Prediction of User Queries Dynamically in Intelligent Query Answering Systems to Improve Relevance and Accuracy Using Recommendation Agents

Jayashree M G[1] Rajkumar R[2]
[1]M.Tech Scholar [2]Assistant Professor
[2]Information Science Department
[1, 2]RNS Institute of Technology Bangalore, Karnataka, India

Abstract— Recommendation agents (RAs) are software agents that elicit the interests or preferences of individual consumers for products, either explicitly or implicitly and make recommendations accordingly. Recommendation Agents have the potential to support and improve the quality of the decisions consumers make when searching for and selecting products online. In this paper, a model of recommendation agents is proposed which query over distributed knowledge bases with heterogeneity for our web-based intelligent query answering systems. Ontologies which are the key technology used to describe the semantics of information exchange are also introduced. These Ontologies provide a shared and common understanding of a domain that can be communicated across people and application systems and thus help knowledge sharing and reuse. This model improves the relevance of the query results.

Keywords: Recommendation Agents, Intelligent Query Answering Agent, User Model

I. INTRODUCTION

The amount of information on today's computers is growing, how to help computer users to locate the required information has become an important research topic in today's intelligent interaction. With the development of information available on the Internet, the effects of intelligence technology on various commerce applications are widespread and exponential increase.

The intelligent query answering systems users propose queries that are formed from the problems that are encountered in their life or work. These users need the specific knowledge to solve their problems. Although some of these systems have correct information and appropriate searching strategies, a user might still feel that he is not provided with the right answer. The main reason is that existing systems apply the same searching approach to all users and do not consider users different cognitive characteristics (attention and memory) and demands. In order to improve the interaction between users and the system, recommendation agents are introduced to improve query answering effects of the system.

A recommendation agent is an interactive decision aid that uses individuals' attribute preferences or interests as the input of a list of recommendations. By asking specific preference questions and providing recommendations accordingly, agents prevent consumers from the time consuming task of searching and comparing all product alternatives available on the Internet. This significantly reduces the level of effort that is necessary for decision making. Ontology is an explicit specification of conceptualization. Conceptualization can be defined as an intensional semantic structure that encodes implicit knowledge constraining the structure of a piece of a domain. Ontologies have shown to be the right answer to knowledge structuring and modeling by providing a formal conceptualization of a particular domain that is shared by a group of people in an organization.

Recommendation agents produce dynamically a personalized navigation web page which includes the knowledge needed to answer their queries. Agent technology, which derives from the combination of artificial intelligence and network technology, is a software entity with self-adaptation and intelligence that can accomplish a task by means of initiative service on behalf of users or programs. So the Agent technology is widely employed in the development of intelligent answering system in distance teaching systems.

II. RELATED WORK

Agent technology, which derives from the combination of artificial intelligence and network technology, is a software entity with self-adaptation and intelligence that can accomplish a task by means of initiative service on behalf of users or programs. So the Agent technology is widely employed in the development of intelligent answering system in distance teaching systems Agent is a rising technology in the field of AI and computer software. Xuejun Wang et al [1] describes a design of intelligent answering system based on agent technology with higher self-adaptation and real-time, and then provides the key technologies in its realization. By this system, efficiency and precision may be increased and learner's efficiency can be enhanced. In order to support the sharing and reuse of knowledge among Artificial Intelligence systems, it is useful to define the common vocabulary in the shared domain. Thomas R. Gruber et al [2] describes a mechanism for defining ontologies that are portable over representation systems. Definitions written in a standard format for predicate calculus are translated by a system called Ontolingua into specialized representations, including frame-based systems as well as relational languages. This allows researchers to share and reuse ontologies, while retaining the computational benefits of specialized implementations.

The translation approach to portability addresses several technical problems. One problem is how to accommodate the stylistic and organizational differences among representations while preserving declarative content. Another is how to translate from a very expressive language into restricted languages, remaining system-independent while preserving the computational efficiency of implemented systems. The author describes how these problems are addressed by basing Ontolingua itself on ontology of domain-independent, representational idioms. The measurement of concept's similarity is basis and foundation of semantic query based on ontology, however, current similarity measurement of ontology concepts involves in artificial intelligence area and psychological area limit efficiency when facing the application that the information is complicated, author [3] describes model to measure the semantic similarity between concepts on the basis of psychological studies about similarity and artificial intelligence studies about similarity, it expresses how to implement semantic query. This approach enables users to reference ontology data directly from SQL using the semantic query operators and make the ontology-driven applications easy to develop.

A new approach for ranking ontologies on the Semantic Web is given in [4], where query terms provided by users are regarded as containing special information about domain knowledge of interest. Each ontology candidates are analyzed separately and ranked with respect to the structure and semantics. Susan Gauch et al [5], proposes expert system technology to the task of searching online collections of documents. Authors develop an intelligent search intermediary to help end-users locate relevant passages in large full-text databases. Expert system will automatically reformulate contextual Boolean queries to improve search results and will present retrieved passages in decreasing order of relevance. It differs from other intelligent database functions in two ways: it works with semantically unprocessed text and the expert system contains a knowledge base of search strategies independent of any particular content domain.

The algorithms for generation of frequent item sets by successive construction of the nodes of a lexicographic tree of item sets is explained [6] and also different strategies in generation and traversal of the lexicographic tree such as breadth-first search, depth-first search or a combination of the two. These techniques provide different trade-offs in terms of the I/O, memory and computational time requirements. Author also explains the hierarchical structure of the lexicographic tree to successively project transactions at each node of the lexicographic tree, and use matrix counting on this reduced set of transactions for finding frequent item sets and provide an implementation of the tree projection method which is up to one order of magnitude faster than other recent techniques in the literature. The algorithm has a well-structured data access pattern which provides data locality and reuse of data for multiple levels of the cache and methods for parallelization of the Tree Projection algorithm.

Carmen Benavides et al [7] proposes an intelligent query answering technique that integrates neighborhood information and data mining rules discovered from the databases. Neighborhood systems handle the notions of close to, analogous to and approximate t and provide the user's background information such as preference, interests, and needs etc., while the knowledge rules discovered by the data mining methods have the summary, statistical or generalized information about the databases. The neighborhood information is incorporated into the query rewriting process to help the systems rewrite the original query and data mining rules are used to help answer the queries more intelligently, effectively and efficiently. Suwei He et al [8] puts forward a design model of an intelligent answering system based on Agent technology as well as a concrete implementation method by analyzing the characteristics and the structure of Agent technology.

III. PROPOSED WORK

Recommendation agent extracts keywords from the query and semantically extended these keywords; then uses ontology selection function to choose the most suitable ontology (goal ontology) and transforms the query according to the language of this ontology; then submit the transformed query to the knowledge bases that are described by this goal ontology in ontology environment.

The figure1 shows the whole system architecture of the paper. Recommendation agents must perform the tasks such as query keywords extraction i.e. After the syntax analysis of users' queries, we extract the set of keywords from these queries, which are to be used to do semantic analysis and keyword semantically extension. Comparing with traditional query system, the most important character of intelligent query answering systems is self-adaptability. Our system constructs user model based on the each user's knowledge levels, cognitive abilities, psychology characteristics, etc. and then makes a query answering plan for each user according to its user model.

Furthermore, the system can instruct a user in person with pertinence and adjust searching contents and strategies dynamically in the process of query answering in order to o improve the self-adaptability and effects of the system. User model includes basic information about users such as name, sex, knowledge level, learning styles and so on. Domain knowledge base contains domain structure and teaching content.

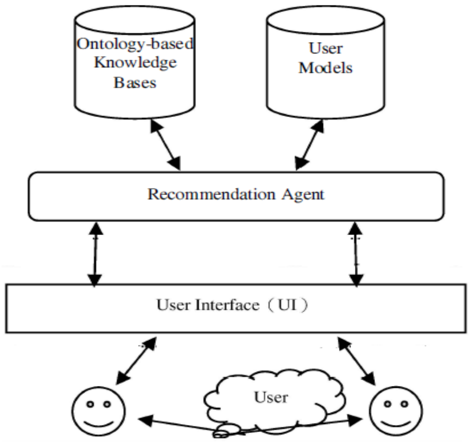

Fig. 1: System Architecture

The recommendation agent performs the steps such as choosing the most suitable ontology (goal ontology) to search through using ontology selection function, transforms the set of semantically extended keywords to the language of the selected ontology and submits the transformed set of keywords to the knowledge bases that are described by this goal ontology in ontology environment for searching If the searching results meet users' needs, then the recommendation agent submit these results to our users by some query results presentation strategies.

IV. ALGORITHMS

A. Algorithm 1: Query Processing Algorithm

Given L is the list of the discovered agents and their mappings, if Query Validation () then

1: if L < > empty then

- Query Reformulation ( )
- Static Recombining Results ( )

2: Dynamic query Resolution

- Semantic Enrichment Query ( )
- Transmission Semantically Enriched Query ( )
- Semantic Evaluation ( )
- Dynamic Recombining Results ( )

B. Algorithm 2: Semantic similarity algorithm

Sim(e1,e2)

Require: Ontology O_1, O_2, $e1 \in O_1, e2 \in O_2$

1: Calculation SimN of e1, e2,

2: Calculation SimC of e1, e2,

3: Calculation SimV of e1, e2,

4: Calculation SimR of e1, e2,

5: $\text{SimTer}(e1,e2) = \alpha_1 \times \text{SimN} + \alpha_2 \times \text{SimC}$

6: $\text{SimStruc}(e1,e2) \leftarrow \beta_1 \times \text{SimV} + \beta_2 \times \text{SimR}$

7: $\text{Sim}(e1,e2) \leftarrow \alpha \times \text{SimTer} + \beta \times \text{SimStruc}$

End

The algorithm calculates the semantic distance between two elements e1, e2 is as follows $\alpha \in [0,1]$, $\in [0,1]$, $\alpha_1 \in [0,1]$, $\beta_1 \in [0,1], \alpha_2 \in [0,1]$, $\beta_2 \in [0,1]$, SimTer: terminological similarity. SimStruc: structural similarity. SimN: Similarity of names using their synonyms and antonyms. SimC: Comments similarity of the two concepts. SimV: Structural similarity vicinity (Our approach is based on the assumption that if the neighbors of two classes are similar, these two classes are also considered as similar). SimR: Roles similarity. (The roles are the links between two OWL DLclasses.)

V. EXPERIMENTAL RESULTS

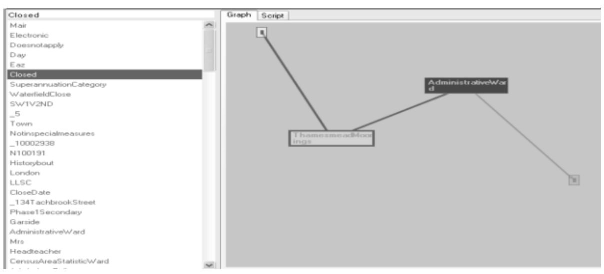

Fig. 2: Query Results

This section briefly shows the presentation of the results and discussions of those results. This section analyses the results of the experiment went as expected with no unusual events that could have introduced error. The result is as shown in figure 2.

VI. CONCLUSIONS

In this paper we have seen that the interaction between users and the system is improved by the introduction of recommendation agents that improve query answering effects of the system. User models based on users' cognitive abilities, knowledge levels, learning styles and psychology characteristics are considered in order to improve the self-adaptability and searching effects of the system. Based on a user's query, the personalized recommendation agent produce a personalized navigation web page, which consists of the query keywords, the information needed for answering users' queries. Hence, the utilization of the communication, interaction and self-adaptability of agents to improve the interaction between users and the system in order to improve searching effects.

ACKNOWLEDGMENT

I take this Opportunity to express my profound gratitude and deep regards to my guide Ms. Rajkumar, Assistant Professor, RNS Institute of technology, Bangalore, for her exempla nary guidance, and constant encouragement throughout.

I would also like to thank Director Dr. H N Shivashankar, Principal Dr. M K Venkatesha and Dr. M V Sudhamani, professor and Head, Dept. of Information Science and engineering, RNSIT, for constant encouragement in implementing this paper and pursuing this paper.

REFERENCES

[1] Xuejum Wang 1, Suwei He, Design of Intelligent A nswering Systems Based On Agent Technology, IEEE, 2010.
[2] T.Gruber, A translation approach to portable ontology specification. Knowledge Acquisition, ACM, 5(2):199-200, 1993.
[3] Sheng Li, An Ontology Mapping Method Based on Tree Structure, Proceedings of the Second International Conference on Semantics, Knowledge, and Grid, IEEE, 2006.
[4] Wang li, Intelligent Query Answering Based on Neighborhood Systems and Data Mining Techniques, IEEE, 2010.
[5] Susan Gauch and John B. Smith, Intelligent Search of Full-Text Databases, ACM,1999.
[6] Ramesh C. Agarwal, Charu C. Aggarwal, V.V.V. Prasad IBM T. J, A Tree Projection Algorithm For Generation of Frequent Itemsets, ACM , 2001.
[7] Carmen Benavides, Isaías García, Héctor Aláiz, Javier Alfonso, Carlos Redondo, Ángel Alonso, Ontologies as Knowledge Representation Structures for CACSD Software, ACM ,2008.
[8] Wang li, Intelligent Query Answering Based on Neighborhood Systems and Data Mining Techniques, IEEE, 2010.

