AUTOMATED LEVODOPA-INDUCED DYSKINESIA ASSESSMENT UNDER REAL-LIFE CONDITIONS

M.G. Tsipouras\textsuperscript{1}, A.T. Tzallas\textsuperscript{1}, G. Rigas\textsuperscript{1}, S. Konitsiotis\textsuperscript{2}, D.I. Fotiadis\textsuperscript{1}

\textsuperscript{1}Material Science and Engineering, Unit of Medical Technology and Intelligent Information Systems, University of Ioannina, \textsuperscript{2}Department of Neurology, Medical School, University of Ioannina, Ioannina, Greece

Parkinson’s disease (PD) is a neurodegenerative disorder that is manifested clinically by several motor disabilities. Levodopa is the standard drug for patients suffering from PD. However, long-term levodopa treatment is often complicated by significantly disabling fluctuations, referred as levodopa-induced dyskinesias (LIDs).

The main focus of this study is the long-term LID assessment under real-life conditions. For this purpose, an automated methodology is developed, which is based on the analysis of signals recorded from six accelerometers and two gyroscopes, placed on certain positions on the subject's body. The obtained signals are analyzed and time, frequency and non-linear features are extracted. Based on these features several classification techniques are tested for LID detection and severity classification. The method has been evaluated using a group of 29 subjects, including normal subjects, PD patients without LIDs and PD patients suffering from LID. The recordings include several activities while other PD's symptoms (tremor, bradykinesia, freezing of gait) are also included.

Extensive evaluation has been performed and results are presented for each body part (wrists, legs, chest, waist) and different body postures (laying, sitting, standing), while the leave-one-patient-out validation technique is employed in all cases. The obtained results indicate high classification ability, varying from 82\%-89\%.

Compared to other approaches, the proposed methodology is advantageous since it is fully automated and the obtained results indicate high efficiency using a dataset that reflects real-life conditions. Additionally, the methodology presents high generalization ability, which ensures that it will be able to cope with LID assessment on new patients.