Chapter 8
A Context-Aware System to Support Personalized Clinical Pathways Using OWL and SWRL:
Digital Healthcare to Anyone Anywhere Anytime

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ABSTRACT

The healthcare sector is crucial for the health and well-being of citizens, and many research efforts are being carried out which aim to support people's health and ultimately improve their quality of life. As a result, there is a growing need for technology-based solutions to support people in providing health services. In this chapter, research is presented which aims to develop a conceptual framework that supports personalized healthcare for pervasive computing that allows monitoring the health and wellbeing of patients anytime and anywhere. Thus, the author proposes virtual health mentor (vhMentor), an ontological and a rule-based model for the representation of knowledge and the exportation of the required interpretations. In case vhMentor detects a health problem, it will send a notification to the patient with instructions, while alternatively caregivers will be notified to investigate the problem and provide help. The system is expected to offer assisted living to long-term patients, improve their quality of life, and to reduce health costs and the caregivers' overwork.

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INTRODUCTION

The evolution of information and communication technologies -especially in the field of wireless and mobile networking - enable the provision of modern health care services. Furthermore, sensor-based monitoring offers the capability of Context Aware Computing (CAC) for health data collection that in turn significantly transforms the prevailing view of health care assessment and delivery. The objective of a context-aware healthcare monitoring environment is to offer qualitative health services by employing state-of-the-art technological equipment. *CAC* is a challenge of mobile distributed computing with the goal of managing next-generation smart applications where personalized devices (sensors, biosensors, mobile phones, iPads, etc.) interact with users creating a smart environment. A *context* is what surrounds the user or more generally the entity under study (e.g., devices, applications). Thus, *CAC* covers a wide range of applications which can perceive their environment and react intelligently according to this perception (Christopoulou, 2022).

The *context* (*environment*) may include in addition to the user's location, lighting, noise level, network interface, communication costs, communication bandwidth and anything else that is considered useful for the user such as in his state of health, in his safety or even in his social condition. e.g., whether is he with his manager or an associate (Schilit et al., 1994). Especially in relation to telemedicine and the continuous and personalized provision of counseling to the patient from everywhere a *CAC* system can obtain and translate the relevant information of the environment and other inherent factors (system logic e.g., applicable medical rules and reasoning) and perform the necessary actions to provide care to the patient.

vhMentor targets to bridge the gap between healthcare and social care systems by focusing on continuous and ubiquitous monitoring of patients' health status. The system collects the necessary information from the medical data collection devices, while its processing follows the medical procedures and the established clinical pathways (care plans) of the evidence-based medical practice (e.g., clinical practice guidelines, clinical pathways, and clinical protocols). Guided by individual tele-health consulting and support services, *vhMentor* aims to propose a context-aware rule-based solution to overcome the lack of automation in medical data monitoring (Christopoulou et al., 2016; 2017).

Consequently, this chapter is organized as follows.

In Section 2 related work regarding Ontology concepts, reasoners, multi-agent and semantic web, approaches via mHealth and wearable smart devices are discussed. In Section 3 Materials and Methods of the proposed *vhMentor* framework and its implementation. More specifically in the first and second sub-sections are presented some basic aspects about the tools used for the implementation of the System. Third sub-section presents the Overview of *vhMentor* OWL-Based System and its