

WRIST-BASED ACCELEROMETERS SUCCESSFULLY DIFFERENTIATE WALKING FROM OTHER ACTIVITIES

Amy Papadopoulos,¹ Nicolas Vivaldi,² Christine Silvers,¹

¹AFrame Digital, Inc, ²George Washington University

Journal MTM 1:4S:9

DOI: 10.7309/jmtm.33

www.journalmtm.com

ABSTRACT

There is a significant body of literature that demonstrates that accelerometers placed at various locations on the body can provide the data necessary to recognize walking. Most of this literature, though, either does not consider accelerometers placed at the wrist, or suggests that the wrist is not the ideal location. The wrist, however, is probably the most socially-acceptable location for a monitoring device. This study evaluates the possibility of using wrist accelerometers to recognize walking during everyday life in order to not only evaluate the amount of time spent walking, but also potentially recognize changes in stability that might lead to falls. Thirty elderly individuals aged 65 years and older were asked to wear a wrist accelerometer for four hours each while simultaneously being videorecorded. Study participants were instructed to go about their normal daily activities during those four hours. Activities captured in the videorecordings ranged from doing laundry and cooking lunch to watching television. Accelerometer data were then analyzed by looking for the well-recognized walking frequencies between 0.7 and 3.0 Hz, as well as by calculating a number of other features from the time-series data. Particular attention was given to features that are capable of being calculated on the wrist device so that future work will not require streaming large amounts of data from the device to a central server. Using the presence or absence of the walking frequencies to characterize the test set yielded results of 93% area under the receiver operating characteristic curve (AUC). Using an algorithm limited to features calculable on the wrist device, moreover, achieved an AUC of 90%. A wrist-based accelerometer, therefore, can successfully be used to differentiate walking from other activities, and, moreover, can do so on a small, socially-acceptable wrist-based device.

The project described was supported by Grant Number R43AG039176 from the National Institute On Aging. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute On Aging or the National Institutes of Health.