

Chapter 67

Infrastructures for Development of Context- Aware Mobile Applications

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ABSTRACT

Context-aware mobile applications are becoming popular; as a consequence of the technological advances in mobile devices, sensors and wireless networking. Nevertheless, developing a context-aware system involves several challenges. For example, what will be the contextual information, how to represent, acquire and process this information and how it will be used by the system. Some frameworks and middleware have been proposed in the literature to help programmers to overcome these challenges. Most of the proposed solutions, however, neither have an extensible ontology-based context model nor uses a communication method that allows a better use of the potentialities of the models of this kind.

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INTRODUCTION

One of the most investigated matters in ubiquitous computing is that of context-aware applications. The development of context-aware applications has several challenges. As examples, we may cite: acquisition, processing, representation and utilization. Some frameworks and middleware intended to ease the development of context-aware applications have already been proposed in the literature (Dey et al. 2001) (Gu et al. 2005) (Weinßenberg et al. 2006) (de Almeida et al. 2006a). Most of the proposed solutions, however, neither have an extensible ontology-based context model nor have an infrastructure that permits the model to be extended without needing to modify the source-code, that is, to be able to modify the context model at runtime.

Another important features in the field of context-aware computing is the help given to the end-users in customizing their context-aware applications. In such systems users are able to govern the behavior of their applications under a certain contextual status (Bischoff et al. 2007) (Stenton et al. 2007) (Dey et al. 2006). However, researches towards these two branches usually have no intersection. The context model is often simplified for applications that allow customization by the user.

In this chapter, we will present some of the infrastructures to aid in the creation of context-aware mobile applications, focusing more on those that employ an ontology-based context model and those that allow customization by the user.

The rest of this chapter is organized as follows. In the next section, we will present some important concepts for understanding the chapter. After that, some infrastructures for developing context-aware applications will be presented, as well as the requirements considered important for these infrastructures. The following section presents the VadeMecum infrastructure, which aims to fulfill some of those requirements. In the sequence, we will present some future directions

of research in this area. Finally, the conclusions of the chapter will be presented.

GENERAL CONCEPTS

In this section we will show the main general concepts for better understanding the chapter.

Ubiquitous Computing and Context-Aware Applications

Weiser (Weiser 1991) idealized a future — by the time it was written—in which computing which would be omnipresent in people’s daily tasks. However, it would not be perceived by them, for it would be a natural situation. This idea opened the path for a new research line until then unexplored: ubiquitous computing.

Ubiquitous computing covers several branches of researches, including context-aware systems, which is a starting step for the future foreseen by Weiser.

With the spreading of mobile devices, such as Smartphones and PDA (Personal Digital Assistants), the end-users of these devices can move while performing other activities. With this, information about the situation the user is in can be collected in order to provide customized services and information, automatic execution of commands and storage of this information for posterior use. This kind of information used for decision making is called context (Dey 2001), being the applications that use these information called context-aware ones (Schilit et al. 1994).

As previously said, in ubiquitous computing the user would be aided by computers in his daily tasks in an unperceivable manner. To achieve this, constant monitoring of the context is necessary, so that the computer can make decisions in order to help the user with his tasks.

There are several challenges related to the use of contexts in systems: acquisition, processing, representation and utilization.

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