

Sensor-Based Fall Risk Assessment - Dagger of the Mind?

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Abstract

Fall events and their severe consequences represent not only a threatening problem for the affected individual, but also cause a significant burden for health care systems. Our research work aims to elucidate some of the prospects and problems of current sensor-based fall risk assessment approaches. Selected results of a questionnaire-based survey given to experts during topical workshops at international conferences are presented.

The majority of domain experts confirmed that fall risk assessment could potentially be valuable for the community and that prediction is deemed possible, though limited. We conclude with a discussion of practical issues concerning adequate outcome parameters for clinical studies and data sharing within the research community. All participants agreed that sensor-based fall risk assessment is a promising and valuable approach, but that more prospective clinical studies with clearly defined outcome measures are necessary.

Keywords: Fall risk, fall prevention, fall prediction, wearable sensors, sensor-based assessment

Introduction

Wearable sensors have been used to measure activity for many years. NHANES (National Health and Nutrition Examination Survey) may be regarded as an early example of their use in a large-scale cohort study. Whereas, until recently, the ability to measure e.g. the number of steps or to estimate active energy expenditure from the data have been research foci, several research groups now use miniaturized wearable sensors in order to extract detailed features resp. motion parameters from the data that reflect more subtle motion characteristics (e.g. gait symmetry, spectral density distribution).

These features can be used to derive classification models, aiming to distinguish between persons with a high risk for falling from those with a low risk, and – ultimately – to predict fall events. Several preliminary studies have been reported in the literature, along with a few medium-scale prospective studies, for example by Greene et al. (1).

However, research methods in these studies often differ with regard to outcome parameters, study participants, sensor systems or combinations used (e.g. accelerometers and gyros), and features extracted from the motion data.

Materials, methods and selected results

The authors created a questionnaire which was distributed in three workshops at international conferences (MEDINFO 2010, ICAMPAM 2011, MIE 2011) aimed at experts in wearable sensors and falls research. Within these workshops, research results from the field of sensor-based fall risk assessment were presented, providing a survey of the state-of-the-art.

The questionnaire referred to outcome parameters, data sharing, prospects and desirability of fall prediction, and other issues. Selected results of a descriptive data analysis will be presented on the poster.

Discussion

Our survey results confirm that sensor-based fall risk assessment is deemed possible and useful by domain experts. Large-scale prospective studies with harmonized research methods are necessary to provide a profound basis for its application in practice.

Acknowledgments

We thank all participants of our three workshops for their attendance and the intensive and rewarding discussions. We thank the organizers of MEDINFO 2010, ICAMPAM 2011 and MIE 2011 for giving us the opportunity to host our workshops, providing us with new insights and contacts.

References

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