



CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Table with 2 columns: Name(s) Patrick Liu, Project Number 36839; Project Title Project POE: Tri-Sensor Cardiac Monitoring System; Objectives/Goals, Abstract, Methods/Materials, Results, Conclusions/Discussion; Summary Statement; Help Received.

36839

Project Title

Project POE: Tri-Sensor Cardiac Monitoring System

Objectives/Goals

Problem:

Every one minute, one person dies from a heart-disease related event globally. Heart disease often strikes through myocardial infarction, or heart attack.

Objective:

Project POE aims to assist patients with heart disease through a stationary diagnostic device that is interlinked with a personalized Android app. It is the first prototype to a wearable device that detects trends before a heart attack.

Methods/Materials

Materials:

Pulse Sensor, Bluetooth HC-06 module, Arduino Uno, Olimex ECG Shield, ECG Passive Electrodes, General Purpose Op Amp (MCP601), 2 Resistors (1k#937; & 2.5M#937;), Capacitor (10nF), Nellcor(TM) Reusable SpO2 Sensors with OxiMax(TM) Technology, LCD Keypad Shield, General-Purpose PCB board, Acrylic Case Covering.

Methods:

Build, test, and fine tune each sensor circuit, add Bluetooth capability, build app, test final prototype on human subjects.

Results

From the testing of my project on human subjects, I found a gradual trend in the data as age increased; The heart rate increased as age went up (ranging from 60-82 BPM), and the oxygen saturation was consistent (98-99%). The diagnosis of the subjects was successful, outputting 100% of the subjects as "Safe and Healthy" based on their age and gender. The total price of the hardware prototype was 87\$. The ECG Shield had the cleanest signal when the electrodes were attached to the left wrist, right wrist, and right ankle.

Conclusions/Discussion

Project POE successfully measures heart rate, blood oxygen saturation, and displays the electrocardiogram of the user. The heart rate and oxygen saturation is logged to an Android mobile app, where an algorithm displays the final status of heart health. The electrocardiogram is displayed on a JavaScript app, which filters the noise in the user's environment. Project POE's capabilities and low cost override other cardiovascular diagnostic devices. Results from testing showed viable data of human subjects.

Summary Statement

I developed a hardware prototype and a mobile application which operate as a diagnostic device that measures the heart's vital data and outputs analysis.

Help Received

I developed the prototype and app myself; My father provided me with the acrylic case that covers the hardware.