Abstract

Until now there has been continued growth in the size of the aging population living at home alone and suffering from physical disabilities. To this effect, many kinds of research are being developed for a system that can improve the quality of life of elderly or needy people in the ambient assisted living (AAL) environment, especially in the home domain. Nevertheless, the information, used in current research works, might not be enough in some circumstances. Other information might help improve the ability of the current research with human activity information being one of them. Thus, this research proposes a high performance activity framework for obtaining more reliable, reasonable, and accurate results.

Consequently, this dissertation describes a "High Performance Activity Recognition Framework for Ambient Assisted Living in the Home Network Environment." The main goal of this study is to develop a high performance activity recognition framework for home application based on the results of this research.

To achieve the goal of this dissertation, Context-aware Activity Recognition Engine (CARE) architecture is designed as a human activity framework. The application requiring human activity information can be built on top of the CARE architecture, i.e. the healthcare system, semantic ontology search system, home security system, etc. The CARE architecture consists of six layers each combining several technologies and techniques.

For building the practical architecture, this research proposes a context sensor network (CSN) in the real environment to collect the surrounding information in the home; including human information. The proposed CSN integrates several sensing techniques for obtaining the data and several communication networks for its transmission. Moreover, posture classification is also presented in this research with a novel range-based algorithm for classifying human posture. All the information will be conformed to the new user's context, and sent to the proposed activity recognition system.

Ontology-Based Activity Recognition (OBAR) is introduced in this research for classifying the human activity based on the new user's context. The ontology approach is selected to define semantic information in the smart home and also to model human activ-

ity. The OBAR system is different from other existing activity recognition in terms of the new user's context and history information. The original idea of using an ontology concept does not support temporal reasoning. However, the OBAR system is implemented together with the external program to keep track of temporal reasoning. Moreover, a new term of activity log introduces the activity's location in activity log (AL^2). The history of activity occurring at the current user's location will be investigated. It improves the results more reasonably and reliably. Through experimental studies, the results reveal that the proposed CARE architecture can achieve an average accuracy of 96.60 %.

Since the proposed research can produce reliable, reasonable, and accurate results of activity recognition, several home applications in the research domain can become more efficient by utilizing the results of this research. For example, the activity information can be used in the healthcare domain for analyzing or recognizing a disease. In the provision of home service delivery, current research systems are dependent on the current situation. However, if the system knows the user's habits based on routine activity, it can prepare the home service automatically.