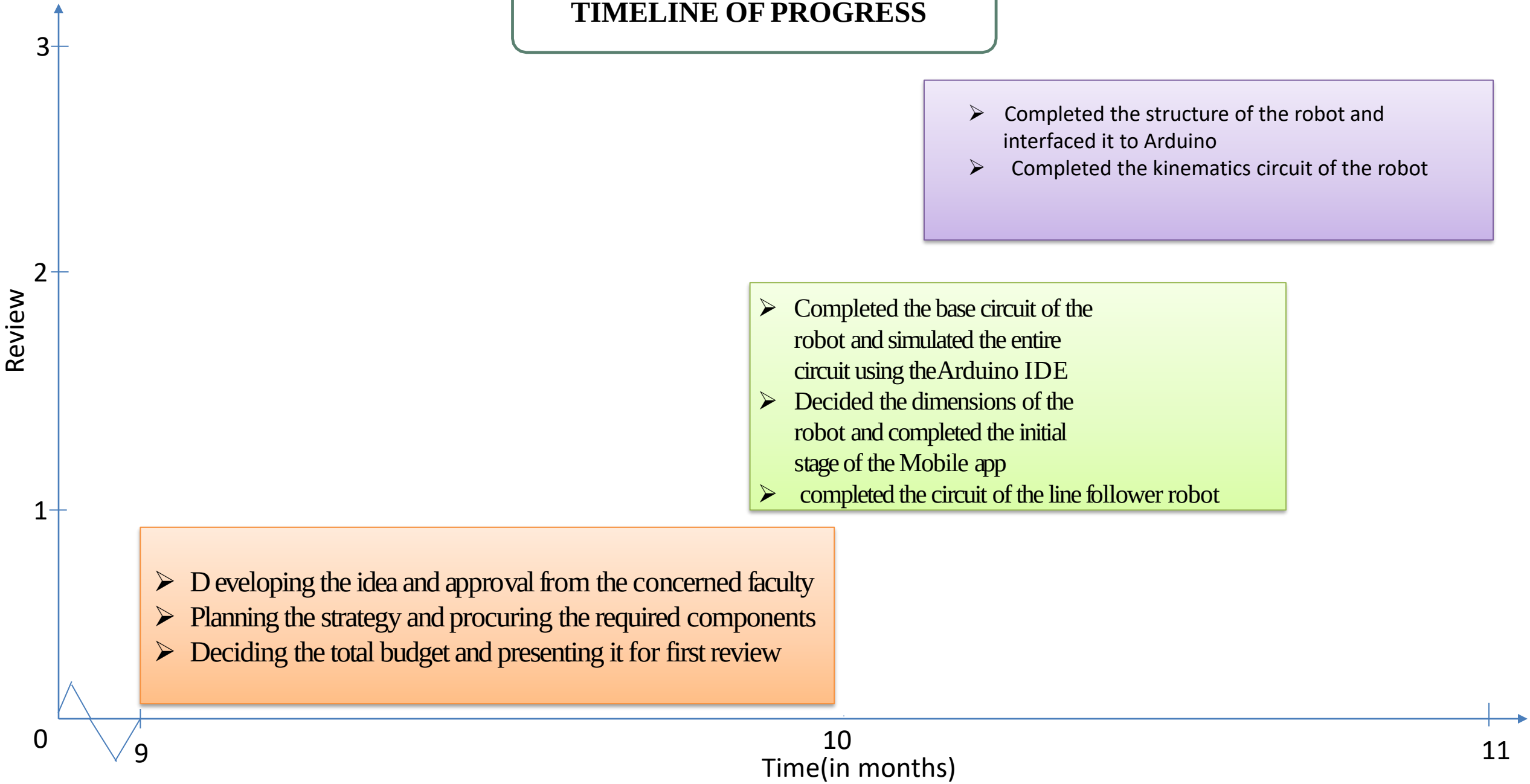
- Battery(Lead acid battery)-12V
- ESP-8266 WI- Fi Module
- L298-N Motor driver modules, DC Motors, PIR sensor
- Jumper wires, bread-boards

These components are used to avoid obstacles in robot's pathway and thereby helping in robot's motion.

LINE FOLLOWER ROBOT

- The line follower robot is an automated vehicle that follows a visual line embedded on the surface. This visual line is a path on which the line follower robot runs. Generally, it uses a black line on a white surface, or you can adjust it as a white line on a black surface.
- The concept of the line follower robot is related to light. Here, we use the behaviour of light on the black and white surface. The white colour reflects all the light that falls on it, whereas the black colour absorbs the light.
- In this line follower robot, we use IR transmitters and receivers (photodiodes). They are used to send and receive the lights. When IR rays fall on a white surface, it is reflected towards IR receiver, generating some voltage changes.
- When IR rays fall on a black surface, it is absorbed by the black surface, and no rays are reflected; thus, the IR receiver doesn’t receive any rays.
- In this project, when the IR sensor senses a white surface, an Arduino gets 1 (HIGH) as input, and when it senses a black line, an Arduino gets 0 (LOW) as input. Based on these inputs, an Arduino Uno provides the proper output to control the bot.

TIMELINE OF PROGRESS

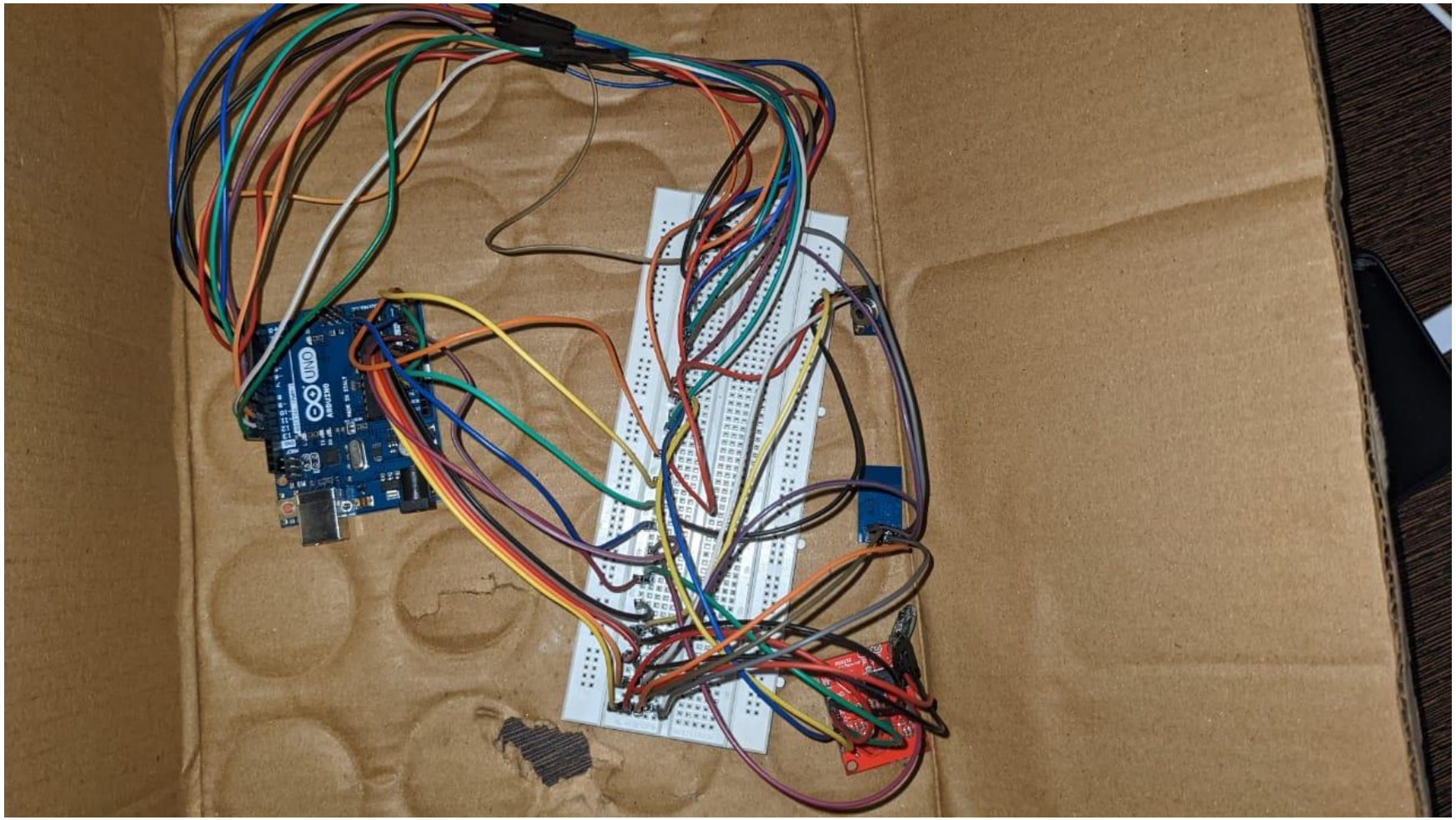


- Completed the structure of the robot and interfaced it to Arduino
- Completed the kinematics circuit of the robot

- Completed the base circuit of the robot and simulated the entire circuit using the Arduino IDE
- Decided the dimensions of the robot and completed the initial stage of the Mobile app
- completed the circuit of the line follower robot

- D eveloping the idea and approval from the concerned faculty
- Planning the strategy and procuring the required components
- Deciding the total budget and presenting it for first review

WORKING CIRCUIT OF THE ROBOT



MOBILE APPLICATION

- This app displays data collected by ESP8266 wifi module.
- It monitors users' heart rate and deploys the data into the cloud environment.
- The app then shows the data using data analysis and therby predicts the risk of heart attack in the user.

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THANK YOU