Assistance for home care of the elderly with sensor solutions.

Julie OGER and Stéphane BESSEAU
PREDICAL, 52 rue de Belle Feuille, 92100 Boulogne Billancourt
julie.oger@predical.fr, stephane.besseau@predical.fr

Mathilde MOUGEOT
LPMA UMR7599, Université Paris-Diderot, France
mathilde.mougeot@math.univ-paris-diderot.fr

Abstract

The adaptation of society to ageing with significant growth of the population over 65 years and with their desire to age at home is a true revolution of society, and should be anticipated. The recent development of new technologies has enabled the emergence of new connected objects. Our joint work with the society PREDICAL and the laboratory LPMA consists to make the IOT collected data talk and then address this health issue by a mathematical prism.

For 18 months, the houses of 12 senior persons living alone, have been equipped with motion, accelerometer, temperature and luminescence sensors. We developed machine learning algorithms to analyse the collected event data in order to provide daily indicators to follow the activity, the social link, the feeding and the sleep quality. Statistical methods have been applied to monitor these indicators over days and to trigger an alarm if strong deviations compared to former behaviours have been diagnosed. Functional data analysis has been also introduced to model the daily activity living and to quantify a potential modification of autonomy.

We observed for all studied indicators, strong regularities emerge from the event data. This first conclusion shows that, it is possible to "learn" the habits of each senior and then to quantify any deviation of behaviour. It appears also that each senior has a unique profile of activity. In addition, during the study, our algorithms were also able to quantify the activity recovery of a senior after a return of hospitalization. This information appears to be extremely useful in complement to medical diagnosis.

In conclusion, our results obtained in those real environments confirm the strong potential of such approach being able to create consistent indicators measuring and monitoring the degree of autonomy of a senior. These indicators provide, in real time, similar information to the AGIR grid used to quantify the degree of autonomy of seniors by the French Health Institution. In our following works, we plan to analyse other kind of sensors and to enlarge the longitudinal studies to 50 seniors.

Keywords: Internet Of Things (IOT), smart data modeling, prevention, seniors independence, activity monitoring.