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Human gait activity recognition mchine learning methods

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In the later stages of the disease, PD patients experience special FOG episodes, where the patient is not able to move the lower limbs despite the clear intention, during which trembling of the lower limbs is often observed. FOG episodes are defined as rare, brief episodes (1–20 s), and typically occur when the patient's focus is shifted from the gait itself. FOG episodes significantly increase falls and injuries. An experimental study showing the feasibility of Machine Learning gait recognition approach was performed. The experiment was conducted as follows: recognizing gait events for one subject, recognizing gait events for five subjects, and PD patient FOG episode's detection. Gait motion profiles can differ substantially between different humans, especially if movement disorders are present.

The ML algorithms in our experiment are trained and tested for each individual subject separately. This way, the algorithms can learn subject specific features and achieve complete personalization with only 3 min of recorded gait. The proposed system could be upgraded to enable real-time ML algorithm deployment on the microcontroller. Upon also adding a cue feedback system, it would be possible to deliver cues 'on demand', when specific events are detected. Furthermore, the existing RF communication can be used to activate cue feedback systems wirelessly in real time. With the proposed Machine Learning algorithms, we demonstrated that the system is capable of detecting specific gait events reliably (accuracy > 97%).

Biography

Jan Slemenšek, a graduate of the University of Maribor's mechatronics department (FERI), is pursuing a PhD in electronics at FERI. He is engaged in a multidisciplinary study that aims to develop a system capable of accurately detecting and cueing specific gait events in Parkinson's disease patients. In addition to his expertise in machine learning, electronics and medicine, he also possesses a wealth of knowledge and experience in various technical fields, including 3D printing, CNC machining, UV lithography, 3D modelling, PCB design, C/python programming, microcontrollers, laser scanning, and plastic extrusion.

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