Name(s)

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Project Number

S0801

Project Title

Tracking Parkinsonian Tremors: A Wearable Device Application Utilizing Smart Sensing for Real-Time Monitoring & Analysis

Abstract

Objectives

Parkinson's Disease is a neurological disorder caused by neuron deterioration in the substantia nigra part of the brain. Such tremor-based diseases impacts tens of millions of people around the world and patients suffer from shaking, stiffness, and problems with balance and coordination. Unfortunately, there are no standard quantitative, efficient and reliable ways for patients and doctors to track tremor progression over time. The goal is to develop a wearable device application that focuses on assisting with diagnosis and monitoring of hand tremors. The app enables real-time quantitative measurement, analysis, data storage, and communication of results to healthcare provider. This allows the doctors to assess the progression of patients' symptoms and assists them in varying the treatment regimen for enhanced patient outcome.

Methods

The app utilizes the smartphone s built-in accelerometer sensor to monitor any movement of the device and is coded on the MIT App Inventor 2 platform. The Google Fusion Table is used to store the recorded data. Android Debug Bridge was used to transfer the app onto the wearable device (Android Tic Watch). All data was recorded through the smartphone, but can also be visually tracked using the wearable device.

Results

According to the data, the range of the sensor s coordinates for normal behavior is the deviation from the recorded original position: ± 0.2 m/sec2 for x-coordinate; ± 0.4 m/sec2 for y-coordinate; ± 0.2 m/sec2 for z-coordinate. Any value recorded outside the above mentioned range is considered abnormal. A normal hand behavior shows a steady graph line, whereas when the tremors are detected, the plotted graph shows peaks and valleys. The extent of peaks and valleys shows the severity of tremors. The tremor score on a standardized scale of 1 to 10 is being used to indicate the severity of tremors in numerical terms.

Conclusions

The developed mobile app for a wearable device can successfully record and plot the presence and severity of hand tremors associated with tremor-based diseases such as Parkinson's Disease. The plotted graph clearly shows the difference between normal and abnormal hand tremors to assist in the diagnosis and monitoring of Parkinson's Disease. The numerical tremor score and the graphical data can help the healthcare provider in keeping a historical record of the patient's condition before, during and after the treatment. The accurate and precise measurements of symptoms can allow doctors to assess disease progression, deliver optimal drug dosage, thus resulting in better prognosis.

Summary Statement

I developed a wearable device application that allows for real-time quantitative measurement, analysis, data storage, and communication of results to assist with the diagnosis and monitoring of Parkinsonian tremors.

Help Received

I designed and developed the app on my own. I trained myself on android programming using online tutorials.