

Chapter 110

Supporting Active and Healthy Aging with Advanced Robotics Integrated in Smart Environment

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ABSTRACT

The technological advances in the robotic and ICT fields represent an effective solution to address specific societal problems to support ageing and independent life. One of the key factors for these technologies is the integration of service robotics for optimising social services and improving quality of life of the elderly population. This chapter aims to underline the barriers of the state of the art, furthermore the authors present their concrete experiences to overcome these barriers gained at the RoboTown Living Lab of Scuola Superiore Sant'Anna within past and current projects. They analyse and discuss the results in order to give recommendations based on their experiences. Furthermore, this work highlights the trend of development from stand-alone solutions to cloud computing architecture, describing the future research directions.

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INTRODUCTION

Europe is facing unprecedented demographic changes due to the ageing population and low birth rates. On one hand, according to the up-to-date statistics, people older than 65 years are the fastest growing segment of the European population and they will account for a third by 2060. On the other hand, the number of working-age people is expected to decline steadily and the number of older people to increase, leading to an increase in the old-age dependency ratio (Eurostat, 2013).

As people age, they become more susceptible to disease and disability; in fact they have at least one that correlates strongly with the functional decline. However, despite the health problems, the majority of older adults hope to remain in their own homes as long as possible. Even if this wish could improve the elderlys' perceived quality of life, nevertheless it is strongly correlated with the risk of domestic accidents, such as falls, and social isolation, such as depression and loneliness. The effect of these risks is the growing emergency admission to hospitals with a not sustainable impact on the healthcare systems. For these reasons, long-term services and support should be provided in order to promote the ageing well, but the workforce shortages and financial burdens cannot supply the demand for Nurse Practitioners (+94% in 2025) (Auerbach, 2012) and Physician Assistants (+72% in 2025) (Hooker, 2011). Furthermore most European senior citizens live in urban areas (Eurostat, 2013) and services are concentrated there, to the detriment of persons living in rural areas with a higher risk of social exclusion. For this reason senior people living in rural areas are highly at risk of isolation. So the ageing population in rural areas and the lack of access to community services is a challenge (EU Panel, 2007).

Fortunately, many technologies have the potential to help older adults maintain their independence and health. Technology could support elderly people in mobility inside and outside the house and in daily activities, encouraging the social relationships and improving the feeling of safety delaying the physical and mental decline. The validation of this hypothesis is provided on one hand by the rapid development of smart technologies to improve areas as diverse as healthcare, education and crime prevention, and on the other hand by their economic accessibility among common people (Mobile Planet, 2014). According to this phenomenon it is estimated that medical electronics equipment production will increase from \$91 billion in 2011 to \$119 billion in 2017 with an average rate of 4.6% per year (iNEMI, 2013). Particularly the EU smart home market is estimated to grow from \$1,544.3 million in 2010 to \$3,267 million in 2015 (Markets and Markets, 2011). Furthermore, the mHealth market will increase in the next few years. 63% of users are comfortable with storing their health record in the cloud (63%), and 30% of them use computers to check medical or diagnosis information (CISCO, 2014).

According to ABI Research (ABI, 2013) a promising market opportunity is also represented by the use of robots for home healthcare applications, in particular the household robots. ABI Research predicts that by 2015, robot sales will exceed \$15 billion, due in large part to advanced sensor technology and cheap, powerful cameras. While most robots are currently limited to industrial settings, it is the home environment that presents the greatest opportunity for robot developers. According to market analysis carried out by ABI Research, the task robot is the robot with highest revenue (+ 37.5%) between 2010 and 2017. These results confirm the projection made by Robotic Japan Association which shows that the domestic robot will be the main segment over the global robotic market.

Furthermore the elderly population will benefit from the services, based on the use of Ambient Assisted Living (AAL) technologies that could contribute to increase their perceived QoL (Moschetti, 2014), as shown in Figure 1.

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