Chapter XLVI
Context-Aware Urban Exploration:
A Paradigm for Non-Directed Exploration in Mobile Computing

Mercedes Paulini
University of Sydney, Australia

Marc Aurel Schnabel
University of Sydney, Australia

ABSTRACT

Mobile computing provides a new dimension in communication and access to data resources that is transforming the way people use information and interact in physical space. The rapid acceptance of these technologies by the public presents researchers with opportunities to develop systems that support social interaction and spatial navigation in unprecedented ways. This research presents a paradigm for negotiating physical space as influenced and supported by information from the virtual. It is proposed that the system allows users to traverse their environments in a more spontaneous and serendipitous manner than possible with existing navigational systems.

INTRODUCTION

As urban environments become increasingly populated by mobile technologies and their supporting infrastructure, new methods of interacting with our surrounds emerge. Sensors capture environmental cues to trigger context-dependent information, and mobile devices store our schedules and preferences, channelling information through increasingly personalized filters. In this third wave of computing, it is becoming necessary to control the increasing amounts of oncoming information through a contextual lens, shifting the focus from unlimited access to customized

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access. This research proposes a framework that supports context-based exploration of urban environments and demonstrates its functionality and informational flow between the elements of the system.

Navigation through both information and urban landscapes is rapidly changing with the proliferation of networked devices in cities. With just a few clicks, one can access geocoded data to find the nearest convenience store or even to locate nearby individuals in one's social circle. With GPS technology, new opportunities for location-based entertainment emerge, yet despite an increasing trend toward spontaneity in our communications, navigational systems maintain fixed destination input, with the user entering precise locations. Spontaneity and serendipitous encounters are not encouraged in such systems, and there is room for a new tool for mobile exploration that supports and encourages such behavior. In contrast to directed search, Web surfing is a method for users to traverse the net from link to link with no end goal—no real search criteria. The enjoyment of such a nondirected "search" arises from the journey itself and from the discovery of unexpected information along the route. This metaphor can be applied to a networked urban environment to change the way interactions occur within the space.

MOBILE NAVIGATION TOOLS

We are accustomed to seeing physical spaces enhanced with localized information. Signposts and street numbers assist in locating ourselves in space and help us conduct physical search. Our physical location is a very powerful indicator of the kinds of information we need access to at any given point in time. Location-based information systems connect items of information to a particular coordinate in physical space. At a later time, users are able to access this information (e.g., text, images, URLs, videos) with a mobile device, thus achieving some level of contextual awareness of location (Burrell & Gay, 2002; Espinoza, Persson, Sandin, Nyström, Cacciatore & Bylund, 2001; Rantanen, Oulavirta, Blom, Tiita & Mantylä, 2004; Williams, Jones, Wood & Fleuriot, 2006). As this system becomes more commonplace, a further level of context awareness must be implemented to save users from informational overload. This could be achieved by invoking user identity as a filtering device. Espinoza, et al. (2001) suggest a method of enhancing access to digital information spaces by filtering information through the matching of a user's history to that of other users. This can be done with a recommender system.

Recommender Systems

Recommender systems identify content relevant to individuals by matching the individual's profiles with the profiles of a community of users (Herlocker, Konstan, Terveen & Tiedl, 2004). To illustrate the power of recommender systems, examine Amazon.com's product recommendation system. When a potential customer views a product, the Web page displays other items purchased by customers in conjunction with the queried product. The items displayed are statistically significant; that is, a high number of other customers will have made these purchases together with the queried product. Thus, a correlation is made based on the assumption that customers interested in a particular product share similar tastes and interests. Recommender systems are successfully utilized in online dating services to match users with other users through collaborative filtering algorithms that require users to assign weightings to randomly selected results (profiles of other users) in order to build up an understanding of their likes and dislikes. This is not always useful as users may be unknown to each other, as in the case of this research. Methods such as those employed by PHOAKS (with anonymous recommendations) or ReferralWeb (combining

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