

A Software Platform for Sensor-based Movement Disorder Recognition

<https://www.neurodegenerationresearch.eu/survey/a-software-platform-for-sensor-based-movement-disorder-recognition/>

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Country

USA

Title of project or programme

A Software Platform for Sensor-based Movement Disorder Recognition

Source of funding information

NIH (NINDS)

Total sum awarded (Euro)

€ 1,565,859.63

Start date of award

30/09/2015

Total duration of award in years

2

The project/programme is most relevant to:

Parkinson's disease & PD-related disorders

Keywords

Essential Tremor, Movement Disorders, Tremor, sensor, Parkinson Disease

Research Abstract

? DESCRIPTION (provided by applicant): The goal of this Phase II is to enhance the availability of advanced brain and behavior research tools [PA-14-250] by developing an automated sensor-

based means of tracking the presence and severity of a broad spectrum of movement disorders during unscripted activities of daily living. The continuously updated and interpreted information from body-worn sensors will provide accurate, objective, and high resolution (1 s.) measurement of motor symptom severity of tremor, dyskinesia, bradykinesia, freezing and gait disorders in Parkinson's disease and postural/kinetic tremor in essential tremor. It will allow researchers to assess the oftentimes complex and dynamic nature of movement disorders, which is poorly captured by the current standard of self-reports and pencil-and-paper instruments. Advances in wearable sensor technology have facilitated such a solution, but there are currently no movement disorder recognition devices capable of interpreting sensor data from non-scripted activity in an effective manner for the more than 45 million people in the U.S. with movement disorders. Our approach is unique in that we are developing a generic Application Generator (AG) software platform containing signal processing modules that can be readily configured to provide automated recognition for different disorders without the need to prepare separate algorithms from scratch for each. Phase I established a proof of concept by developing a rudimentary AG platform that achieved automatic recognition of tremor, dyskinesia and freezing-of-gait in patients with Parkinson's disease (PD) from novel hybrid sensors that provided both muscle activity and movement data through surface electromyographic (sEMG) and accelerometer recordings. Phase II will continue the development to include a broader range of PD movement disorders, as well as other neurological conditions. Aim 1 will create an enhanced AG Platform by incorporating combined sEMG and inertial measurement unit (IMU) sensors to more completely describe involuntary movements and reduce the risk when tracking additional disorders. Human subject testing will provide a sensor database for testing IMU sensor accuracy and minimizing soft tissue artifacts. The Phase I recognition algorithms will be updated using the enhanced platform. Aim 2 will use the enhanced platform to develop new recognition applications that track bradykinesia and gait disorders in PD, and postural and kinetic tremors in patients with essential tremor. Our goal is to achieve error rates < 5% during unconstrained monitoring conditions with user-independent algorithms. Aim 3 will deliver a portable pre-commercial device with the requisite hardware, software, user interface, and report generator to effectively monitor PD, essential tremor, and sitting/standing/walking activity. The system will collect and process sEMG/IMU data using a tablet PC to enhance usability. Movement disorder experts and prospective end-users will guide the Phase II development and assist us with future commercialization plans for other neurological conditions such as cerebral palsy, dystonia, ALS, and restless leg syndrome. It will also form the basis for a patient-operable device for clinical use.

Lay Summary

PUBLIC HEALTH RELEVANCE: The project is intended to improve the effectiveness of and reduce the burden on researchers and clinicians when assessing individuals with involuntary movement disorders, a condition affecting an estimated 45 million Americans. The proposed project will transfer measurement capabilities from the laboratory to the marketplace so that more researchers may access new technologies to assess neurological disorders such as Parkinson's disease and essential tremor (from the Phase II efforts), and other conditions such as cerebral palsy, dystonia, and restless leg syndrome from future developments that will emanate from the deliverable. The attainment of this goal will increase the effectiveness of researchers and reduce the time required for research advancements to reach the consumer. The resulting improvements in motor function will ultimately lead to greater independence and productivity for this growing segment of the population.

Further information available at:

Types:

Investments > €500k

Member States:

United States of America

Diseases:

Parkinson's disease & PD-related disorders

Years:

2016

Database Categories:

N/A

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