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PERSONALIZED UBIQUITOUS COMMERCE: AN APPLICATION PERSPECTIVE

1. INTRODUCTION

1.1 The Rise of Ubiquitous Commerce

To many people, the term “e-commerce” conjures up the image of the dot com madness of the late 1990’s. As we know well by now, Amazon.com has not made brick-and-mortar bookstores obsolete; neither did electronic exchanges replace physical supply chains. However, e-commerce as a utility function has become an integral part of as well as a permanent fixture to businesses of all sizes, large and small. With the proliferation of devices such as cell phones and personal digital assistants (PDAs), as well as digital cameras, embedded microprocessors, miniature sensors, radio frequency identification (RFID) tags, and wireless networks like 802.11 and Bluetooth, we are currently witnessing a trend in which technology is moving away from desks into our pockets, purses and even onto our walls and furniture. Traditional products ranging from cars, refrigerators, to toys and alarm clocks also begin to acquire computing, sensing, and communications capabilities. In short, technology is increasingly blending into our everyday environments, following us every step of the way, creating a world that is always on, always active and always aware. We coin the term “ubiquitous commerce,” or u-commerce for short (Gershman, 2002), to refer to this new reality, which promises, and perhaps ultimately demands, that businesses be available at the times and places where people use these products and services rather than just through the Web or at physical stores. This emerging reality also presents a new set of challenges and opportunities, and redefines what we mean by personalization.

1.2 Personalization for Ubiquitous Commerce

The Web is a highly customisable medium. Many Web-based applications support some level of personalization. My Yahoo, for example, allows us to explicitly select and customize content types, sources, and presentation formats. Amazon.com recommends books and music that are potentially of interest to us based on our past purchasing history. While features like these are useful, they are far from adequate to many people for three important reasons. First, most of these
customisations are based on the static profile specified by the user, e.g., My Yahoo preferences. As these preferences change, the user must remember to explicitly make corresponding changes to the system. In the real-world, however, few users are disciplined enough to do so. As a result, these profiles often become obsolete and useless very quickly. Second, while past transactions reveal much about our interests, the current representation of such history is fragmented. Amazon.com, for example, might make excellent recommendations of books and music based on what I’ve bought from them during the past six months. However, their recommendations could be totally off mark by not taking into account of my purchases from other stores, especially their competitors, both online and offline. Perhaps most importantly, most existing e-commerce applications have little or no awareness of the current tasks in which the user is involved. As a result, they cannot adapt their offerings dynamically to the present need of the user. For example, Amazon.com may recommend a new childcare book because I bought a similar book two months ago. However, what they may not realize is that I’m currently involved in a home improvement project and thus more interested in books on this topic.

In the world of ubiquitous commerce, user task context is more readily available, and thus may be used for further personalization of services. One very common type of context, for example, is the user’s real-time location. With inexpensive Global Positioning Systems (GPS) built-into cars, cell phones, PDAs, and other products, it is now possible to provide a wide range of location-based services, ranging from navigation and roadside assistance, to personalized advertising and shopping. A roadside billboard owner, for example, may dynamically change the advertising message based on the number of cars currently passing by, the type of car, and even the type of driver. This is made possible by integrating real-time context information from various sources, including GPS embedded in those vehicles. As sensors like GPS, RFID, and digital cameras become ubiquitous, more user context will be available electronically. This in turn will open the door to a new generation of ubiquitous commerce applications that support a much richer and more personalized experience.

Thus, personalization in ubiquitous commerce involves more than just static user profiles and online transaction histories. It calls for automatic sensing of the user identity, the task, and the surrounding physical environment in which the current task is taking place. As illustrated by the applications described throughout this chapter, the novel use of sensors and personalized devices is essential to seamless tracking of dynamic user contexts in the physical world and, ultimately, to achieving a higher level of personalization.

1.3 The Organization of this Chapter

For the remainder of this chapter, we will describe four research prototypes of personalized ubiquitous commerce: MAGIC MEDICINE CABINET, ONLINE WARDROBE, REAL-WORLD SHOWROOM, and VIRTUAL HANDYMAN. Each of these applications addresses a different task domain, and thus provides its own unique set of features. One common thread among them is that they all attempt to create a new