Chapter 8.16
Intelligent User Interfaces for Mobile Computing

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ABSTRACT

In this chapter, the practical issue of realizing a necessary intelligence quotient for conceiving intelligent user interfaces (IUIs) on mobile devices is considered. Mobile computing scenarios differ radically from the normal fixed workstation environment that most people are familiar with. It is in this dynamicity and complexity that the key motivations for realizing IUIs on mobile devices may be found. Thus, the chapter initially motivates the need for the deployment of IUIs in mobile contexts by reflecting on the archetypical elements that comprise the average mobile user's situation or context. A number of broad issues pertaining to the deployment of AI techniques on mobile devices are considered before a practical realisation of this objective through the intelligent agent paradigm is presented. It is the authors hope that a mature understanding of the mobile computing usage scenario, augmented with key insights into the practical deployment of AI in mobile scenarios, will aid software engineers and HCI professionals alike in the successful utilisation of intelligent techniques for a new generation of mobile services.

INTRODUCTION

Mobile computing is one of the dominant computing usage paradigms at present and encapsulates a number of contrasting visions of how best the paradigm should be realized. Ubiquitous computing (Weiser, 1991) envisages a world populated with artefacts augmented with embedded computational technologies, all linked by transparent high-speed networks, and accessible in a seamless anytime, anywhere basis. Wearable computing (Rhodes, Minar, & Weaver, 1999) advocates a

world where people carry the necessary computational artefacts about their actual person. Somewhere in between these two extremes lies the average mobile user, equipped with a PDA or mobile phone, and seeking to access both popular and highly specialized services as they go about their daily routine.

Though the growth of mobile computing usage has been phenomenal, and significant markets exists for providers of innovative services, there still exist a formidable number of obstacles that must be surpassed before software development processes for mobile services becomes as mature as current software development practices. It is often forgotten in the rush to exploit the potential of mobile computing that it is radically different from the classic desktop situation; and that this has serious implications for the design and engineering process. The dynamic nature of the mobile user, together with the variety and complexity of the environments in which they operate, provides unprecedented challenges for software engineers as the principles and methodologies that have been refined over years do not necessarily apply, at least in their totality, in mobile computing scenarios.

How to improve the mobile user's experience remains an open question. One approach concerns the notion of an application autonomously adapting to the prevailing situation or context in which end-users find themselves. A second approach concerns the incorporation of intelligent techniques into the application. In principle, such techniques could be used for diverse purposes, however, intelligent user interfaces (IUIs) represent one practical example where such techniques could be usefully deployed. Thus the objective of this chapter is to consider how the necessary intelligence can be effectively realized such that software designers can realistically consider the deployment of IUIs in mobile applications and services.

BACKGROUND

Research in IUIs has been ongoing for quite some time, and was originally motivated by problems that were arising in standard software application usage. Examples of these problems include information overflow, real-time cognitive overload, and difficulties in aiding end-users to interact with complex systems (Höök, 2000). These problems were perceived as being a by-product of direct-manipulation style interfaces. Thus, the concept of the application or user interface adapting to circumstances as they arose was conceived and the terms "adaptive" or "intelligent" user interfaces are frequently encountered in the literature. How to effectively realize interfaces endowed with such attributes is a crucial question and a number of proposals have been put forward. For example, the use of machine learning techniques has been proposed (Langley, 1997) as has the deployment of mobile agents (Mitrovic, Royo, & Mena, 2005).

In general, incorporating adaptability and intelligence enables applications to make considerable changes for personalization and customization preferences as defined by the user and the content being adapted (O'Connor & Wade, 2006). Though significant benefits can accrue from such an approach, there is a subtle issue that needs to be considered. If an application is functioning according to explicit user defined preferences it is functioning in a manner that is as the user expects and understands. However, should the system autonomously or intelligently adapt its services based on some pertinent aspect of the observed behavior of the user, or indeed, based on some other cue, responsibility for the system behavior moves, albeit partially, from the user to the system. Thus, the potential for a confused user or unsatisfactory user experience increases.

A natural question that must now be addressed concerns the identification of criteria that an

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