Rodríguez-Martín, Daniel, UPC-BarcelonaTech, Spain
Samà, Albert, UPC-BarcelonaTech, Spain
Pérez-López, Carlos, UPC-BarcelonaTech, Spain
Cabestany, Joan, UPC-BarcelonaTech, Spain
Català, Andreu, UPC-BarcelonaTech, Spain
Rodríguez-Molinero, Alejandro, NUI Galway, Ireland

Enhancing FoG detection by means of postural context using a waist accelerometer

Objectives

Current FoG detection algorithms depend on movement frequencies and, thus, false positives could appear during daily life of patients. The aim of this study is to analyse the contextualization of FoG detection based on a waist inertial sensor by including a posture detection algorithm previously validated.

Methods

20 PD patients (mean age: 69.3, std: 7.05 and Hoehn and Yahr mean: 2.74, std: 0.41), 10 freezers and 10 non-freezers, performed a set of predefined activities at their home during approximately 20 minutes, both in ON and OFF motor states. Video recordings were obtained as gold-standard, synchronized with the inertial signals and labelled by experienced therapists. Signals used belong to REMPARK database (www.rempark.eu).

FoG algorithm originally developed by Moore and extended by Bächlin has been applied. Sensitivity has been determined from freezer patients and specificity from non-freezers. Optimal FoG detection parameters (FI, PB) were found by maximizing the geometric mean among sensitivity and specificity. The enhancing effect of posture contextualization is measured on optimal FoG detection by rejecting those episodes arisen when patients are sitting.

Results

FoG detection with optimal parameters provides a sensitivity and specificity of 71.5% and 74.7%, respectively. Posture contextualization slightly decreased sensitivity to 70.1% and increased specificity to 79%, on average. In a non-freezing patient the algorithm is capable of increasing the specificity up to 11.95% more.

Conclusions

FoG detection based on a waist-worn accelerometer can be enhanced in terms of specificity by posture contextualization. Daily life monitoring and actuation can benefit from these algorithms.