AD8232 ECG Heart Monitoring Measurement Sensor Module Pulse Signal Board Set

User Manual

An ECG Sensor with disposable electrodes attaches directly to the chest to detect every heartbeat. The electrodes of ECG sensor will convert heartbeat to electric signal. ECG Sensor is very light weight, slim and accurate to measure continuous heartbeat and give rate data of heart beat. This device is used by trained doctors and medical assistances.

Electrodes of ECG Sensor have 3 pins and connected by cable with 30 inches in length. It makes ECG sensor easy to connect with controller and placed at the waist or pocket. In addition, the plug-in for the cable is a male sound plug which will make the cable easily removed or inserted into the amplifier board. The sensor is assembled on an arm pulse and a leg pulse. Every sensor electrodes have methods to assemble in body.

Hardware:

1)Arduino Uno/Mega/Nano

2)ECG Module (AD8232)

3)ECG Electrodes - 3 pieces

4)ECG Electrode Connector -3.5 mm

5)Power supply

6)Connecting Wires

Software Requirement:

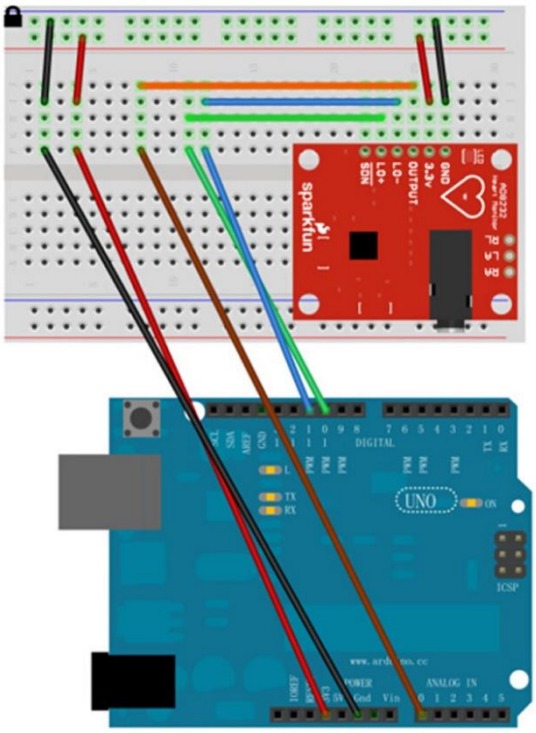
1) Arduino IDE

Download from (https://www.arduino.cc/en/Main/Software)

2)Processing IDE

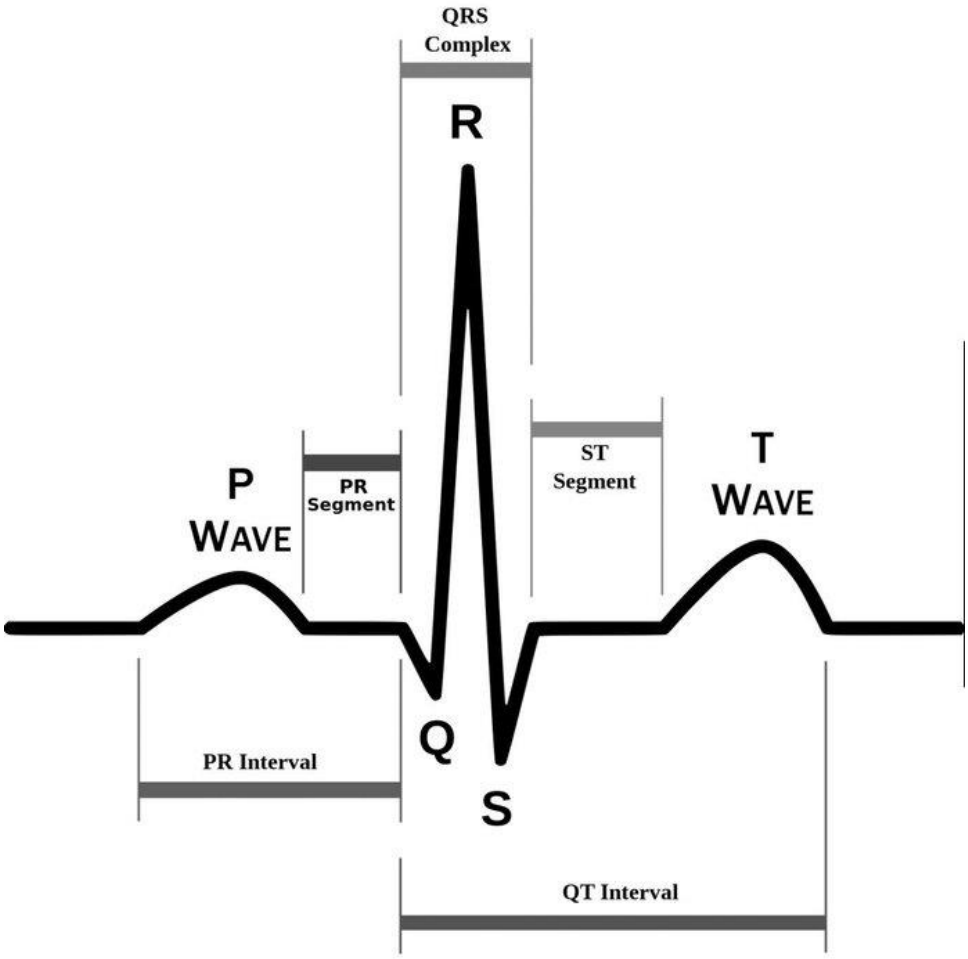
Download from (https://www.processing.org)

Pin Connections:



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

ECG Signal Parameter:



The figure above displays one cycle ECG signal from a heartbeat. From the figure, one cycle consists of P wave, QRS wave and T wave. P wave offers benefit information about the propagation time of the impulse to both atria. Then, follow with a flat trend called with the PR segment which is in consequence of propagation of the electric impulse from atria to ventricles. And follow with QRS complex wave which you can look in above figure. Q, R and S complex contain three small waves i.e. small Q wave, the high R wave and the small S wave. The QRS complex give information about the ventricular systole in consequence of the impulse propagation to the ventricles (Q wave), whereas the transmission to the whole tissue is caused by the R and S wave. The QRS complex provides information about fibrillation and arrhythmias, it can be helpful to analyze heart attacks. And then ST interval, it is following by the S wave and including with the T wave, it can point out the ischemia occurrences. It represents the period during which ventricles are contracting, which is the last stage of the heart cycle. The T wave permits one to have information about the cardiac hypertrophy, heart attacks, and ischemia. Moreover, others parameters, such as the QT interval, allow specific further pathologies to be characterized. Finally, the ECG signal ended with a small peak, U wave.

Table Normal ECG Parameters:

Phase Duration Amplitude

P Wave 0.06-0.11 <0.25 PR

Interval 0.12-0.20 -

PR Segment 0.08 -

QRS Complex <0.12 0.8-1.2

ST Segment 0.12 -

QT Interval 0.36-0.44 -

T Wave 0.16 <0.5

Changes in parameters of ECG with Heart Diseases:

Abnormal Parameter Effect on Heart

1)Short QT Interval Hypercalcemia, Hyperkalemia

2)Long QT Interval Hypocalcemia

3)Flat or inverted T waves Coronary ischemia, hypokalemia,

left ventricular hypertrophy

4)Peaked T wave, Long PR,

QRS wide, QT short Hyperkalemia

5)Prominent U waves Hypokalemia

6)Increased HR Tachycardia

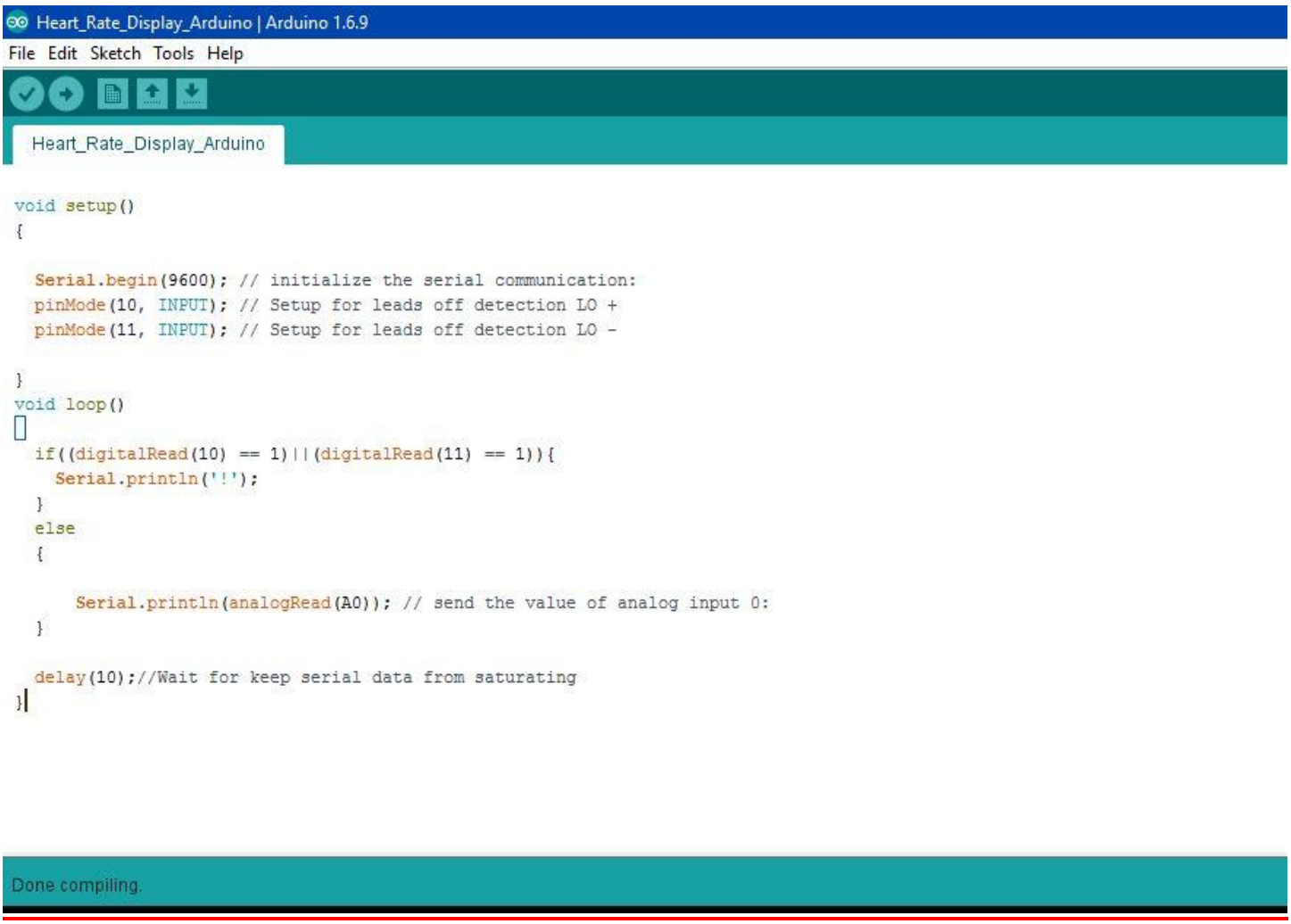
7)Decreased HR Bradycardia

8)Increased QRS Bundle branch block

9)Increased PR AV block

From the ECG parameters, analyzing a Heart Rate Variability (HRV) of the ECG signal can be implemented. According to the parameter changes comparing to the normal parameters above, the system may predict which disease that the user is potentially suffering from.

Arduino Program:



Download the .ino file and open the Arduino IDE. Connect the hardware.

Output data in serial monitor is:

658

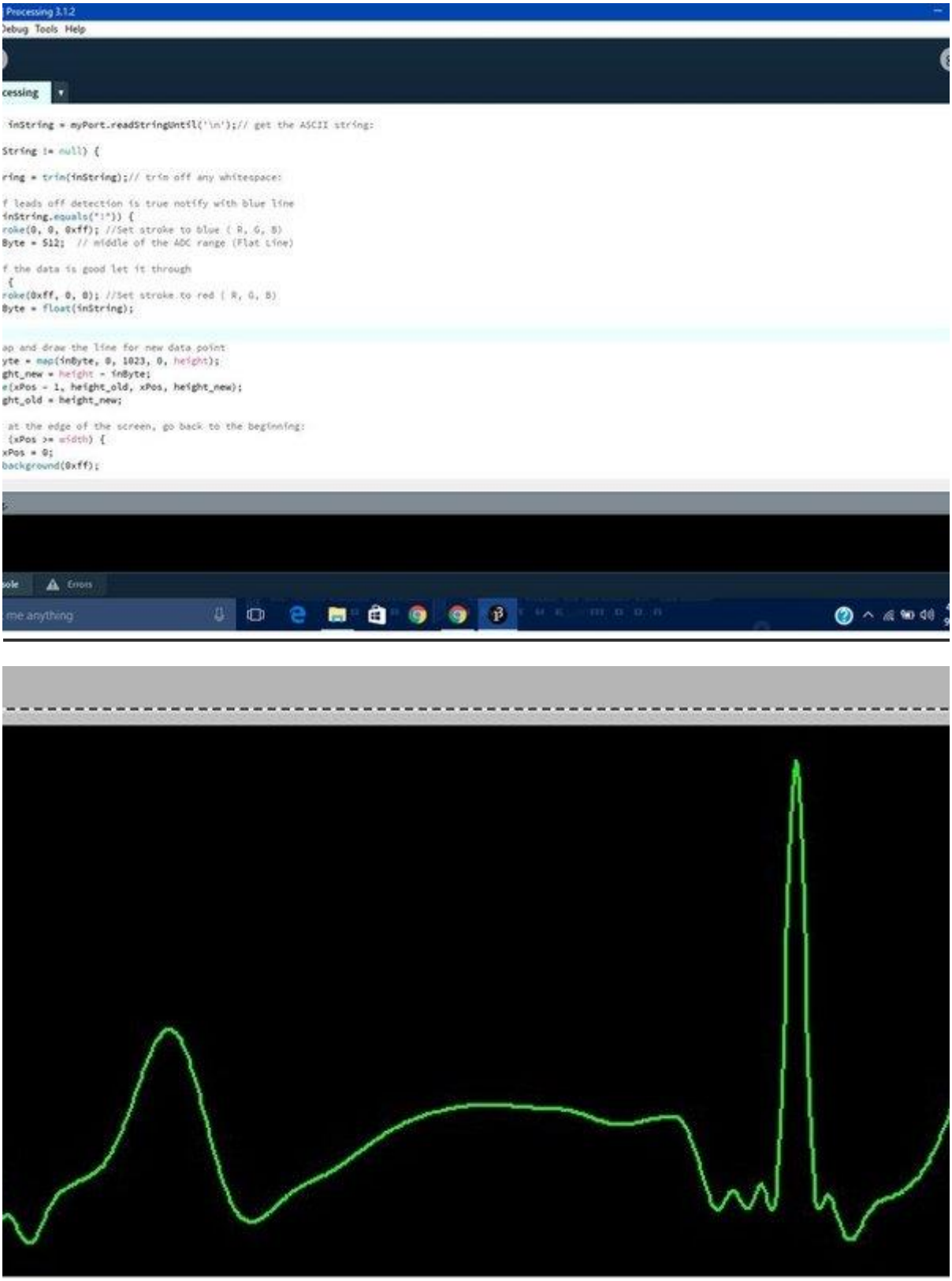
654

456

567

432

Processing Program:



For graphical representation download and open .pde file in Processing. Select the baud rate same as Arduino.

Applications:

1)Fitness and activity heart rate monitors.

2)Portable ECG Remote health monitors.

3)Gaming peripherals.

4)Biopotential signal acquisition.

Advancements:

1) Data can be uploaded or directly sent to the doctors by using IOT Technology.

2) By using more electrodes measurement can be more accurate