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Pervasive informatics and persistent actimetric information in health smart homes : different approaches

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Introduction: This paper discuss the ability to obtain a reliable pervasive information at home from a network of localizing sensors allowing to follow the different activity-station at which a dependent (elderly or handicapped) person can be detected. Since 12 years ([1-3]), many experiments have been achieved for watching dependent people at home, in particular elderly and handicapped persons. For acquiring data necessary to permit the alarms triggering, numerous sensors have been invented, in particular for localizing the person at home or in the surroundings. These localizers are on the body (GPS, accelerometers,...), in the flat rooms (on the walls: infrared or radar detectors; on the ground, the bed or the chairs: pressure sensors), on the doors (magnetic switches) or in gardens and streets (video-cameras).
Methods: The data recorded can be treated as time series as the sequence of color coding numbers of balls (symbolizing activity-stations) taken in a Polya's urn, in which the persistence of the presence in an activity-station is represented by adding a number of balls of the same color as the ball just drawn ([5]). The sequence could also represent historical data from a model, deriving from language models and markovian processes existing in speech recognition research, where the persistence is the probability to stay at the same activity-station ([6]). Other models can also be used as well as the mean time passed or the remaining time in the activity-station. Theses models are compared in order to use the most representative one.
Results: Using statistics, the best model offers up to 98.03% of good prediction location, considering only the last second of location but distinguishing days of week. Other models need to be improved. We discuss the pertinence of such procedures to early detect sudden or chronic changes in the parameters values of the random process made of the succession of ball numbers. We will use the best procedure to trigger alarms, which will occur when an incorrect prediction is made, or when the person persists at the same station more than the mean time passed in this station, or when the remaining time is passed.
Conclusions: The sensors network is very important to follow up the dependent people during their walk trajectories inside home or outside. If the space/time data are acquired on healthy elderly people or on patients which suffer from neuro-degenerative diseases, the sensors recording must be very well calibrated, to give birth to specific profiles concerning the time series which correspond to the successive locations of the dependent person in rooms inside the flat or in specific places inside a room ([4]). Simpler than Polya's urns derived approach, the Markovian approach seems to be a good way of location modeling. Other models need to be improved in order to concurrence it. A big hope comes from the ambient information techniques to be able to detect a sudden fall on the ground or a progressive stereotyped behavior (for the early diagnosis of chronic neuro-degenerative diseases like the Alzheimer or Parkinson ones).

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References

1. Couturier et al., Rev. Gériatrie 21:23-31, 1996.
2. Demongeot et al., Comptes Rendus Biologies 325:673-682, 2002.
3. Das et al., Pervasive and Mobile Computing 2:372–404, 2006.
4. Le Bellego et al., IEEE Transactions ITB 10:92-99, 2006.
5. Demongeot et al., IEEE CISIS & APPLIMS, 589–594, 2008.
6. Fouquet et al., IEEE CISIS, 2009.