

Introduction

The goal of this project is to create a device that demonstrates the digitizing of bio-potential signals. The device will act as a digital electrocardiograph that is capable of logging ECG waveforms into a memory bank for later retrieval and analysis. The aim is to assist in modern areas such as Electronic Health **Records and other known digital patient data** banks.



Figure 1. Breadboard Prototype and Arduino

Background Research

Research reveals that there is a growing market for mobile measuring devices in cardiology. The main goal in today's industry is to increase mobility while providing a central data bank that that these devices can pass information to. By using the internet as a medium for data flow, mobile devices such as these assist greatly in the fields of medical telemetry.



Figure 2. Project Block Diagram

Data-Logging Electrocardiograph By Cuong Nguyen







Figure 3. Breadboard Prototype to PCB Development

Method

A main ECG circuit will extract and amplify the bio-potential signal while also filtering out any unwanted noise. The signal will then travel through a microcontroller's analog to digital converter (Arduino ADC) to digitize the data. It is these digital data points that will be logged and used to generate useful information such as a plotted ECG waveform and heart beats per minutes. The entire device is powered by two 9V batteries. The interfacing between operator/PC and the device will be through Bluetooth, therefore isolating the subject and device from equipment connected to high voltage sources by design.



Figure 4. Eagle PCB Layout



Complications

One of the major complications throughout the project was ambient noise interfering with the device's functionality. This problem was addressed as much as possible through aggressive filtering. Another problem was on the software side, relating to the Arduino's S.D Library used in the project. Because the library was under the 8.3 File Name convention, files and directories were limited to only eight characters long while file extensions were limited to three.



Figure 5. Raw ECG Waveform by Plotting Captured **Digital Data Points.**

Conclusion

With this device functioning as intended, the project has completed a majority of the objectives listed in the undergraduate senior proposal. Although it is working, the device is not intended for replication or distribution. Further development and rigorous testing would be needed in order for this device to reach an acceptable medical grade.

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References

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