

E-Commerce Product Selection and Evaluation Services

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INTRODUCTION

Despite the rapid growth of e-commerce and the hype surrounding it, the potential of the Internet for truly transforming commerce is largely unrealized to date is because most electronic purchases are still largely nonautomated. User presence is still required in all stages of the buying process. According to the nomenclature of Maes's group in the MIT Media Labs (Maes, 1994; Guttman & Maes, 1999), the common commerce behavior can be described with consumer buying behaviour (CBB) model, which consists of six stages, namely, need identification, product brokering, merchant brokering, negotiation, purchase and delivery, and product service and evaluation.

The solution to automating electronic purchases could lie in the employment of software agents and relevant AI technologies in e-commerce. Software agent technologies can be used to automate several of the most time consuming stages of the buying process like product information gathering and comparison. Unlike "traditional" software, software agents are personalized, continuously running and semiautonomous. These qualities are conducive for optimizing the whole buying experience and revolutionizing commerce, as we know it today. Software agents could monitor quantity and usage patterns, collect information on vendors and products that may fit the needs of the owner, evaluate different offerings, make decisions on which merchants and products to pursue, negotiate the terms of transactions with these merchants and finally place orders and make automated payments (Hua & Guan, 2000).

At present, there are some software agents like BargainFinder, Jango, and Firefly providing ranked lists based on the prices of merchant products. However, these shopping agents fail to resolve the challenges presented as follows.

Seller Differentiation

Many merchants deny entry of such comparison agents into their site and refuse to be rated by these agents for this reason. Unless product comparisons can be performed in a multidimensional way, merchants will con-

tinue to show strong resistance toward admitting software agents with product comparison functions into their sites.

Buyer Differentiation

Although comparison between products based on price and features is currently available on the Internet, this feature is only useful to the buyer with relevant product knowledge. What is truly needed is a means of selecting products that match the users' purchase requirements and preferences. These preferential purchase values include affordability, portability, brand loyalty, and other high level values that a user would usually consider in the normal purchase process.

Differentiation Change

In today's world of rapid technological innovation, product features that are desirable yesterday may not be desirable today. Therefore, product recommendation models must be adaptable to the dynamic, changing nature of feature desirability.

The current agents also do not have complete interpretation capability of the products because vendor information is described in unstructured HTML files in a natural language. Finally, there is also the issue that the agents may need a long time in order to locate the relevant product information given the vast amounts of information available online. A more coordinated structure is required to ensure faster search time and more meaningful basis for product comparison. It is, therefore, the aim of this paper to propose a methodology for agent learning that determines the desirability of a product and to propose an agent framework for meaningful product definition to enable value-based product evaluation and selection.

LITERATURE REVIEW

In this section, we consider some of the online solutions that are currently applied on the Internet for product comparison and recommendation and a number of agent architectures proposed for electronic commerce.

Internet Models

The most common Internet model for e-commerce product selection is feature-based product comparison. Most search engines are able to collate the relevant product information for a specified number of the filtered products and present the outcome in the form of a comparison table. The drawback from this scheme is that it is usually only able to make comparisons between a specified number of products. There is also no strong basis for making product recommendations based only on the product features without consideration for the user's preferences.

Several dot.com startups like allExperts.com and ePinions.com use a network of Web users who contribute their opinions about a specific product to assist a user to make product purchase decisions. The drawback from this scheme is that the process of product filtering, which is the precursor to product evaluation, is usually absent. Furthermore, the opinions of the contributors could be based on different value judgments. Thus, what may be desirable to a user need not be so for another user.

Agent Frameworks

Little research has been done in this area; however, there are a number of operations research techniques available to consider for this purpose like in Bernard (1999), Decker (1996), Lee (1998), and Sarkar et al. (1995). The main problem with these agent frameworks is that the product domains are distinct and separate. However, for a complex system like a personal computer system where component level information is widely available, it would be a definite advantage to be able to mobilize the relevant product agents together to give a better evaluation of the given product. There is therefore insufficient agent integration toward product recommendation. The cause of this problem most probably lies in the form of knowledge representation for the products.

ARCHITECTURE OF AGENT-BASED TRADE SERVICES

SAFER (*Secure Agent Fabrication, Evolution and Roaming*) for electronic commerce (Guan, 1999) is an infrastructure to serve agents in e-commerce and establish the necessary mechanisms to manipulate them. SAFER has been proposed as an infrastructure for intelligent mobile agent mediated e-commerce. The proposed trade services is best positioned based on such an infrastructure, which offers services such as agent administration, agent migration, agent fabrication, e-banking, and so forth.

The central design questions raised are as follows:

- How does a purchase agent locate relevant vendor agents among the sea of agents in the World Wide Web?
- After the products have been found, how does the agent evaluate the performance and desirability of a particular product and make good recommendations?

Our solution would be an agent-based trade services entity.

Trade Services

A trusted trade services entity is proposed for each agent community (Zhu, Guan, & Yang, 2000). All the vendors participating in the framework are to be registered with the trade services and the products to be sold within the agent framework are also to be registered. In thus doing, the approach also overcomes the potential problem of an overtly long product searching process when there is no known directory for the purchase agents to locate a product and related vendor information quickly. The trade services, in this role, acts as an intermediary between the purchase agents and the vendor agents and provides the facilities for agent matchmaking and agent brokering. The agent naming service provides the mapping of agent names and their locations while the agent broker maintains the mapping of agents and their capabilities within the framework.

The trade services is proposed to be a neutral, logical entity that embodies a collection of autonomous expert agents, each capable of handling a specific domain. However, the trade services needs not play a merely passive role as a routing mechanism in a client-server framework that connects the purchase agent to the relevant expert agent. It also plays an active role in providing interconnectivity between the various expert agents in order to achieve a better evaluation of the product. This "divide-and-conquer" approach will be especially useful in evaluating complex, composite products like the PC, where reliable evaluation of individual components could be the key to a reliable overall recommendation. This could mean that the trade services needs to have some metaknowledge about the relationships between products and these relationships could be built into the knowledge base by the manner the product information was represented.

The advantages to a multiagent trade services approach are as follows:

- **Lower search cost and waiting time:** If each expert agent handles its own knowledge base, the extent

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