Adaptive Mobile Guides

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Abstract. In this chapter we discuss various aspects of adaptive mobile guide applications. After having motivated the need for web based mobile applications, we will discuss technologies that are needed to enable adaptive mobile web applications, including not only positioning technologies but also sensor technologies needed to determine additional information on the context and situation of usage. We will also address issues of modeling context and situations before giving an overview on existing systems coming from three important classes of mobile guides: museum guides, navigation systems and shopping assistants. The chapter closes with an extensive discussion of relevant attributes of web based mobile guides.

17.1 Introduction

Accessing the world wide web from mobile terminals is not difficult for people living in developed countries. Internet service providers, computer device manufacturers and telecommunication companies offer a variety of services and devices to allow for the mobile access of web-based services. For example, attendees of scientific conferences are able to access the web through their notebooks if wireless access points are provided, e.g. to retrieve background information on the current speaker. Managers read email on their blackberry devices through GPRS on the go and football fans use their mobile phones equipped with UMTS or I-mode technology to watch video scenes of the latest match of their preferred teams. Obviously, there are no major technological hurdles that prevent users from accessing and using these kinds of services.

In contrast to traditional desktop systems, mobile systems are always used in a specific context. However most of the mobile systems nowadays do not make use of the current context or situation and hence are only usable for a very specific purpose.

In this chapter we will focus on a particular subclass of mobile systems, that of \textit{mobile guides}. Mobile guides are applications that provide assistance in a particular, sometimes narrowly defined domain. These guides usually provide assistance very similar to those of human experts of the particular domain. Suitable domains for mobile guides are
for example tourist applications, such as museum and tour guides, pedestrian navigation systems and shopping assistants. In these domains the mobile guide acts as an expert of the domain and provides the user with information adapted to the current situation. The high degree of adaptivity is the major differences between mobile guides and the aforementioned examples of mobile computing. Adaptivity in the scope of mobile guides is often referred to as context-based computing, i.e. the ability to use information on the current context to adapt the user interaction and the presentation of information to the current situations of users. An important ability of this class of systems is their adaptation to limited resources, such as technical resources (e.g. screen size, bandwidth, ergonomics, and connectivity) and the cognitive resources of the users (e.g. attention span, working memory, and haptic abilities). Mobile guides can be classified along this dimension by distinguishing three different classes of resource sensitive guides: (a) resource adapted guides, (b) resource adaptive guides and (c) resource adapting guides\(^1\). Resource adapted guides have been optimized in advance for restricted resources that are well known and follow regular patterns. The quality of their assistance remains constant for a given input. This includes for example known limitations of screen size of a mobile pedestrian navigation system. In contrast resource adaptive and resource adapting guides can handle varying resource restrictions. Therefore, their results depend on the available resources during runtime. Resource adaptive processes rely on a single strategy to react to varying resources, whereas resource adapting processes select among a number of strategies on a meta cognitive level to comply with different resource situations. For example a pedestrian navigation system that relies on positioning technologies with varying positioning quality (e.g. GPS\(^2\)) could apply a strategy to compensate these variations by changing the level of abstraction when giving directions to users. Such a mobile pedestrian navigation system would fall into the class of resource adaptive guides. If it would use several adapted positioning strategies, e.g. strategies that help to localize users indoors and outdoors and a meta strategy that selects between these strategies when appropriate.

We claim that well-designed context-based mobile guides should incorporate this notion of resource adaptivity in one of the three described ways to increase their flexibility and ability to adapt to situations and users. Beside these abilities there are technical prerequisites common to all mobile guides, such as sensing and positioning technologies and algorithms which will be discussed in the next section. Afterwards we will discuss a particular example of a representation formalism that helps to model situations and relevant knowledge on a domain based on the semantic web framework (section 17.2.2). Section 17.3 will discuss a broad range of mobile adaptive guides coming from three expert domains: museum and tourist tours, navigation advice and shopping assistance.

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1. This classification is based on a classification for adaptive processes, firstly presented in [53]
2. Global Positioning System