Chapter 5.3
Adapting to the User

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ABSTRACT

Adaptation is one of the key requirements to handle the increasing complexity in today's computing environments. This chapter focuses on the aspect of adaptation that puts the user into focus. In this context it introduces the different adaptation types possible for ubiquitous computing services like interaction, content, and presentation. To allow for an automatic adaptation it is important to get some means about the users. Basic requirements to model the users and approaches to personalize applications will be presented.

INTRODUCTION

In the near future... Imagine a businessman preparing for a trip to some western metropolis to meet a customer. As usually, he organizes his trip via the World Wide Web checking how to get to his destination, finding reasonable accommodation and investigating things to do in his free time. To keep himself occupied during his journey, he might listen to his music collection while surfing the mobile Internet and reading emails. At his destination, he checks in at the hotel and enters his room, the heating and ambient light is adjusted to his preferences and in the morning, he expects to have a shower at his preferred temperature. At his customer's premises, the meeting room is well prepared for his presentation, his preferred hot drink is waiting for him and the business cards are automatically transferred between the participating businessmen.

This small scenario touches on many aspects of modern life, already in place or yet to come. For example, information acquisition via the World Wide Web, either stationary or mobile, interaction with intelligent infrastructures such as hotels or meeting rooms, and also IT supported interaction with others. In order to exploit the benefits of those services completely, the key requirement is adaptation to the user. But to allow for a reasonable adaptation, a deep understanding of the user by means of accounting for his preferences, capabilities and usage context is needed. This chapter introduces basic forms of adaptation

followed by techniques to allow for inferences concerning the user's interests.

ADAPTING TO THE USER

When speaking about adaptation to the user one needs to focus on three main aspects of adaptation: Interaction, Content, and Presentation. In our traveling business man scenario interaction can be observed in various forms: *search for information via a desktop computer, listening to some music on the move or even enter the hotel room.* Content is the media/information and the means to interact with, either some Web pages or the music selection on a mobile device. Presentation defines how to inform the user about the outcome of a service usage, for example heating the shower in the morning or presenting only suitable travel connections according to the user's needs. It is obvious that all three forms of adaptation are highly connected and interweaved.

Interaction Adaptation

In the last few years, the high tech industry has started to learn that one of the most important features of all computerized services and devices is their interface to humans. This counts especially in ubiquitous computing scenarios, where those services often are not recognizable as such and where complexity of service arrangements reaches new levels. Think back to our hotel or meeting room example.

A basic concept to describe and cope with the complexity of information processing in this manner is the concept of communication channels. Such a channel can be described as a directed temporal, virtual or physical link allowing for information exchange between different communicating entities. For example it can be the graphical user interface of a mobile device that notifies the user about the current battery status.

Different aspects need to be considered while establishing such a communication channel. Communication is not a one way process, it happens via various channels in parallel. Obviously the capacity of a sender or receiver to process information varies significantly, especially with respect to the actual context.

Furthermore, communication requires abstraction at different levels in order to process information chunks to a coherent view. The first step in this processing chain is information *fission*, which describes the decomposition of information into small chunks. It is than followed by information *fusion,* in which those chunks are combined to new pieces of information.

Along different communication channels, one can distinguish various interaction metaphors. In classical desktop computing, monomodal interaction via a graphical user interface with keyboard and pointing devices dominates. But in recent time, new interaction modalities or even combinations of modalities have gained momentum (Oviatt, 1996). This is on the one hand, due to the ubiquity of computing services, and on the other due to the progress in speech technologies and image recognition (see Chapter Intelligent User Interfaces). The latest prominent examples are pointing gestures for personal gaming consoles.

Modalities can be differentiated according to the activation mode, whether the user actively issues an interaction (e.g., via speech) or whether the system observes passively the user behavior (e.g., his mood based on the facial expression). Generally, multimodal interaction serves two main purposes: First, to allow for a more natural interaction with computerized services, and second, to disambiguate the given user input for complex tasks.

Interaction adaptation often follows a processing chain. First the amount of information that needs to be exchanged between the user and the system is defined. For this information the most suitable modality is selected in a second step. In case the system is not suited for multimodality, the modality for the interaction is chosen during the system design.

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