Chapter 1.8
Context as a Necessity in Mobile Applications

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ABSTRACT

This chapter presents how the use of context can support user interaction in mobile applications. It argues that context in mobile applications can be used not only for locating users and providing them with suitable information, but also for supporting the system's selection of appropriate interaction techniques and providing users with a tool necessary for composing and creating their own mobile applications. Thus, the target of this chapter is to demonstrate that the use of context in mobile applications is a necessity. It will focus on the current trend of modeling devices, services and context in a formal way, like ontologies, and will present an ontology-based context model.

INTRODUCTION

The future of computer science was marked by Weiser's vision (Weiser, 1991), who introduced the term ubiquitous computing (ubicomp) by defining a technology that can be seamlessly integrated into the everyday environment and aid people in their everyday activities. A few years later, the European Union, aiming to promote "human-centered computing," presented the concept of ambient intelligence (AmI) (ISTAG, 2001), which involves a seamless environment of computing, advanced networking technology and specific interfaces. So, technology becomes embedded in everyday objects such as furniture, clothes, vehicles, roads, and smart materials, providing people with the tools and processes that are necessary in order to achieve a more relaxing interaction with their environment.

Several industry leaders, like Philips and Microsoft, have turned to the design of ubicomp applications with a focus on smart home applications. However, people nowadays are constantly on the move, travel a lot, and choose to live in remote or mobile environments. In the near future, each person will be "continually interacting with hundreds of nearby wirelessly connected computers" (Weiser, 1993). Therefore, the need for mobile applications is now more evident than ever.

Recent years have seen a great breakthrough occur in the appearance of mobile phones. Initially they were used as simple telephone devices. Today,

mobiles have evolved into much more than that. Although the majority of people still use mobile phones as communication devices, an increasing number of users have begun to appreciate their potential as information devices. People use their smart mobile phones to view their e-mails, watch the news, browse the Web, and so forth. Eventually, mobile phones and other mobile handheld devices became an integral part of our daily routine.

Both scientists and designers of ubicomp applications have realized that the mobile phone could be considered as one of the first AmI artefacts to appear. As mobile phones are becoming more powerful and smarter this fact is increasingly proven true. Thus, scientists wanting to take advantage of the emerging technology have implemented a great number of mobile applications that enable human-computer interaction through the use of handheld devices like mobile phones or personal digital assistants (PDAs). Such applications include visitor guides for cities and museums, car navigation systems, assistant systems for conference participants, shopping assistants and even wearable applications.

A closer examination of mobile applications shows that most of them are location-aware systems. Specifically, tourist guides are based on users' location in order to supply more information on the city attraction closer to them or the museum exhibit they are seeing. Nevertheless, recent years have seen many mobile applications trying to exploit information that characterizes the current situation of users, places and objects in order to improve the services provided. Thus, context-aware mobile applications have come to light.

Even though significant efforts have been devoted to research methods and models for capturing, representing, interpreting, and exploiting context information, we are still not close to enabling an implicit and intuitive awareness of context, nor efficient adaptation to behavior at the standards of human communication practice. Most of the current context-aware systems have been built in an ad-hoc approach, deeply affected by the underlying technology infrastructure utilized to capture the context (Dey, 2001). To ease the development of context-aware ubicomp and mobile applications it is necessary to provide universal models and mechanisms to manage context.

Designing interactions among users and devices, as well as among devices themselves, is critical in mobile applications. Multiplicity of devices and services calls for systems that can provide various interaction techniques and the ability to switch to the most suitable one according to the user's needs and desires. Context information can be a decisive factor in mobile applications in terms of selecting the appropriate interaction technique.

Another inadequacy of current mobile systems is that they are not efficiently adaptable to the user's needs. The majority of ubicomp and mobile applications try to incorporate the users' profile and desires into the system's infrastructure either manually or automatically observing their habits and history. According to our perspective, the key point is to give them the ability to create their own mobile applications instead of just customizing the ones provided.

The target of this chapter is to present the use of context in context-aware ubicomp and mobile applications and to focus on the current trend of modeling devices, services and context in a formal way (like ontologies). Our main objective is to show that context in mobile applications can be used not only for locating users and providing them with suitable information, but also for supporting the system's selection of appropriate interaction techniques and for providing them with a tool necessary for composing and creating their own mobile applications.

In the background section, which follows, we define the term context and present how context is modeled and used in various mobile applications focusing on ontology-based context models. In the subsequent sections we present our perspective of context, an ontology-based context model for