비교 검색을 위한 지능형 검색 시스템

서양진, 한상용

Intelligent Search System for Comparative Searches

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Abstract

A cyber shopping mall is a place where consumers acquire product information, and make purchase decisions in the cyber space. Even though it offers many advantages over traditional malls, there are still several limitations to do shopping in an existing cyber mall.

One of these limitations is the absence of an efficient shopping aid to compare multiple items from multiple malls. Existing search systems usually support a keyword search with limited conditions. Consumers spend lots of their time to compare multiple alternatives from search results.

In this paper, we propose an intelligent product search system. There are two main features in our system. The first one is a full support of comparison shopping with multiple perspectives based on commercial search engines. The second one is an enhancement to the shopping aid based on a new concept of Shopping AssistanT. Our system is implemented in Visual Basic and PERL, and experimental results show a satisfactory performance.

Keywords: *Cyber Shopping mall; Search System; Mediator;*

1. Introduction

It is not an easy thing for online shopping consumers to buy the product with their requirements. In the dawning of the online shopping, consumers need to visit many candidate online stores to compare multiple alternatives. Visiting many sites sitting in front of a computer is very time-consuming task. It is not a trivial matter to compare the products in different sites.

As a solution of this problem, the concept of comparison shopping is proposed. Comparison shopping is the way to find the desired product from several online stores, and a software agent is employed for this purpose [1, 2]. First generation comparison shopping agents [3, 4] are restricted to comparing products only on price. This will be the efficient way if consumers intend to buy a product like CD, which has very simple features. However, consumers' satisfaction level is low if they try to purchase a product, which has more complex features such as consumer electronics.

Currently, a few sites support comparison shopping, and fewer sites support multiple criteria comparison. However, none of them support a systematic shopping guide, which we can find easily in the real store.

We propose an intelligent product search system based on a mediator, which supports multiple customers' perspectives. Our system is built on the top of the existing comparison shopping services,

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and supports multiple criteria requirements from customers. Our system also supports an intelligent shopping AssistanT, which guides customers as if they are in the real store.

In this paper, we show existing comparison-shopping aids and their characteristics. The design and architecture of our intelligent product search system based on a mediator is introduced. Implementation and its evaluation follows and we present the issues that to be studied in the future.

2. Existing Comparison Shopping aids

BargainFinder [5] was the first comparison shopping agent. Given a specific music CD, BargainFinder provides the search result, which contains a price (including shipping cost) and the name of online store. In BargainFinder, the product requests originate from a central site, and some merchants block the requests because they don't want to compete on price alone. Shopbot [2] solved this issue by having the product requests originate from each consumer's Web browser. Besides, it automates to create a merchant description for each merchant contrary to BargainFinder, which creates the description manually. Shopbot was adapted in private industry and contributed to the development of an even better shopping agent at Jango [6]. It was not simple thing to add a new store to compare, whether it is done manually or automatically. From this viewpoint, MySimon [7] is the outstanding one. It performs a comparison for products at more than 2,000 stores. Its basic comparison criterion is price, too. But it provides different additional criteria based on products. Compare.net [8] is another appealing tool, which has several shopping ways. It provides the tabular comparison and multiple criteria comparisons.

With these tools, consumers can make a purchase decision more efficiently. But, many consumers still feel inconvenient. We have investigated the reason from the consumers' viewpoint. There are several descriptive theories and models that attempt to capture consumer-buying behavior. Although different, these models all share a similar list of six fundamental stages guiding consumer-buying behavior[4]. Existing comparison shopping agents can be categorized by these six stages, and most of them don't have a systematic shopping guide. It is obvious if we compare online shopping with a shopping in a real store. When a customer enters a real shop, he will get the help from a clerk right away. A customer asks questions like "Do you have a 25 inch TV?", "What is the price?", and "Does this have a closed caption functionality?", and etc. A tool that acts as a clerk at online stores is also needed.

3. An Intelligent Product Search System Based on a Mediator

In this section, we present a new search system that is built on the top of the existing commercial comparison shopping services. On the requirements from a customer, it filters out necessary information for each different search engine and executes the commercially available engine. The search results are also analyzed to personalize customers' request. The first search is done by existing comparison shopping services and the second search finds proper information from the first search results. Our system consists of three major parts. They are a shopping assistant (SAT), a search gateway, and a mediator.

3.1 SAT (Shopping AssistanT)

SAT is mimicking what a store clerk would do when a

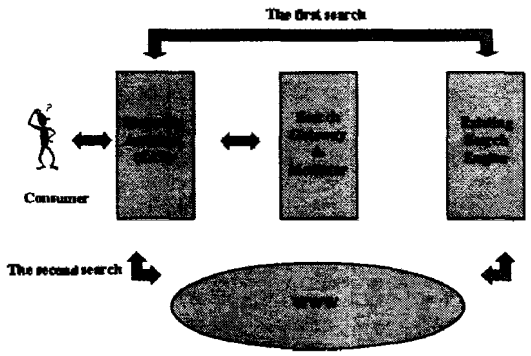

Figure 1 – Overall Search Process and System Architecture

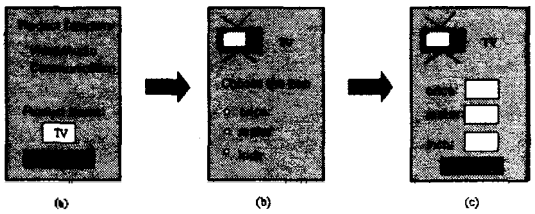

Figure 2 – The Operation of a Search Gateway

customer comes into the store. A customer tells his/her request to SAT through a search gateway. Then SAT performs the first search by the help of a mediator and analyzes the search result to get necessary information for the second search. Finally, it performs the second search and provides a customer with a candidate product list for his/her request.

3.2 Search Gateway

The operation and the architecture of the search gateway are shown in Figure 2 and 3. When a customer types a product name (Figure 2 (a)), search gateway looks into a predefined synonym list as the same product can be spelled different such as 'television', 'tv', and 'televi'.

On the identification of the product, the features of the product are presented to a customer. Then the customer selects several items, which he/she wants to give them as the condition of purchase, among them (Figure 2(b)).

The last form is given to the customer. He/She fills out the form and requests a search to our system (Figure 2(c)).

3.3 Mediator

Existing comparison shopping services do not support all the features as shown in Figure 2 (c). Our system suggests a 'mediator' as a solution for this matter. A mediator is a query analyzer as shown in Figure 4.

A query analyzer separates the query into two groups: one which is supported by existing comparison shopping services (Query Part Ⅰ) and the other which is not(Query Part Ⅱ). Then, it hands the first part query to existing search engines. The second party query will be used in the second search.

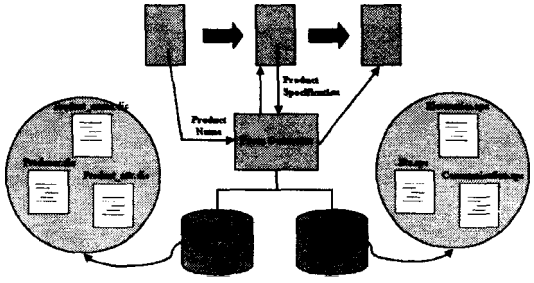

Figure 3 – The Architecture of a Search Gateway

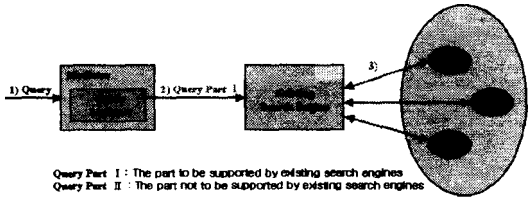

Figure 4 – The Composition of a mediator

4. Implementation

Our system is implemented in Visual Basic. SAT performs basic web browsing by using a 'web browser' control. A web browser control defines each HTML document as an object that has certain properties, collections, methods and events. Sometimes, we must handle the HTML source itself. We use the openURL method of 'Internet Transfer' control for this purpose.

When the second search is performed, SAT evaluates the relevance of each product for search criteria. We use a simple strategy for this evaluation. SAT separates product features into three groups: one is what consumers choose as 'Yes'. The other is what consumers choose as 'No'. The last one is a character string condition. SAT uses these as the criterion of relevance evaluation. If the keyword that is chosen as 'Yes' or a character string is found, the relevance factor is increased by 1. Otherwise, it is decreased by 1. For a string match, synonym list is important since HTML document does not contain the exact same text as customers type in. So, we keep synonyms information to recognize all these different representations. This information is kept in a dictionary DB as a form of HTML document.

A search gateway is implemented as CGI in PERL. Two CGIs are made. These are 'generate-form' and 'make-form'.

'Generate-form' provides a product specification list depending on the product name. 'Make-form' generates a form to be filled out by customers as shown in Figure 2(c).

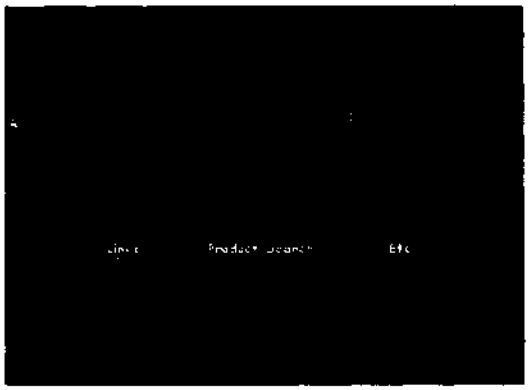

Figure 5 – The Initial Page

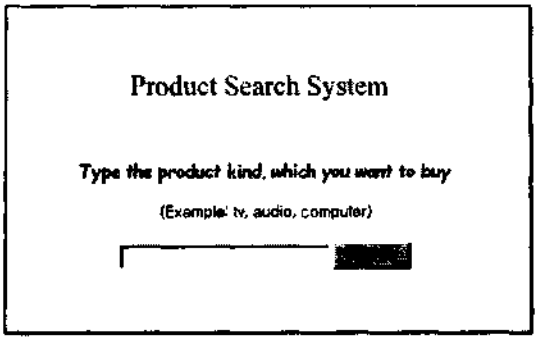

Figure 6 – A consumer inputs the product sort

A mediator is implemented as CGI in PERL. A mediator generates the HTML document that SAT reads and obtains information from analyzing criteria to be selected by consumers.

5. Experimental Result

This section shows a product search example using the proposed system. Assume that a consumer wants to buy a TV with a closed caption function. He/she expects the price to be between $1,000 and $1,500.

SAT shows the initial page as shown in Figure 5. He/she clicks 'Product Search' and our system provides the first page as shown in Figure 6. A consumer fills out the form with 'tv' and the system provides a product specification list for TV. Currently, there are 'price', 'brand', 'size', 'closed caption' and 'automatic setup' as necessary features for a TV. If a consumer wants to choose a certain item, he/she marks it as 'Yes'. Otherwise, he/she marks it 'No'. In our example, 'closed caption' is marked as 'Yes' and others are marked as 'No' (Figure 7).

On a new window, a consumer fills out the price range and 'Yes' for the caption function (Figure 8). Now, our system searches the proper products that satisfy his/her requirements. The result is shown in Figure 9.

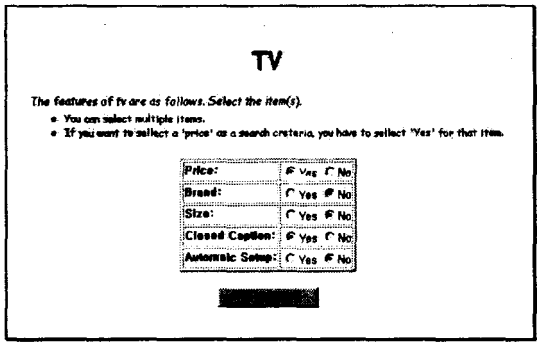

Figure 7 – A Product Specification List

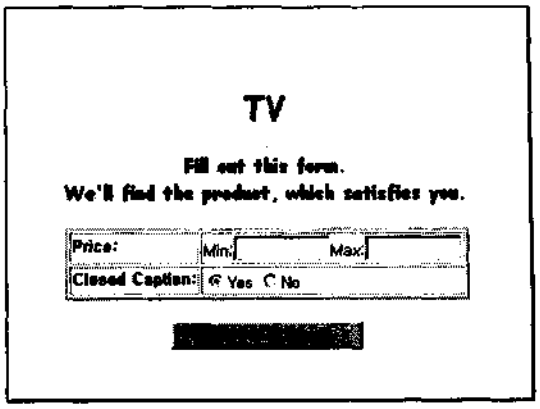

Figure 8 – The Last Input Form

6. Evaluation

By using our system, a customer gets the search result, which is nearer his/her purchase condition. But, we have found many hurdles to overcome. First, a search result is not sometimes compatible with a certain existing shopping mall search service. In this case, a reliability guarantee through existing comparison shopping services is not attained, and the information from the corresponding service is not available.

Second, if there is a change of input data format for each shopping service, the code to translate should be rewritten. A change happens rarely. But, there must be a tool that catches the change and rewrites a code automatically if necessary.

The third is response time. For the second search, our system opens the URL to get an output of the CGI and is also required to open the appropriate HTML document. This needs much time.

One approach to solve a response time is to make the

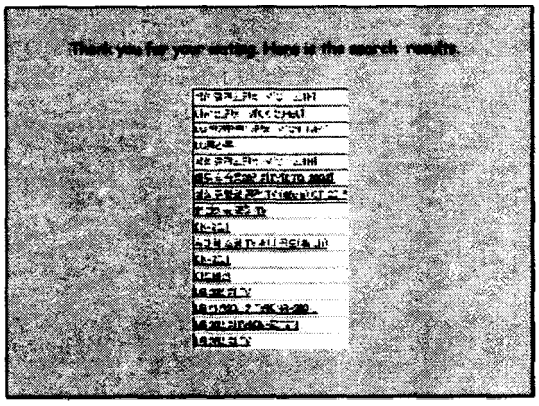

Figure 9 – A Search Result

operation of SAT more effective. It is not critical that the first search spends a long time. The real problem comes from the second search. However, through a careful observation, we find out that a condition of each search is not entirely different. On the contrary, they are overlapped for many items. We expect that the response time can be improved by using this fact. For example, we cache the pages that are already read and investigate whether there is any overlapped part with previous search. Then we can perform a search faster for the overlapped part.

7. Conclusion

It is not an easy thing for online shopping consumers to buy the product with their requirements. Consumers need to compare multiple alternatives. To help this, the concept of comparison shopping is proposed. A few sites support presently comparison shopping, and fewer sites support multiple criteria comparison. However, none of them support a systematic shopping guide.

In this paper we propose an intelligent product search system. There are two main features in our system. The first one is a full support of comparison shopping with multiple perspectives based on commercial search engines. The second one is an enhancement to the shopping aid based on a new concept of Shopping AssistanT.

The system is implemented and carefully evaluated. It shows valuable results.

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