Chapter 1.33
Intelligent User Preference Mining

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INTRODUCTION

A business-to-consumer environment can be developed through software agents (Guan, Zhu, & Maung, 2004; Maes, 1994; Nwana & Ndumu, 1996; Wang, Guan, & Chan, 2002) to satisfy the needs of consumers patronizing online e-commerce or m-commerce stores. This includes intelligent filtering services (Chanan & Yadav, 2000) and product brokering services to understand user's needs better before alerting users of suitable products according to their preference.

We present an approach to capture individual user response towards product attributes including nonquantifiable responses. The proposed solution can capture the user's specific preference and recommend a list of products from the product database. With the proposed approach, the system can handle any unaccounted attribute that is undefined in the system. The system is able to cater to any unaccounted attribute through a general descriptions field found in most product databases. In addition, the system can adapt to changes in user's preference.

BACKGROUND

In e-commerce activities, consumers are confused by the large number of options and varieties of goods available. There is a need to provide on top of the existing filtering and search services (Bierwirth, 2000) an effective piece of software in the form of a product brokering agent to understand their needs and help them in selecting products.

Definitions

A user's choice in selecting a preferred product is often influenced by the product attributes ranging from price to brand name. This research will

classify attributes as accounted, unaccounted, and detected. The same attributes may also be classified as quantifiable or nonquantifiable. *Accounted attributes* are attributes that the system is specially customized to handle. A system is designed to capture the user's choice in terms of price and brand name, making them accounted attributes. *Unaccounted attributes* are not predefined in the system ontology. The system does not know whether an unaccounted attribute represents a product feature. Such attributes merely appear in the product descriptions field of the database. The system will attempt to identify unaccounted attributes that affect the user's preference and consider them as *detected attributes*. Thus, detected attributes are unaccounted attributes that are detected to be crucial in affecting the user's preference.

Quantifiable attributes contain specific numeric values (e.g., memory size) and their values are well defined. Nonquantifiable attributes on the other hand do not have any logical or numeric values, and their valuation could differ from user to user (e.g., brand name). The proposed system defines price and quality of a product in the ontology and considers them to be quantifiable, accounted attributes.

Related Work

One of the research goals among related work is to understand a user's needs before recommending products through the use of product brokering services. Due to the difference in complexity, different approaches were proposed to handle quantifiable and nonquantifiable attributes. One approach to handling quantifiable attributes is to compile these attributes and assign weights representing their relative importance to the user (Guan, Ngoo, & Zhu, 2002; Sheth & Maes, 1993; Zhu & Guan, 2001). The weights are adjusted to reflect the user's preference.

Much research aimed at creating an interface to understand user preference in the context of nonquantifiable attributes. This represents a more complex problem as attributes are highly subjective with no discrete metric to measure their values. Different users give different values to a particular attribute. MARI (Multi-Attribute Resource Intermediary) (MARI, 2007) proposed a "word-of-mouth" approach to solving this problem. The project split up users into general groups and estimated their preference to a specific set of attributes through the group each user belongs to. Another approach to handling nonquantifiable attributes involves requesting the user for preferred attributes. Shearin and Liberman (2001) provided a learning tool for users to explore their preferences before requesting them to suggest desirable attributes.

The problems in related work lie in the handling of nonquantifiable attributes, as the approaches are too general. Most work so far only attempted to catch user preference through generalization and stereotyping instead of understanding specific user needs. Another problem is that most works are only able to handle a specific set of attributes. The attributes to be handled are hard-coded into the system design, and the consequence is that it is not able to handle attributes that are unaccounted. However, the list of product attributes is often large. The approach used in related research may not be able to cover all the attributes, as they need to classify them into the ontology.

DESCRIPTION OF INTELLIGENT USER PREFERENCE DETECTION

The proposed approach attempts to capture user preference based on two quantifiable accounted attributes, price and quality. It learns incrementally any unaccounted attribute that affects a user's preference. If any unaccounted attribute is suspected, the system comes up with a list of candidate attributes and verifies their importance through a genetic algorithm (Haupt & Haupt, 1998). Thus, attributes that were unaccounted for