

Chapter 103

Building Context–Aware E–Commerce Systems: A Data Mining Approach

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ABSTRACT

Context is any information/knowledge about an application and user that can be used by an e-commerce system to provide efficient services to the users of the system. In this article, we propose to extend usage of context as compared to previously designed context-aware e-commerce systems. While in previous work, context was mainly considered for mobile e-commerce systems, we propose to build and use context for e-commerce systems in general. The context is employed to tailor an e-commerce application to the preferences and needs of users and provide insights into purchasing activities of users and particular e-commerce stores by means of using Data Mining techniques. This article proposes a model of context that includes micro-, macro- and domain contexts that constitute knowledge about the application and its user on different levels of granularity. The article also proposes a technique for extracting groups in social networks. This knowledge is part of macro-context in the proposed model of context. Moreover, the article discusses some of the challenges of incorporating context with e-commerce systems, emphasizing on the privacy issue, with an ultimate goal of developing intelligent e-commerce systems.

1. INTRODUCTION

While most people tacitly understand what context is, they find it difficult to explain. The term “context-aware system” was first defined by Schilit

et al. (1994) as software that “adapts according to its location of use, the collection of nearby people and objects, as well as changes to those objects over time”. We adopt the definition of context given by Dey (2001), “Context is any information that can be used to characterize the situation of an

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entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and the application themselves.” With an understanding of what context is, application designers can determine what behaviours or features the applications should support and what context is required to achieve the behaviours.

In order to obtain the knowledge about the users and applications and to be able to tailor the e-commerce system to the preferences and needs of the users, Data mining techniques can be used. E-commerce domain possesses an enormous amount of data which can be mined in order to turn it into knowledge (Ansari et al., 2001). Data mining is the process of analyzing data and summarizing it into useful information (to increase revenue, cut costs etc.), i.e., finding patterns and correlations in the data. Data mining goes through phases of data extraction, storage, analysis, and data presentation in a useful format. Data mining software analyzes relationships and patterns in the stored data based on user queries.

Thus the goal of using data mining in the context of this paper is to gain the knowledge necessary to adapt the e-commerce system to customers based on their needs, interests and preferences, as well as to provide the e-commerce stores, manufacturers/suppliers with useful insights into purchasing activity of the customers, as discussed in the following sections.

2. BACKGROUND

The research on context-aware e-commerce systems mostly concentrates on mobile-commerce (m-commerce) (Tarasevich (2003), Vassilakis et al. (2007), Thawani et al. (2007), Jin & Miyazawa (2002)). Three broad categories of context are considered in the model of context for m-commerce proposed by Tarasevich (2003), namely environment, participants and activities. The “Environment” component of

the model considers the physical properties of objects in the physical environment such as location, brightness, and noise level, etc. The “Participants” category considers properties of the user(s) and other participants. These include the user’s location as well as the user’s personal properties (such as gender, age, education). The “Activities” category includes the tasks and goals that the participants have, it also includes events in the environment (e.g., weather). The model as well considers the possible interactions between different categories of the context model. Time is also incorporated into the model. This enables building context history and predicting the future context.

Vassilakis et al. (2007) discuss the issues, challenges and research directions for mobile and context-aware e-commerce. The context taken into account by the applications can involve location, time of access, the devices used to access an m-commerce application, the communication network, the nature of transaction carried out etc. The challenges that are introduced by the mobile and context-aware e-commerce systems are dictated by the limited communication bandwidth, limited computational power, small screen size of mobile devices (such as PDAs and cell phones). An important aspect of the applications is the user interface issue.

In m-commerce applications, due to user mobility, users can be anywhere anytime (location context) while running an m-commerce application. Mobile devices’ limitations such as small screen and key pads add other challenges to m-commerce applications. These challenges can be resolved by employing natural interfaces (such as speech interface) instead of traditional screen and keyboard as in the e-commerce applications, which would allow a user to be mobile (e.g., ride a bicycle) and use the m-commerce application. By making an m-commerce application context-aware, the application can successfully be used when environmental conditions, user’s circumstances and user priorities change.

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