Early Detection of Parkinson’s Disease with Sensor Fusion

Background

Parkinson’s disease (PD) is a neurodegenerative disorder of the central nervous system that affects both motor and non-motor functions. The prevalence of PD has doubled in the past 25 years and worldwide there are more than 10 million living with Parkinson’s disease.

A typical early sign of Parkinson’s disease is balance and gait problems. More specifically, individuals with Parkinson’s usually take slow, shuffling steps and in the initial stages of the disease, these abnormalities tend to be unilateral. The latest study reported that early PD patients present several pathognomonic gait characteristics, such as significantly lower walking velocity and longer stride duration [1]. This allows the identification of PD at the early stage, which is crucial for establishing treatment to slow neurodegeneration and improve symptoms, functioning, and quality of life.

Project

In this project, we proposed to use a biomedical radar sensor and an E-skin tactile sensor for the early detection of PD disease.

Biomedical radar sensor
E-skin tactile sensor

Biomedical radar has demonstrated high precision and accuracy in the monitoring of walking patterns [2] and can provide reliable data on an individual’s gait. It is the most suitable sensor technology for continuous monitoring in a real-life environment, e.g. at home, due to its unique characteristics, such as being cost-effective, contactless, privacy-preserved, compact, and easy to use.

E-skin tactile sensors mimic some of the sensory capabilities that the skin possesses, mainly the perception of touch and pressure. They can measure the force applied by the feet while walking and provide additional data on the gait and balance function of PD patients.

We hypothesize that more reliable detection of early PD can be achieved by combining the motion data from the biomedical radar sensor and force data from the E-skin sensor. The objective of this project is to develop a method to combine data from both sensors for early detection of PD.
Number of students: 1 or 2

Prerequisite: fundamental knowledge of signal processing

For more information about this project, please contact us.

Contact: Xuezhi Zeng, Associate Professor, E2, xuezhi@chalmers.se
Emmanuel Dean, Associate Professor, E2, deane@chalmers.se
Gunilla Kjellby Wendt, Adjunct Professor, E2, kjellby@chalmers.se
Head of the department of occupational therapy and physiotherapy, Sahlgrenska University Hospital
