Thesis Proposal

Map-i Doctoral Program- 2011/2012

By

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March 8, 2012

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Title:

Self-calibrated Behavioral Model for Ambient Assisted Living (AAL)

Based on Positioning and Tracking Patterns

(Generic title- subject to change)

Background

As clearly noted in recent years, the number of elderly people keeps increasing rapidly worldwide. In Europe alone, projections nowadays indicate that the number of senior citizens aged over 65 will increase to 30% in 2060 [1]. With this continued growth, indeed many critical issues like the quality of life, safety, and healthcare services for senior citizens are rapidly increasing, raising the need for efficient, accessible, and cost-effective care solution that allows providing appropriate healthcare services for elderly while keeping their independence and comfort. Positioning and tracking technologies are being exploited to address some of these needs. Reliable and accurate location information is more than just desirable for many Ambient Assisted Living (AAL) systems. It is life-saver sometimes. It helps in providing real-time patients' monitoring services, and accordingly, reducing the likelihood of having critical and emergency situations such as heart attacks, strokes, and sudden falls.

Various indoor positioning systems have been designed –with vary capabilities- to provide real-time location information [2-4] . The success of these systems can be mainly attributed to their capabilities in providing precise and accurate positioning for different applications. However, these systems are still employed for professional environments only. Many simple environments like home environment still are not fully considered. Home environments consist of many electric and electronic objects which could be the main source of interference for many positioning technologies. Moreover, home environments have no fixed infrastructure and there are many building constraints (e.g. building layout, floors, and materials) need to be considered as well in positioning. In addition, home residents mostly are non-technical people and their technology interaction and acceptance need to be taken into account.

In this thesis work, we would like to further study and investigate the challenges that might face the deployment of AAL in home environments. We are more concerned to identify the positioning and tracking technologies that most suitable for AAL, and how

to use them properly as part of a self-calibrated behavioral model to support real time monitoring. Universal platform is a recent European effort in this trend[1].

Research Questions

- Existing indoor positioning /location/ tracking technologies are not adequate for Ambient Assisted Living. Thus, what are the main positioning requirements for AAL in home environments?
- How positioning/tracking technologies should be integrated into a self-calibrated monitoring system for AAL?

Goal

- Propose a model for the integration of positioning and tracking technologies with intelligent AAL for monitoring

Methodology

The research methodology can be summarized as follows:

- Study the existing techniques and solutions for positioning and tracking
- Identify the specific requirements that facing the deployment of AAL in home environments
- Develop a behavioral model for people monitoring based on positioning and tracking patterns
- Validate the proposed model through real world experiments

Research Unit

UbiComp research group,
Centro Algoritmi,
University of Minho (UMinho), Guimaraes

Relevant Conference and Journals

- International Conference on Indoor Positioning and Indoor Navigation (IPIN)
- Wireless and Mobile Computing, Networking and Communications, (WIMOB), IEEE International Conference
- Communications Surveys & Tutorials, IEEE
- Wireless Communications and Networking Conference

[1] http://www.universaal.org/

- Position Location and Navigation Symposium, PLANS
- Systems, Man and Cybernetics, Part A: Systems and Humans, IEEE Transactions
- http://www.aal-europe.eu/news-and-events/aal-forum-2011

References

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[2] H. Liu, H. Darabi, P. Banerjee, and J. Liu, "Survey of wireless indoor positioning techniques and systems," *Systems, Man, and Cybernetics, Part C: Applications and Reviews, IEEE Transactions on,* vol. 37, pp. 1067-1080, 2007.

[3] Y. Gu, A. Lo, and I. Niemegeers, "A survey of indoor positioning systems for wireless personal networks," *Communications Surveys & Tutorials, IEEE,* vol. 11, pp. 13-32, 2009.

[4] G. Borriello and J. Hightower, "A survey and taxonomy of location systems for ubiquitous computing," *IEEE Computer,* vol. 34, pp. 57-66, 2001.