

## Chapter 3.9

# Technology Enablers for Context–Aware Healthcare Applications

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### ABSTRACT

The increasing availability of mobile devices and wireless networks, and the tendency for them to become ubiquitous in our daily lives, creates a favourable technological environment for the emergence of new, simple, and added-value applications for healthcare. This chapter focuses on how context and location can be used in innovative applications and how to use a set of solutions and technologies that enable the development of innovative context and location-aware solutions for healthcare area. It shows how a mobile phone can be used to compute the level of familiarity of the user with the surrounding environment and how the familiarity level can be used in a number of situations.

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### INTRODUCTION

*“The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.” (Weiser, 91)*

In 1991, Mark Weiser had a vision that still inspires many researchers in the ubiquitous and pervasive computing area. In a perfect world people needs would be detected and fulfilled by a set of devices that would act in the background to provide the means or data necessary to the users’ activities. Current technology does not allow to entirely fulfilling the Weiser vision but allows realizing many aspects of this pioneer vision.

Continuous monitoring of the health condition of people has been desired for many years, in particular for impaired persons or for people requiring special health treatments. In certain cases, these requirements for continuous monitoring force people to stay at the hospital facilities for a few days, such as when monitoring cerebral activity, or force them to visit the hospital every few days for downloading data from portable monitoring equipment to a server, such as when monitoring the hearth rate.

The increasing availability of mobile devices and wireless networks, and the tendency for them to become ubiquitous in our dally lives, creates a favourable technological environment for the emergence of new, simple, and added-value applications for healthcare.

One major opportunity resulting from this technological evolution is that electronic health assistants can now be used by everyone, independently of their health condition.

The technological evolution achieved during the lasts years lead to more sophisticated environments. We have more sophisticated users in the sense that more people use more technology in their living and have their lives controlled by technology, and also because more technological devices exist to assist people that search for healthcare services. WLAN, Bluetooth, mobile phones, digital diaries are among some of the most popular technologies used today by many people. Others technologies control peoples' life individually or collectively, many times without people noticing it, like remote video surveillance or remote traffic control systems.

To explore and take advantage of these new technologies it is necessary to solve a set of technical, ethical and legal problems. Pervasive and ubiquitous computing devices can be very useful to people, providing important information and establishing an infrastructure that enables the emergence of a new kind of applications and services: the context-aware services and applications.

In context-aware computing, applications adapt their behaviour accordingly to the context of its users. The context is all the information that characterizes the user in a specific moment. It may include the location, position, a list of nearby objects (e.g. people), the user's activity, the available resources, some user's vital signals, and even the familiarity of the user with his/hers surroundings.

Among the technical problems that need to be worked out are the notion of context and the context management. Until today, many location-based and context-aware services and applications were built based on specific solutions, where location or other data was directly used from the sensors.

Context management should be done through an open and generic entity capable of supporting virtually any sensor or positioning service, without imposing a specific space model and by being capable to support a context based on multiple dimensions.

Context is all the dimensions (all the information) that characterize a user in a specific moment. Some basic dimensions of a context may be obtained directly from physical sensors, while some others may be calculated from raw data or may even be estimated from the information provided by other dimensions.

Location and position have been the most used dimensions when creating context-aware applications and services because there are more sensors and services capable of provide this kind of data than any other dimension. Moreover, position and location are among the dimensions that, in fact, influences a lot the interaction of people with computing devices. Context-aware applications that rely primarily on location are known as location-aware. Location-aware applications provide to mobile users the possibility to access services and information that are relevant to the user in a specific moment and location.

A number of technologies can be used to acquire the user's position and location, inside and outside buildings. In the last decade, research in

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