Chapter 14

Current Trends in Interoperability, Scalability, and Security of Pervasive Healthcare Systems

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ABSTRACT

The development of pervasive healthcare systems consists of applying ubiquitous computing in the healthcare context. The systems developed in this research field have the goals of offering better healthcare services, promoting the well-being of the people, and assisting healthcare professionals in their tasks. The aim of the chapter is to give an overview of the main research efforts in the area of pervasive healthcare systems and to identify which are the main research challenges in this topic of research. Furthermore, the authors review the current state of the art for these kinds of systems with respect to some of the research challenges identified. In particular, the authors focus on contributions done regarding interoperability, scalability, and security of these systems.

INTRODUCTION

Pervasive healthcare is an emerging scientific discipline that involves the use of the ubiquitous computing technology (pervasive computing) in the healthcare environment (Arnrich et al., 2010). As defined by Varshney (Varshney, 2007) pervasive healthcare is the “healthcare to anyone, anytime, and anywhere by removing locational, time and other restraints while increasing both the coverage and the quality of healthcare”.

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The health challenges of the OECD countries are a motivation for doing research on the pervasive healthcare discipline. These challenges can be summarized as the following:

- There is a huge increase of the ratio between elderly and young people.
- Healthcare costs and the chronic diseases are increasing as people grew older.
- Current lifestyles (e.g. smoking, obesity, and inactivity) are contributing to the prevalence of chronic diseases.
- The constantly expansion of the scope of medicine contributes to increase both, the healthcare costs and the average life expectancy.
- There is an increasing lack of clinical professionals due to retirement and small number of medical and nursing students.

Moreover, research on pervasive healthcare is also motivated by the Europe 2020 program, a 10-year strategy proposed by the European Commission on 2010 for advancement of the economy of the European Union (EU). An integral part of Europe 2020 is to promote good health, and to do so there are four among the seven flagship initiatives of Europe 2020 relevant to the healthcare domain, which are the following:

- **Innovation Union**: Aims to maximize EU’s capacity for innovation. In the healthcare domain the goal is to make Europe a world-leader in developing ways to promote active and healthy aging.
- **Digital Agenda for Europe**: Focused on developing and using digital applications. There are four key actions related with health:
  - Give Europeans secure online access to their medical health data and achieve widespread telemedicine deployment.
  - Propose a recommendation to define a minimum common set of data.
  - Foster EU-wide standards, interoperability testing and certification of eHealth.
  - Reinforce the Ambient Assisted Living Joint Programme.
- **Agenda for New Skills and Jobs**: Focuses on highlight the economic role of mental health and the health of the workforce. This should improve working conditions and workplaces that prioritize the health and well-being of their employees.
- **European Platform against Poverty**: Aims to ensure economic and social cohesion. The European Commission will contribute by boosting efforts on health promotion and prevention with a focus in reducing health inequality.

The pervasive healthcare discipline tries to find new solutions and approaches to mitigate these challenges. To achieve this goal pervasive healthcare tries to modify the healthcare service delivery model in the Western countries, by moving it from a centralized approach focused on doctors to a decentralized one based on the patients (Arnrich et al., 2010). In other words, it tries to move from a reactive model in which people go to hospital because they are ill, to a pro-active and preventive model where people are active participants in their own well-being, and thus providing a more personalized healthcare. This personalization involves the use of technologies that can move the patient treatment and care