Chapter 22

An Agent-Based Architecture for Product Selection and Evaluation Under E-Commerce

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ABSTRACT

This chapter proposes the establishment of a trusted Trade Services entity within the electronic commerce agent framework. A Trade Services entity may be set up for each agent community. All products to be sold in the framework are to be registered with the Trade Services. The main objective of the Trade Services is to extend the current use of agents from product selection to include product evaluation in the purchase decision. To take advantage of the agent framework, the Trade Services can be a logical entity that is implemented by a community of expert agents. Each expert agent must be capable of learning about the product category it is designed to handle, as well as the ability to evaluate a specific product in the category. An approach that combines statistical analysis and fuzzy logic reasoning is proposed as one of the learning methodologies for determining the rules for product evaluation. Each feature of the registered product is statistically analyzed for any correlation with the price of the product. A regression model is then fitted to the observed data. The assumption of an intrinsically linear function for a non-linear regression model will simplify the efforts to obtain a suitable model to fit the data. The model is then used as the input membership function to indicate the desirability of the feature in the product evaluation, and the appropriate fuzzy reasoning techniques may be applied accordingly to the inputs thus obtained to arrive at a conclusion.

INTRODUCTION

The Internet and World Wide Web is becoming an increasingly important channel for retail commerce as well as business-to-business (B2B) transactions. Online marketplaces

provide an opportunity for retailers and merchants to advertise and sell their products to customers anywhere, anytime. For the consumers, the Web represents an easy channel to obtain information (e.g., product price and specification) that will assist them in their purchase decisions. However, despite the rapid growth of e-commerce and the hype surrounding it, there remain a few fundamental problems that need to be solved before e-commerce can really be a true alternative to the conventional shopping experience. One of the reasons why the potential of the Internet for truly transforming commerce is largely unrealized to date is because most electronic purchases are still largely non-automated. User presence is still required in all stages of the buying process. According to the nomenclature of Maes' group in the MIT Media Labs (Maes, 1994; Guttman & Maes, 1999), the common commerce behavior can be described with the 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.

This adds to the transaction costs. 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 semi-autonomous. 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, 2000). The ultimate goal of agents is to reduce the minimum degree of human involvement required for online purchases.

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 below.

Seller Differentiation

Currently, the most common basis for comparison between products via the e-commerce channel is through price differentiation. Through our personal experience, we know that this is not the most indicative basis for product comparison. In fact, product comparisons are usually performed over a number of purchase criteria. 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 multi-dimensional way, merchants will continue to show strong resistance towards admitting software agents with product comparison functions into their sites.

Buyer Differentiation

Current e-commerce architecture places too much emphasis on the price as the single most important factor in purchase decisions. This simplistic assumption fails to capture the essence of the product selection process. 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 user's purchase requirements and preferences. For example, a user may consider whether a product is popular or well received in addition to the price factor when making his

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