



Development of a Wearable IMU Sensor System for Balance and Sway Measurement in Patients with Balance Disorders

Project Management and Software Development
for Medical Applications

General Info

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disorders. Multiple wireless IMUs will be employed for real-time movement data collection, enabling seamless body movement and posture measurement.

Project Abstract

This project aims to develop the software for a wearable inertial measurement unit (IMU) sensor system to accurately measure and visualize balance and sway in patients with balance disorders. The system will consist of a single body-attached IMU sensor to create a posturography system and track body position changes. The student working on this project will develop software to stream, process and visualize the data collected by the IMU sensors in real-time.

Student's Tasks Description

The student working on this project will be responsible for developing software (in Python) to stream, process and visualize the data collected by the IMU sensors. This will involve creating a real-time data acquisition component using the sensors SDK [1]. The student will also be responsible for implementing sensor fusion techniques to combine accelerometer, gyroscope and magnetometer data from multiple IMU sensors to calculate the posture and orientation of the body in space more accurately.

During this project, the student will not only learn to analyze movement sensors' data but also gain insight into software development best practices, software architecture, and design patterns.

Background and Motivation

CereGate is a neurotechnology company developing novel communication interfaces with the nervous system. The key components of our interfaces are the software platforms that we develop. Our platform is hardware-agnostic and can be utilized to develop a multitude therapeutic solutions.

Balance disorders are a prevalent health issue, affecting millions of individuals worldwide. These disorders can significantly impact a person's quality of life, leading to impaired mobility, increased risk of falls, and restricted independence.

A current project at CereGate involves developing a closed-loop system aimed at enhancing balance and reducing fall risk in patients with balance

Technical Prerequisites

To complete this project, the student should have following skills:

- Python programming
- Experience with version control systems such as Git
- Experience in Qt/PyQt (nice to have)
- UI design (nice to have)
- Experience with unit test (nice to have)



References

- [1] <https://mbientlab.com/metamotionrl/>
- [2] Horak, F. B. (2006). Postural orientation and equilibrium: what do we need to know about neural control of balance to prevent falls?. Age and ageing, 35(suppl_2), ii7-ii11.
- [3] Greene, B. R., McGrath, D., Walsh, L., Doheny, E. P., McKeown, D., Garattini, C., ... & Kenny, R. A. (2012). Quantitative falls risk estimation through multi-sensor assessment of standing balance. Physiological measurement, 33(12), 2049.