Smart Homes and Ambient Assisted Living: Redefining Technology in the Home.

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Abstract. The ever growing segment of older adults and increases in life expectancy have led to new models of aging that rely on technology to enhance home monitoring and quality of life. A smart home is a residential facility wired with sensors or other information technology applications that aim to improve quality of life for the residents and support their independence. The objective of this workshop is to discuss this emerging domain of biomedical and health informatics and specifically, focus on design, implementation and evaluation considerations for smart homes and ambient assisted living applications by highlighting technical, ethical, clinical and other considerations. Several case studies will be presented that will showcase innovative technology used in real world settings. In addition, the workshop will also investigate the factors associated with residents' acceptance of ambient assisted living technologies, including concerns for privacy, usability, usefulness and security but also implications for the resident’s social network and his/her relationship with family members based on empirical outcomes. Issues of cost-effectiveness and future trends will be discussed. The International Medical Informatics Association (IMIA) Working Group on Smart Homes and Ambient Assisted Living is sponsoring this workshop.

Keywords. Telehealth, human interfaces, human factors, smart homes, home monitoring.

1. Introduction

A “smart home” is a residential facility equipped with devices, sensors or other information technology applications that aim to improve quality of life for the residents and increase their safety and independence. The aging population and the increase in life expectancy have led to new models of aging where technology can play a role in monitoring one’s quality of life, detecting or even predicting adverse events and supporting independence.

The objective of this workshop is to discuss design, implementation and evaluation considerations for “smart homes” and ambient assisted living applications.

The workshop will discuss the technical, ethical, clinical, architectural and policy implications for informatics designers and researchers in the area of smart homes. An evaluation framework will be discussed that includes active involvement of all stakeholders, i.e., end users, health care providers and administrators, family members and informal caregivers, in the design, implementation and evaluation of a smart home system. The participatory evaluation protocol relies on a theoretical framework by Bellotti and Sellen [1] who emphasized the importance of feedback and control for end users when exploring ubiquitous computing environments. The evaluation protocol includes tools for both formative and summative evaluation. Empirical outcomes from three case studies will be presented to highlight the design and evaluation framework for such ubiquitous computing applications.

The first case study is focusing on the use of sensor technologies to support monitoring of older adults in an independent retirement community. In this project, sensor-based technologies are used to monitor activity levels and overall well being of older adults living in an assisted living facility [2]. The technology in this context is designed to support aging in place. Design challenges and preliminary findings will be presented.

The second case study presents the use of both wearable and stationary technology at elderly people’s homes. In this project, a multi-sensor device is used to identify activities of daily life and to derive
‘normal’ behavioural activity routines [3-5]. Furthermore computer-based questionnaires are used to assess changes in the perceived quality of life and well-being on a daily basis.

The third case study focuses on design and implementation issues in the course of the construction of a 3-room smart home lab facility at a university. Technical details on sensors, networks and servers will be presented, as well as an activity feedback component based on media portal software. Besides, an example of an automated falls detection system will be shown.

The workshop will also investigate the factors associated with residents’ acceptance of ambient assisted living technologies, including concerns for privacy, usability, usefulness and security but also implications for the resident’s social network and his/her relationship with family members or other remote caregivers based on empirical outcomes. Furthermore, factors pertaining to cost-effectiveness, current status and future trends will be discussed. The International Medical Informatics Association (IMIA) Working Group on Smart Homes and Ambient Assisted Living is sponsoring this workshop.

2. Outline

The outline of the workshop is as follows:
- Overview of the field of “smart homes” and ambient assisted living (Presentation of examples and demonstration projects worldwide)
- Discussion of the main clinical problems expected in the next 20-30 years and implications for technology developers [6]
- Case Study 1: Technology for Aging in Place in an independent retirement community
- Case Study 2: Wearable and stationary technology in elderly people’s homes
- Case Study 3: Design and construction of a 3-room smart home lab facility at a university
- Discussion of design and evaluation considerations
- Privacy, current trends in health care and information technologies that impact the design and evolution of “smart homes”
- Future Trends of Smart Home Technologies
- Open discussion

Who should attend: Informatics researchers, system designers, interested clinicians, policy makers

Educational Goals:
- Upon completion of the workshop, participants will be able to
  • understand the role of information technology in enabling a shift from institution centric to patient centric applications for ambient assisted living
  • understand the impact of the technology on disease management, clinical outcomes, privacy, safety and quality of life in the home environment
  • understand design and implementation challenges associated with home based applications and aging in place
  • understand ongoing research and future trends
  • utilize an evaluation framework for “smart home” applications

Prerequisites: none

Required equipment: Projector, Laptop. Handouts will be provided. Power-point slides will be used.

Workshop instructors:

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3. References


