## Using Multi-Feature Fusion for Detecting Freezing of Gait Episodes in Patients with Parkinsonøs Disease

Ramadan Moawad, Hadeer Tawfik , nashwa.elbendary

## Abstract

ô This paper proposes a model for detecting Freezing of Gait (FoG) episodes in patients with Parkinsonøs Disease (PD) using multi-feature fusion. Vigrtqrqugfcrrtqceicrrnkguvyqueigoguhqthgcvwtg"gzvtcevkqp0"Vig"Łtuv"qpg"ku"vkog/ domain statistical feature engineering and the second one is spectrogrambasedtimefrequencyanalysisbyConvolutionalNeural Network (CNN) feature learning. The two extracted feature sets are fused with applying Principal Component Analysis (PCA) algorithm for dimensionality reduction. Benchmark dataset of three tri-axial accelerometer sensors for patients with PD is tested in both principle-axes and angular-axes. Moreover, performance of the proposed approach is characterized on experiments considering several Machine Learning (ML)algorithms.Experimentalresultsshowthatusing multi-feature fusion with PCA dimensionality reduction outperforms using typical single feature sets. The ukipkLecpeg"qh"vjku"uvwf{"ku"vq"jkijnkijv"vjg"korcev"qh"wukpi"ownvk/hgcvwtg"hwukqp"qp" the performance of FoG episodes detection. Index Terms ô Freezing of Gait (FoG), Parkinsonøs Disease(PD), MachineLearning, ConvolutionalNeural Network (CNN), Angular-axes, Spectrogram, Principal Component Analysis (PCA), Multi-Feature Fusion

2020 International Conference on Innovative Trends in Communication and Computer Engineering (ITCE) 2020, February

Future University In Egypt (http://www.fue.edu.eg)