Chapter 17

Reviewing Home Based Assistive Technologies

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ABSTRACT

Population ageing is an unprecedented challenge for human societies, which recently is globally tackled by new technologies. In this chapter technologies tailored for use by the elderly people termed ambient assisted living and e-health are discussed. Focus is only placed on those technologies that can be adapted for home use. Emphasis is drawn both on the technical front as well as on the application front based on recent literature. The scope is to make sure the audience reaches a sufficiently broad understanding of what technology is available for home use by elderly people. Applications and research efforts spent but also funded at the European level with a clear focus on those supported by elderly trials are provided. The chapter is enriched with case studies from various projects.

INTRODUCTION

It has been more than a decade since the appearance of systems capable of monitoring health from a distance using Information and Communication Technologies (ICT) gave birth to a term named “e-health” thereafter. e-Health may be used to monitor one’s health from home (Homecare Applications; tele-homecare). Basically different types of networks have been identified for homecare applications and substantial advances have been made over recent years in applying technology to meet the needs of older people. In parallel and in accordance with e-Health solutions, the field of Ambient-Assisted Living (AAL) has been developed, aiming on alleviating the difficulties of everyday life for the elderly or people with disabilities in general.

The objective of this chapter is to provide an overview of technologies used for AAL and e-health but with focus only on those that can allow for a home-based use and be tailored for use by the elderly people. Emphasis is drawn both on the technical front as well as on the applica-
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Regarding the former, recent literature is reviewed so as to enable a sufficiently broad understanding of what technology is available for home use by elderly people. As for the latter front, that is applications, the chapter takes an approach to review research efforts spent but also funded at the European level; focus is only given to those supported by elderly trials. The chapter is enriched with case studies from projects that the author team has participated.

BACKGROUND

Technical Aspects of Home-Based Health Monitoring

Basically three types of networks have been identified for homecare applications:

1. A network within the patient home consisting of sensors, input devices, and the processing unit for evaluation and display of measurement data: There are basically two alternatives for this:
   a. Wired technologies: The simplest wired alternative comprises connecting sensors through their serial port (interface RS-232-C) through a serial hub to the processing unit. Another solution is an Ethernet network. The greatest difficulty with wired technologies is the wires themselves. They require space and effort during installation.
   b. Wireless technologies: There are a number of wireless solutions suitable for a home network. Infrared technology, which is used in TV remote controls, is a low-cost solution. However, due to the restriction of line-of-sight between sender and receiver, it is probably not applicable in a home-care setting. A strong contender is Bluetooth, a standard for a wireless personal area network (PAN). The data rate is certainly sufficient for sending data from sensors to the processing unit. Another alternative is Wireless Local Area Networks (WLAN) with standards such as HomeRF, Hiperlan (Europe), and WLAN 802.11 (USA). As already mentioned, this is a complex solution that is unlikely to be needed in the patient home with a network of rather simple sensors. In addition, WLAN cards are not produced to fit into small devices, whereas a Bluetooth transceiver can be small enough to fit into a pen cap.

2. A network between the patient home and the health care provider for transmitting data from the home to a central server. There are again wired and wireless alternatives. With wired technology, the processing unit can be attached to a wired network (telephone line, ISDN, cable modem, etc.), while with wireless technology, the processing unit makes the connection using a radio link. The radio link need not be from home to server. It is sufficient for the radio link to reach out of the house to a network access point that may be wired. One wireless solution is connection from home to health care server through a GSM (Global System for Mobile Communications, one of the leading digital cellular systems) modem. Other wireless technologies are satellite communication or the true Wireless Wide Area Network (Wireless WAN). There are also evolutions of second generation technology like GPRS (General Packet Radio Services) or EDGE (Enhanced Data rates for GSM Evolution), or even 3G technology like UMTS (Universal Mobile Telecommunications System). In order to use a mobile phone for data communication, special hardware (usually a PC card) is needed for the computer, i.e. the processing
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