Name(s)	Project Number
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Project Title

iCordisX: SmartPhone-Based Personalized Cardiac Monitoring Using Computer Vision and Bluetooth Low Energy

Abstract

Objectives/Goals

iCordisX aims to provide a personalized and data-driven supplement for cardiac anomalies that acts as a dependable healthcare interface for wireless ECG monitors.
Targeted Features: User-based system, daily symptom tracker, BLE functionality, diagnosis/monitoring mode.

Methods/Materials

Drew out and implemented project system: sensors + hardware. Developed algorithm for #diagnosis# of ECG. - Machine learning for extraction of baseline features from MIT-BIH Database, and object detection. Designed app interface: screens, user input, data flow and models. Tested fully-functional app system, review data output, compare accuracy to MATLAB algorithm, receive feedback from cardiologists/entrepreneurs. Create hardware casing (acryllic) and 3D shell.
ECG Circuit - 1 x Arduino Pro Mini and Cable - 1 x AD8232 board 3x TENS electrodes
Computer + Software: Arduino IDE, Processing 3 Software, Anaconda-Navigator (Jupiter-Notebook), MATLAB R2016B, node.js, Visual Studio Code, XCode, AWS EC2 Instance

Results

Smoothing/peak detection method in MATLAB resulted in detrended signal, color-coded blue and red to distinguish the original signal.The Python algorithm was able to successfully filter, calculate specific intervals, and calculate heart rate, as seen by its percent error of only 8.08% for averaged features when compared to the MATLAB analysis. Average Signal Quality should be at least approximately .94. iCordisX has a calculated net price of $131 dollars (excluding the mobile device), an impressive feat for all it's capabilities.

Conclusions/Discussion

CordisX provides a unique value proposition: a personalized, simplistic monitoring system that is appealing to the aging society. The feature extraction algorithm is comparable to the accuracy of a standalone MATLAB program, which also verifies the device#s accuracy of data output. The app is flexibility with data management and real-time data streaming, whether it be via monitoring or diagnosis. Users will receive a data-driven supplement for their daily heart health, all while logging it in the database for their personal physicians to see. Survival rates from heart attack may be increased from early detection in irregular heart rhythm, where the emergency protocol may be activated. All of iCordisX#s features are driven by the user#s information, and allows the user to view trends over a large period of time.

Summary Statement

iCordisX aims to provide a personalized and data-driven supplement for cardiac anomalies that acts as a dependable healthcare interface for wireless ECG monitors.

Help Received

Received resources at beginning of project from Nitish Nag (PhD Student @UCI) to begin algorithm engineering.