CMPT 340 Project Proposal: Pulse Oximetry Data Analysis with a Mobile Application (Android)

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1 Project Overview

Name: Oxylyzer
Motivation: Obstructive sleep apnea is a common respiratory disorder during sleep. It is usually detected via a full-night polysomnography (PSG). Some studies have found an accuracy rate of 97% for diagnosing sleep apnea using pulse oximetry in comparison to PSG, making it a viable alternative.[1] We hope to achieve the same results using a smartphone and a wireless pulse oximeter to increase the convenience and affordability for this type of procedure. Current mobile applications addressing these issues use only accelerometers or sound analysis, which can often lead to inaccurate results due to environmental variables.
Goal: Our team will be developing an Android app for the analysis of pulse oximetry data for primarily diagnosing sleep apnea. We hope that the app will give users a general understanding of what the oxygen levels indicate.

2 Project Specifications

2.1 Team Description:

App Development: Dylan (Lead), Fedora, Chris, Michael
Pulse Oximetry Analysis: Chris (Lead), Akshay

2.2 Steps:

1. Research signal representations
2. Analysis of signals
3. Application development: Design, Implementation, Integration, Testing
4. User Demonstration, Final Written Documentation and Presentation

[1] Brouillette, R.T., Ducharme, F.M., Leimanis, A., Luciano, R., Morielli, A., Waters, K.A.: Nocturnal pulse oximetry as an abbreviated testing modality for pediatric obstructive sleep apnea. Pediatrics. 105(2), 405-12 (2000)

2.3 Timeline and Projected Milestones:

Week	Date	Goals
1	Feb 3	Research sleep apnea detection, general information gathering.
2	Feb 10	Begin app design, find info on hardware, order oximeter.
3	Feb 17	Finalize design, begin development, interface w/hardware.
4	Feb 24	App development, begin data analysis.
5	Mar 3	App development, coordinating accelerometer to counteract movement.
6	Mar 10	Freezing features, add user help, tutorials.
7	Mar 17	App development, testing, bug fixes.
8	Mar 24	Testing, bug fixes.
9	Mar 31	User Testing, bug fixes.
10	Apr 7	Finalize app, begin presentation.
11	Apr 14	Complete presentation, documentation.

2.4 Anticipated Problems and their Proposed Solutions:

Getting the Pulse Oximeter from the supplier in time
PS: Use pre-existing data for the duration without the oximeter.
Interfacing pulse oximeter with Andriod
PS: Research similar approaches interfacing with bluetooth.
Getting data from pulse oximeter via bluetooth
PS: Ensure oximeter uses a standard bluetooth profile.
Analysis of data to get significant conclusions
PS: Compare with other applications and research.
Problems with determining the accuracy of the data
PS: Compare positive results from previous studies against our analysis.

2.5 Project Tools:

- Android Smartphone
- Android development envrionment, eg. Eclipse with ADT
- Matlab/Sage for data analysis and simulation

2.6 Anticipated Results: Our results should include an Android application capable of recording oximetry data, analysing data for pathological features, viewing historical data, graphing pulse oximetry data in correlation with problematic features and importing/exporting data via email.

References

1. Clinical Use of Pulse Oximetry, `http://www.copd-alert.com/OximetryPG.pdf`
2. Sleep Apnea Monitoring Using Mobile Phones, `http://www.aloul.net/Papers/faloul_healthcom12.pdf`
3. Giannouli, E., and Moussavi, Z., Yadollahi, A.: Sleep Apnea Monitoring and Diagnosis Based on Pulse Oximetery and Tracheal Sound Signals. Medical & Biological Engineering & Computing 48.11, 1087-097 (2010)