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Web Personalization using Web Mining

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Abstract: ***The rapid development of internet stimulates the development of the e-commerce sites. Generally, an e-commerce website provides some review pages, which are a collection of reviews from the users of the product. The reviews are useful for prospective buyers in obtaining the desired product. Still, consumers spend a lot of time searching for the right product to buy, because they need to filter and compare search results data by themselves. Although consumer filter of many unwanted products by themselves, the search results are not so ideal. Therefore, we are proposing a system that attempts to use Semantic Analysis, Ontology, and Web Mining techniques as a basic approach. We elaborate the product reviews into the recommendation technique, in addition to product features. We are only focusing on the computer peripherals and many consumers are not familiar with the technical features of the product, so that is in our proposed framework, preference of the customer is expressed in the form of functional requirements of the product. Mapping the functional requirements, product features, and product reviews are in ontology, so the recommendation is based on exploration of semantic relations in this ontology. In addition to this, we are proposing another recommendation based on the product features and compatibility of those features with other products. Involving product reviews on recommender system able to increase the precision and provides ease of use.***

Keywords: Ontology, Customer reviews, Recommender system, Knowledge base

I. INTRODUCTION

A recommendation system is a tool for providing a personalized recommendation product desired by the user. The product could be any computer peripheral, such as RAM, motherboard, processor, hard-disk drive, solid state drive, power supply etc. There are several techniques in a recommendation system, such as content-based filtering, collaborative filtering, hybrid-based filtering, and knowledge-based filtering. Our system is based on Web mining and is an effort to provide an e-commerce website that will focus on the computer peripherals recommendation based on the customer product reviews. The system will use Ontology, web mining, semantic analysis, and cookies. The aim of the project is to provide the precise product according to the requirements of the customer. We try to incorporate reviews of products as a key element in the knowledge base of the system, in addition to the features of the product itself. In our project, we use the knowledge-based filtering for our framework.

In e-commerce sites, there is a particular page that contains the reviews of the users who have used the products. We extract the important information from these reviews. Product recommendation is based solely on mapping between user's requirements, product features and reviews in an ontology. We create a knowledge base based on this ontology learning method. This information is mapped and stored in an unstructured database on the server. Later this information is used for recommending products to the users. Although this will not give accurate results but more precise results will be the output of our system. The requirements of the users are compared with the products in the database and correlation is formed to decide which product fits best in user's budget. Once the recommended products are displayed on the screen, the user can select as per his/her choice and that's where our second recommendation takes place. Once the product is selected we will display the list of other products that are compatible with this product based on the product compatibility. The system will be capable of recommending only those products are best suited and compatible with the product in focus.

II. LITERATURE SURVEY

A. *Application of Data Mining Techniques for Web Personalization* [1]

In [1] it proposes the use of historic searches of the user and his past transactions, his preferences and the transactions of other users, to recommend products of related interest, which have a higher probability of being purchased by the customer and also representing the current market trends to the user, while he is on the website. The data of past searches is stored in cookies in the web browser and the transaction data is obtained from the database of the website. Web pages can be personalized based on the characteristics (interests, social category, context, etc.), actions (click on button, open a link, etc.), intent (make a purchase, check status of an entity), or any other parameter that can be identified and associated with an individual, therefore providing them with a tailored user experience. There are several categories of web personalization: Behavioural, Contextual, Technical, Historic data, Collaboratively filtered.

B. Commodity Search System for Online Shopping Based on Ontology and Web Mining [2]

In [2] for Online Shopping Based on Ontology and Web Mining Therefore, this system attempts to use semantic analysis, ontology, and web mining technique as a basic approach. This system proposes a novel commodity search system to track consumer demand, and that is, when the commodity price of any website is lower than the consumer price conditions, the system will proactively notify consumers. This system results indicate that the novel commodity search system could assist consumers to search commodity, and provide historical price information of commodity for consumers to decide. Product reviews are not taken into consideration and rating generated will not be accurate.

C. Constructing Ontology-based Product Catalogs System for E-business [3]

In [3] System for E-business system, the main focus is the development of a system of ontologies representing products and services, which includes the definitions, properties, and relationships of the concepts that are fundamental to products and services. The system will function as a standard reference system for e-catalogs system. The ontology will function as a knowledge base, not only for the design and construction of product database, but also for search and discovery of products and services. The system is designed to serve as product ontology knowledge base, not only for the design and construction of product databases but also for search and discovery of products. The authors have discussed some issues including product ontology modeling and ontology implementation. Although this is very effective system, this system requires a lot of data to begin with which is not feasible.

III. PROPOSED SYSTEM

Web personalization using web mining system proposes two types of recommendation. The recommendation is based on past transactions, user reviews and compatibility of the products. Based on these categories rating is generated for each product. Each product has its own rating mapped with it and stored in the database. This system is using two types of databases which are MySql and MongoDB used for storing structured and mapping unstructured entities together respectively. Product information, product reviews, user credentials are all stored in the structured database. The mapping of the product features and user reviews and particular users past transactions are stored in the unstructured database. The reviews are extracted for each product and parts of speech are used to collect necessary adjectives, nouns, verbs, etc from user reviews. Knowledge Base is built using information related to product features, its sentiments, information related to the mapping of product reviews to product features. Using ontological learning system recommends some products based on user requirements and gives the precise results.

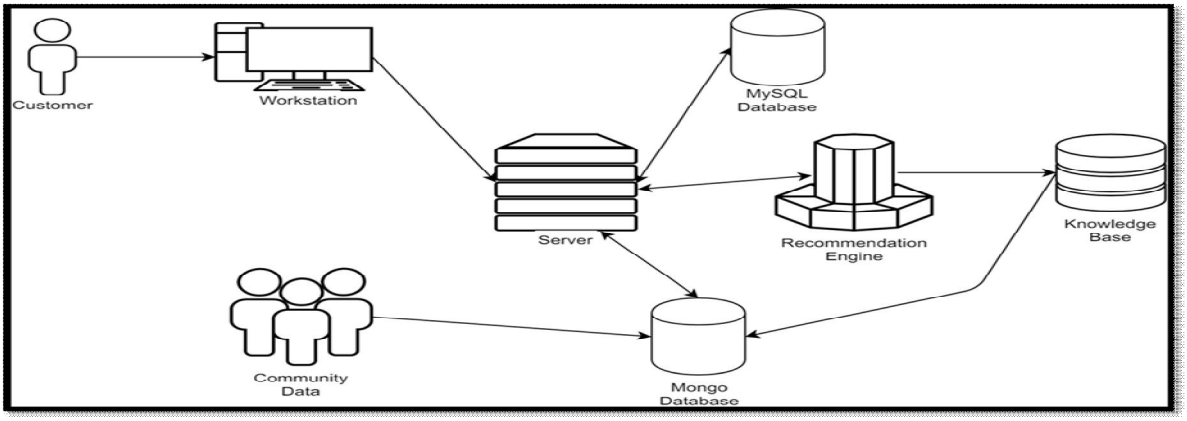

Figure 1. Architecture of Web Recommendation System

IV. METHODOLOGY

This section introduces the methodology and working of the proposed system.Fig.1 shows the architecture of web recommendation system

A metaphysics provides a controlled vocabulary and relationships among words to describe the consumer's talent level and experience with the merchandise within the review comment within the system. We'd like to outline the categories and relationships within the ontology just once and might use them till the products have new options. Every review comment is painted as an associate degree metaphysics instance. Manually mapping the metaphysics instances is tedious and time overwhelming, so we've machine-controlled the method exploitation text- mining techniques. As the metaphysics has been outlined, the mapping method includes the identification of each the categories involved within the instance and their attributes.

A. The ontological Mapping Method Involves 2 steps

1) The first step, sentence choice, and classification identify the class attributes. Within the value of the text knowledge, the user assigns every feature from the comment either a "good" or "bad" value. Therefore, the system selects and classifies the sentences in the review into 3 categories: "good," "bad," and "quality." The "good" class teams sentences containing info about options that the patron has evaluated as product strengths. The "bad" class teams sentences containing info concerning features that the patron considers product weaknesses. The "quality" class contains the sentences that indicate the opinion quality as determined by the consumer's talent level.

2) Once the system has chosen the relevant sentences, the second step, concept identification, identify the categories that the sentences belong. The ideas concerned within the sentences confirm the classes within the metaphysical, that area unit known by connecting words.

B. Identifying Conceptual Identities

1) Once each sentence has been classified into a category, the concept (class) in the ontology implicated in the sentence must be identified. Each concept in the ontology contains a label name and a related word list. The lists contain vocabulary (sets of keywords) that the system can use to match the concept with a sentence in the comments.

2) For example, related words for the concept “comparison” include “compare,” “compared,” “equal,” and “same. We manually created the ontology to ensure that it was complete and well defined. However, mapping the ontology instances from review comments is fully automatic after training. Similar to other classification applications, collecting and labelling training examples for sentence classification are manual processes.

3) Once the system has been trained, it automatically classifies a sentence as “good” or “bad.” In the concept identification step, we created the synonym database manually. The system identifies the concept automatically if it identifies in the sentence a keyword from the database.

C. lustrated Example

Here we present the steps that Informed Recommender follows to offer a recommendation about a LCD display in response to a user request. Again, we conducted this example using data from the Samsung LCD display review. First, we explain how we defined the ontology and how the reviews are mapped onto the ontology. Example,

Samsung LCD A900 (xyz, 16-Jan-2018) The huge screen is excellent for gaming and work. I like the new design and look of the hardware. The LCD screen is quite scratch resistant. Images looks shard and vibrant. The frame rate is smooth and nice! The size of the display is large but it is not that heavy. The screen brightness is low compared to other devices in the market. Number of different modes are useful

Now the ontological mapping for the same is given below

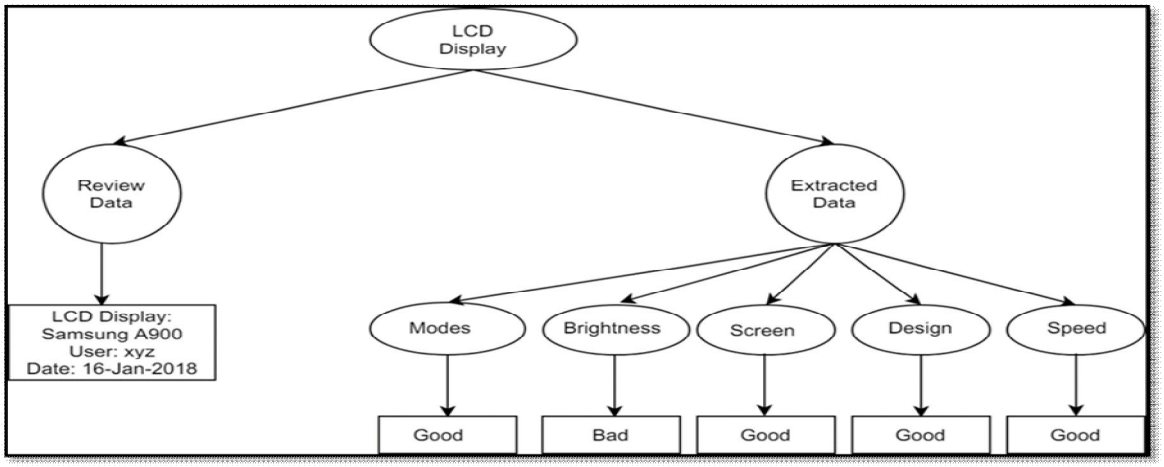

Figure 1. Ontology Mapping of LCD display review

D. Representing Consumer Reviews: The ontology

First of all, we define an ontology for the Computer domain. We obtained each concept in the ontology by analyzing consumer reviews. Consumers can rate any computer peripheral on a scale of one star to five stars and write free-form text reviews. To

construct the ontology, we first listed all possible objects necessary to cover given product reviews. We determined that such a list should include different product brands such as SanDisk, Samsung, and so on. Furthermore, different products can be qualified by features such as size, speed, memory, and quality.

E. Mapping A Review Comment Into An Ontology

Once the ontology has been defined, we must match the information in the review with the ontology. We now show a new mapping to map the information into the ontology. We conducted this example using the review in Figure 2. It classifies each sentence into a different categories as shown in figure.2.. Informed Recommender applies the set of rules we obtained in the previous section to each sentence of the new review to classify it into one category. For example, the system classified the first sentence into the "good" category on the basis of categories mentioned above and because no "bad" or "quality" rules applied.

F. Computing A Recommendation

Computing a recommendation is solely based on the average user rating of a particular product and the similarity is found between users and products they reviewed. Based on the similarity matrix, the recommended products are mapped to the users and will be displayed.

G. Making a recommendation

After calculating an average rating for each product and how likely the users are willing to buy it, it is recommended to the users based on their history, past transactions and specifications of the currently interested product.

V. CONCLUSION AND FUTURE WORK

The proposed system utilizes the product's features and product reviews for recommending products, based on products functional requirements desired by the user. The mapping between functional requirements, features (specifications) of products and opinions of the product features is in an ontology. Recommendations and explanations obtained through exploring semantic relations in the ontology.

A. Based on the evaluations results of the user acceptance, we can conclude:

1) Involving information of the product reviews in a recommender system is able to increase the perceived usefulness and perceived ease of use. Moreover, the intention of the user to use the system in the future, greatly influenced by the perceived usefulness.

2) In recommender system involving product reviews, the user feels attracted to the system is based on the perceived ease of use. Meanwhile, the interest of the user to use the system are influenced by the perceived usefulness. In recommender system that does not involve product reviews, the user will feel attracted to them based on perceived usefulness, but the user has no intention to use this system in the future. Thus, recommender system involving product reviews more acceptable than recommender system that does not involve product reviews. As the knowledge-based recommender system, the greatest effort lies in the building the knowledge. This system issues the real-time information retrieval and design of user interface that makes it easy to update ontology.

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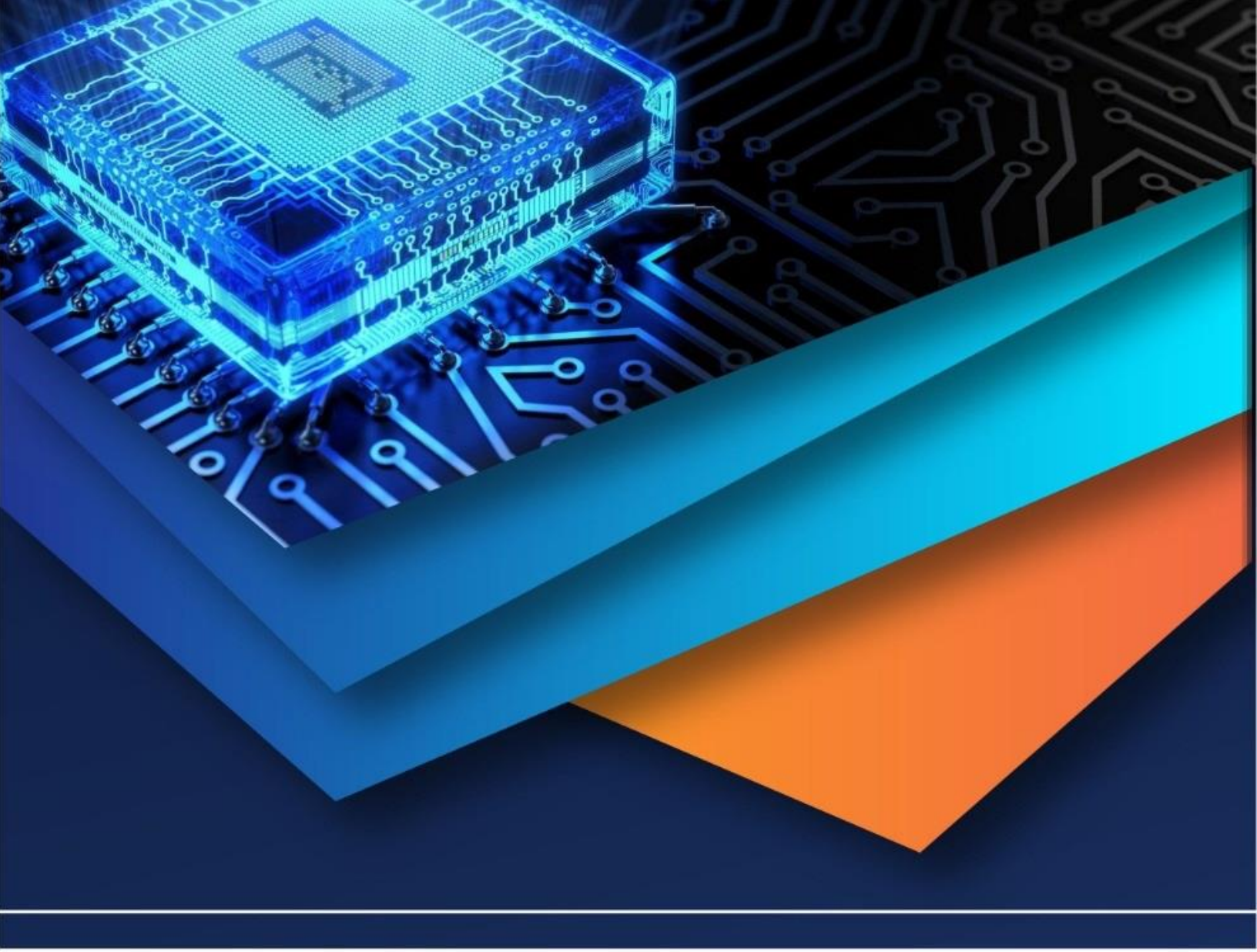

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