Modeling and Analyzing User Contexts for Mobile Advertising

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ABSTRACT

Context-aware advertising is one of the most critical components in the Internet ecosystem today because most WWW publisher revenue highly depends on the relevance of the displayed advertisement to the context of the user interaction. Existing research work focuses on analyzing either the content of the web page or the keywords of the user search. However, there are limitations of these works when being extended into mobile computing domain, where mobile devices can provide versatile contexts, such as locations, weather, device capability, and user activities. These contexts should be well categorized and utilized for online advertising to gain better user experience and reaction. This paper examines the aforementioned limitations of the existing works in context-aware advertising when being applied for mobile platforms. A mobile advertising system is proposed, using location tracking and context awareness to provide targeted and meaningful advertisement to the customers on mobile devices. The three main modules of this comprehensive mobile advertising system are discussed, including advisement selection, advertisement presentation, and user context databases. A software prototype that is developed to conduct the case studies and validate this approach is presented.

Keywords: Context Awareness, Location Based System, Mobile Advertising, Mobile Computing, Mobile Marketing

1. INTRODUCTION AND MOTIVATION

Online advertising constitutes a large portion in the financial ecosystem of web sites nowadays, including search engines, commercials, blogs, news, reviews etc. Driven by recent Internet revolution and the tremendous increases in online traffic, a huge growth in spending on online advertising is seen in last few years. eMarketer in 2007 reports a total Internet advertising spending of nearly 20 billion US dollars just in 2007. This number supports the World Wide Web (WWW) to be amongst the top 3 advertisement medium, along with TV and print media. In these online advertisements, contextual advertising is a main category that we have identified in providing the advertising content matching the keywords of the user searches or the content of the web pages where the advertising content will be placed. How to optimize the advertising content in this method is always an important research topic with the dual goals of increasing revenue of both publisher

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and advertising business. However, if we check most of the current advertisements, the majority of these advertisements are either serendipitous or solely dependent on the keywords of users’ searches, both forms of advertising where all the users who perform the same search are deemed identical and are thus shown the same advertisements. These approaches of selecting advertisement mostly result in the advertisement banners that we have seen on various web sites and are trying to sell the products that we will never buy or even look for details. A superior online advertising approach should always provide the customers with information that match their contexts and interests as much as possible (Chatterjee, 2006). Every possible factor that contributes to understand the interests and contexts of the existing and potential customers should be appropriately captured and carefully investigated.

Meanwhile, mobile computing technologies have profoundly transformed the way how people communicate and receive information from various media including WWW. With mobile devices becoming more powerful and affordable, the user base has expanded from the early business elites to ordinary people. Consequently, mobile information access is gaining widespread prominence with improving connection speed and access technologies leading to richer content explosion and user experience. The addition of mobility has opened up new prospects as devices are expected to be with users at all time providing reliable information on user interests and contexts. In turn, the next generation of mobile computing applications should leverage mobility of devices combined with advanced approaches to provide more customized information and, at meantime, more targeted advertisement. Mobile advertising, which is a cross area of mobile computing, and online advertising, is a form of advertising that targets users of handheld wireless devices such as mobile phones and PDAs. In comparison with traditional advertising, mobile advertising can be more location-dependent, user-targeted, and device-customized. Mobile advertising can reach the target customers anywhere anytime; customers can be aware of mobile advertisements and services while they are walking. Location tracking in our opinions is most important in such scenarios and so is worthy being studied distinctively before other contexts. Using demographic information collected by mobile devices in the current locations of customers, much targeted advertising can be done. Such advertisements can also inform a user about ongoing specials (such as restaurants, hotels and malls) in surround areas. The messages can be sent to all the users located in a certain area or to the users who previously subscribe to certain advertising messages. Furthermore, combing with the mobile user context, including user profile (such as a special preference on certain kinds of products) and user’s previous activities (such as clicks on the advertisement belonging to one particular seller), advertising companies can provide the customers more targeted and acceptable advertisements at the exact time the customers may need these advertisements and at the exact location they may find it close to use the contact information in the advertisement, not just “spam” them with advertisements they will never buy.

As the user profile may be obtained properly from the registration record and user location can be provided by the GPS unit in the mobile device or the cell station of the carrier network, it is understandably difficult for a computer to judge the preference of a user and predict what advertisement may be of her favor at a specific time in a specific location. Recent mobile computing research is investigating how to collect and analyze the contexts of user activities in order to predict users’ preferences (Bardram, 2004). Recently an interesting trend has emerged in building recommendation systems that leverage the opinions of other users to make predictions for the user, by utilizing a methodology, namely Collaborative Filtering. It is a technology that has emerged in e-Commerce applications to produce personalized recommendations for users (Schafer, 1999). It is based on the assumption that people who like the same things are likely to feel similarly towards other things. This has turned out to be a very effective
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