Heartmate - the Rescuer

Submitted in partial fulfillment of

Mini Project 1B

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May 2022

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CERTIFICATE

This is to certify that the project entitled **"Heartmate - the Rescuer"** is a bonafide work of

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Project Report Approval for S.E.

This project report entitled **'Heartmate - the Rescuer'** by **Adarsh Rao, Gouresh Sankhe, Rakshita Khantwal, Umer Shaikh** is approved for **Mini Project 1B.**

Examiners

1. _____

2. _____

Date : / /

Place : **Kurla, Mumbai**

Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea / data / fact / source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Adarsh Rao	**Gouresh Sankhe**
Rakshita Khantwal	**Umer Shaikh**

Date : / /

ACKNOWLEDGEMENT

A project is a teamwork which involves the contribution of many people. We would like to thank everyone who have contributed by taking interest in our work and motivating us all the way through. Our sincere thanks to our project guide Mr. Jithin Isaac, for motivating, co-operating and guiding us throughout the project work, with her effective skills and huge knowledge base. For their continuous valuable guidance, support, suggestions and their precious time in every possible way throughout the project activity.

Date : / /

ABSTRACT

Cardiac disease is a concern as people age. In fact, heart problems are fairly common in men over the age of 50 but are increasingly affecting younger adults, regardless of gender. This is attributed, at least partially, to more sedentary and stressful lifestyles and unhealthy habits. Electrocardiogram (ECG) is a common medical test to check the cardiac function by measuring the electrical activity of the heart. ECG is considered a fairly routine and sufficient indication of heart health. It is possible to design a low-cost ECG machine using Arduino and an AD8232 ECG sensor. It is an op-amp device that measures bio potential signals and offers a fairly accurate ECG graph with the help of which, the heart beat of the person can be monitored.

Contents

List of Figures

List of Abbreviations

ECG	Electro Cardio Graph
HPF	High Pass Filter

Chapter 1

Introduction

We all might know some or the other person who has suffered a heart attack. Why does this happen? It is because of the lack of blood supply to the heart. We have therefore come forward with a project in which we can keep a check on the heartbeat of a person using electrocardiograph sensor AD8232 thereby keeping check on the persons heart and to diminish the chances of a heart attack by detecting it in the preceding time.

1.1 Problem Statement

The aim of this project is to generate a graph of the beating heart and to detect any irregularities in it thereby alerting the user of the abnormal heartbeat detection.

1.2 Scope of the Project

The proposed outcomes and future uses are :

1. Using it in Biomedical field.
2. Making it available for common people for their safety.
3. Using it to keep a check on the heart rate of a person who has already suffered with heart problems.

Chapter 2

Literature Survey

AD8232

The AD8232 Single Lead Heart Rate Monitor is used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading. The AD8232 Heart Rate Monitor breaks out nine connections from the IC that you can solder pins, wires, or other connectors to.

https://robokits.co.in/sensors/biomedical-sensor/ad8232-ecg-sensor-with-ecg-cable-and-electrodes

1. AD8232 has fully integrated single-lead ECG front end.
2. High signal gain (G = 100) with dc blocking capabilities.
3. It has 3-pole adjustable low-pass filter with adjustable gain
4. It allows only single-supply operation: 2.0 V to 3.5 V
5. It is designed to extract, amplify, and filter small bio potential signals in the presence of noisy conditions

Arduino Uno

https://www.arduino.cc/en/uploads/Tutorial/595datasheet.pdf

The Arduino Uno is a type of Arduino board that is provided as an open-source board that uses an ATmega328p microcontroller in the board. The Arduino Uno contains a set of analog and digital pins that are input and output pins which are used to connect the board to other components.

https://www.educba.com/what-is-arduino-uno/

1. The board contains 14 digital input/ output pins in which 6 are analog input pin
2. The board has a USB connection that can be used to a power supply to the board.
3. The Arduino UNO board has a list of several hardware components and has the capability to interact with those devices. The device includes Blue-tooth, internet, motor control, and many more.
4. The board has a total of 32 KB size flash memory that is used to store the data in it.
5. The board has one LED fitted inboard to make the debugging process easy and help to find the bugs in the code along with one reset button that helps to restart the program using the board.

Chapter 3

Working

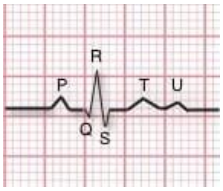
Board Label	Pin Function	Arduino Connection
GND	Ground	**GND**
3.3v	3.3v Power Supply	**3.3v**
OUTPUT	Output Signal	**A0**
LO-	Leads-off Detect -	**11**
LO+	Leads-off Detect +	**10**
SDN	Shutdown	**Not used**

We have shown the reference voltage and relative parameters in the below table.This is the connection points of sensor and Arduino UNO

Figure 3.1: Working in tabular form

An ECG is a paper or digital recording of the electrical signals in the heart. It is also called an electrocardiogram or an EKG. The ECG is used to determine heart rate, heart rhythm, and other information regarding the heart's condition. ECGs are used to help diagnose heart arrhythmias, heart attacks, pacemaker function, and heart failure.

ECG can be analyzed by studying components of the waveform. These waveform components indicate cardiac electrical activity. The first upward of the ECG tracing is the P wave. It indicates atrial contraction.



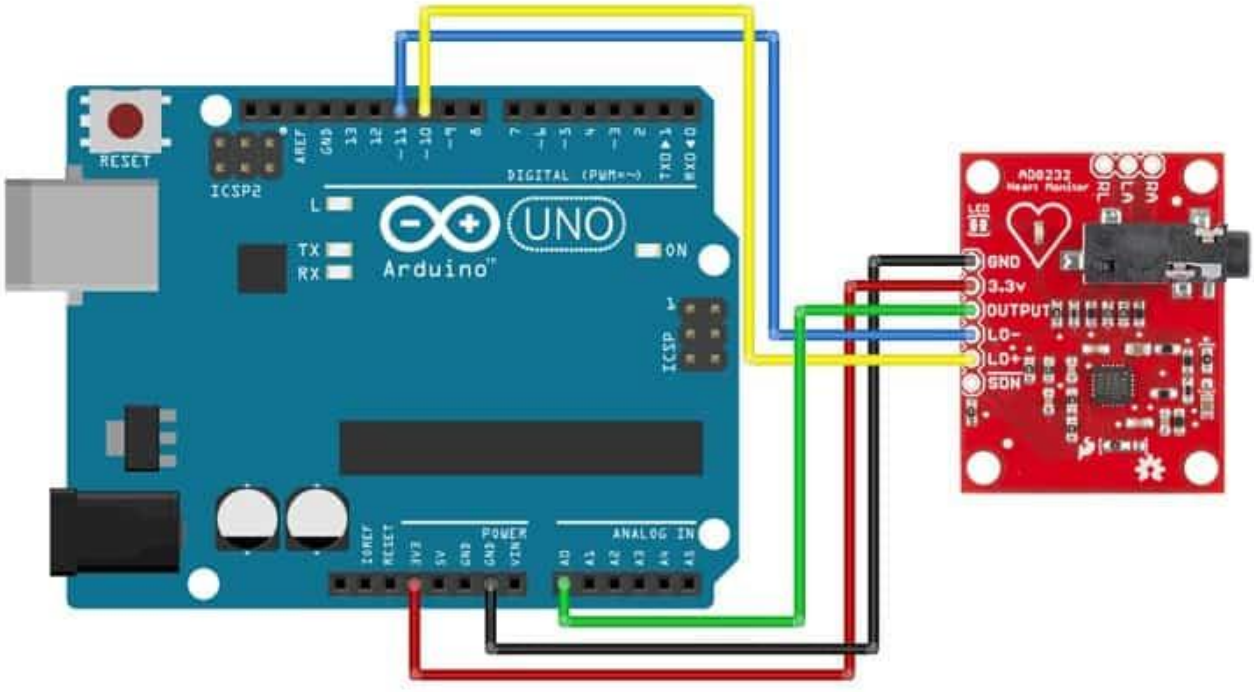
Chapter 4

Testing and Troubleshooting

We initially faced a lot of issues while connecting and soldering also there was Issue in our arduino code we were getting graph orientation in random manner We had to debug the code and make a proper orientation for our output With the help of debugging the code and using proper arduino code we successfully got graph in proper required orientation

Below mentioned Figure is a connection Diagram and circuit diagram of Arduino and AD8232 ECG sensor the connection and pin diagram of sensor and arduino is mentioned above in a tabular form For better understanding

Figure 4.1: 3D Model



Chapter 5

Results and Discussion

The working of the Heartmate- the Rescuer was carried out with the help of IC AD8232. AD8232 is a cost-effective, ECG analog sensor for measuring the electrical activity of the heart. It is an integrated signal conditioning block for ECG and other bio potential measurement applications.

1. When we connect the ECG pads to our body the AD8232 Sensors senses the heartbeat of a person using a proper Arduino code graphs are generated as user wants depending upon how bauds used in Arduino.The graph generated is a real time graph of a person with the help of ECG sensor one can check heart condition using proper graph Complexes if the heartbeats are fast more peak and irregularities are seen in the graph

2.The AD8232 module breaks out nine connections from the IC that you can solder pins, wires, or other connectors to. SDN, LO+, LO-, OUTPUT, 3.3V, GND provide essential pins for operating this monitor with an Arduino or other development board. Also provided on this board are RA (Right Arm), LA (Left Arm), and RL (Right Leg) pins to attach and use your own custom sensors. Additionally, there is an LED indicator light that will pulsate to the rhythm of a heartbeat.

4. The AD8232 Heart Rate Monitor breaks out nine connections from the IC. We traditionally call these connections “pins” because they come from the pins on the IC, but they are actually holes that you can solder wires or header pins to.

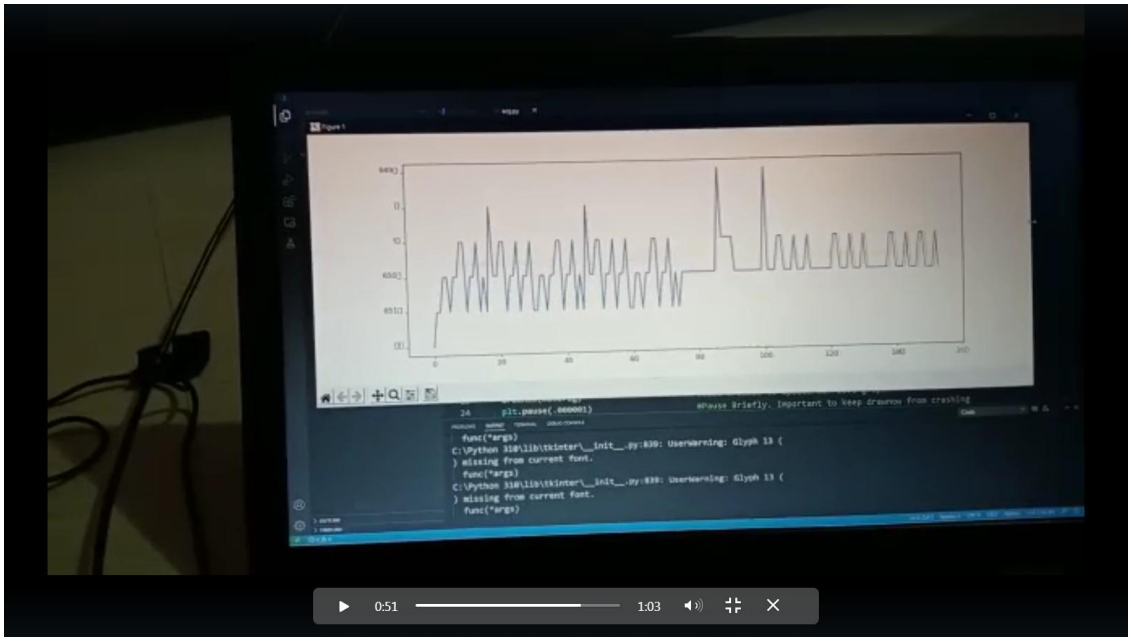


Figure5.1.2 Shows the output of our ECG Graph in Python VScode Ide

The real time values of python are generated and sent to python ide code with the help of code and real time values generated from Arduino

With the help of python and MatplotLib we have generated ECg graph on python as well

The wearable health monitoring system can be based on a microprocessor and customization platform, smart textiles, body area network, commercial Bluetooth sensorhe methodology and results demonstrated that it is possible to overcome most of the design barriers that have thus far prevented wearable sensor systems from being used in everyday clinical practice.

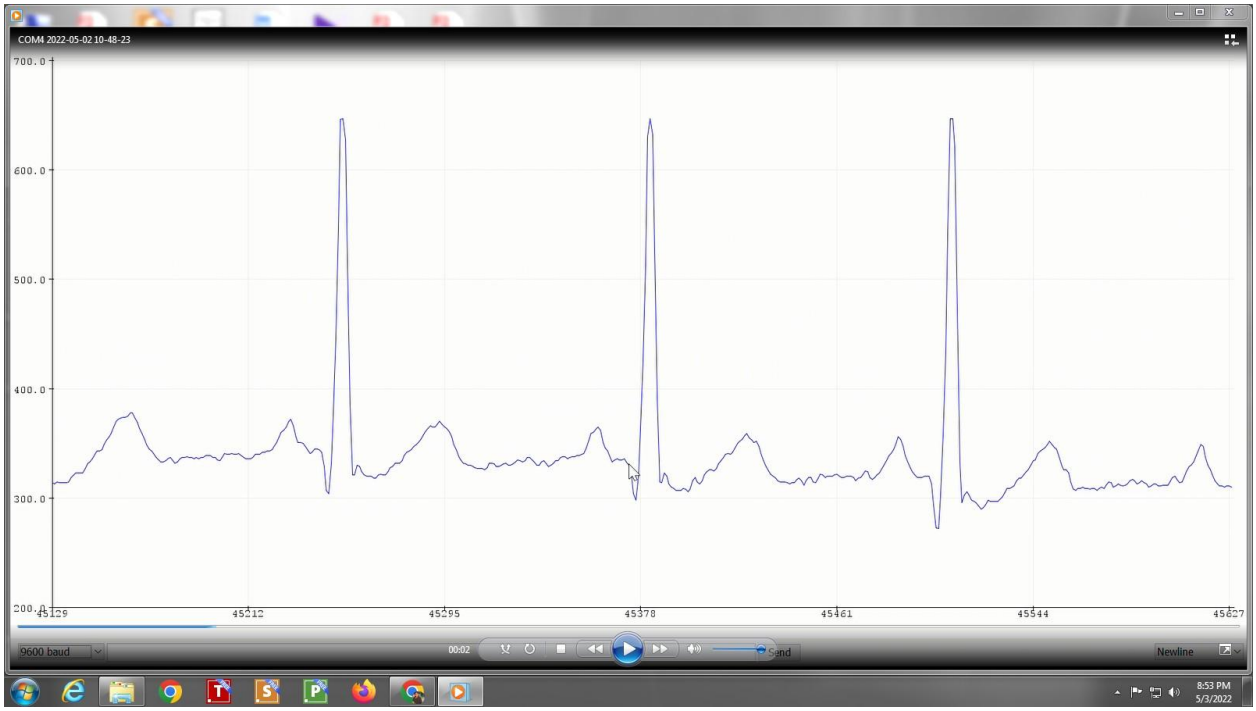


Figure 5.1: Simulation model on Arduino. Here ECG Graph of a person is generated we can see the peaks and complex of the person respectively

Chapter 6

Conclusion & Future Scope

The completed project has fulfilled most of the stated objectives. Effective time management and proper coding has played a large part in making the project a success.

Everyone can rely on this in the future as this will help them to keep a check on one of the most important organ of their body as it is both a safe and effective product.

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APPENDIX

Appendix A

Datasheets

A.1 AD8232

Features

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 Size: 3.5cm x 3cm

The AD8232 ECG Module is a cost-effective board used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram and output as an analog reading.

Additionally, this board includes pins like the right arm (RA), left arm (LA) right leg (RL) pins to connect custom sensors. An LED indicator in this board is used to indicate the heartbeat rhythm of humans. The AD8232 ECG module comprises a function like quick restore used to decrease the length of long resolving tails of the HPFs. AD8232 ECG module can be easily interfaced with any micro controller unit. It requires one analog pin for getting the output of the sensor and three digital pins for control related operations.

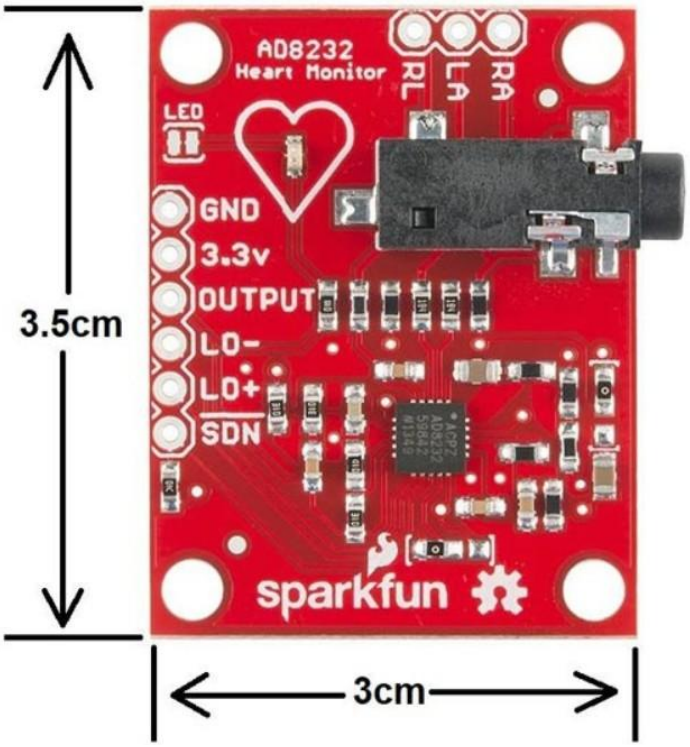

Figure A.1: IC AD823