Effective Approach for Exploratory Search Engine using Search Goal-Based Query Recommendation Technique

Ashwini V. Borkar
PG Scholar
Department of Computer Science and Engineering
Government College of Engineering,
Amravati-444 604, Maharashtra, India

Prof. Kamlesh Waghmare
Assistant Professor
Department of Computer Science and Engineering
Government College of Engineering,
Amravati-444 604, Maharashtra, India

***Abstract*— Exploratory search is very important and challenging activity for the web searchers. In exploratory search, the searcher is unfamiliar with their problem domain unsure about the ways to achieve their goal, or lacks a well-defined goal. To support exploratory search, the search system is required not only to provide accurate search results but also help searchers explore related and novel aspects. Therefore, an exploratory search system needs an effective query recommendation method to resolve this problem. However, the current query recommendation methods mainly focus optimizing user's current query which is far away from satisfying user's information needs of the whole search session. To support exploratory search, we observed and analyzed the search logs of exploratory search process performed by different users, and it is found that there is much more search goal shift appearance in exploratory search.**

Keywords: **query recommendation, exploratory search, search goal shift graph.**

I. INTRODUCTION

In this technological world where advanced technology is rapidly growing, the exploratory search is the necessary activity. We can say that the exploratory search can be driven by the user's curiosity or willingness to find the interested information. It might be possible that user want to learn more about the specific area rather than only find selective information. Firstly, what is exploratory search – exploratory search is the search where users are totally unknown about their goal or fail to achieve their goal or lack of well-defined or organized goal. The various techniques, methods are in existence for the exploratory search but are they efficient as per the users demand or fail to achieve the necessity? Some of the proposals are beneficiary but need advancement. Near about every technique has their limitations and to overcome these limitations some new ideas are came up with this new proposed method.

At the very first the exploratory search was proposed by White et. al where they describe the information seeking problem context which is multi-faceted. The existing methodology focus on the limited area which is far away from the goal of exploratory search. In order to provide accurate result for the exploratory search the query recommendation method is very useful which helps the user to explore their related search and novel aspects. Therefore, the effective query recommendation method is used for the exploratory search to increase the possibilities of related results. There is a large size and popularity of the volume of web data so it is very difficult to extract the relevant information that has been used in various application. To provide the desired result, this paper designs an interactive search expansion mode, which expands searches in various directions like relevancy, profile and reference-based results.

The contribution of this paper is summarized as follows.

- Proposing a method to build a search engine which explores the result according to the user's queries
- The keyword extraction is taken out and semantic keywords are set for the reformulation.
- Designing an interactive search expansion mode and expanding search result. the proposed one helps users to find their interested information.it can better support the exploratory search.

In our proposed system, we will discuss about how to improve the search engine result using user's information needs so that the interest towards using search engine will be increased. To support exploratory search, the search system is required not only to provide accurate search, but also to help searchers explore related and novel aspects. Therefore, exploratory search system needs an effective query recommendation method to resolve this problem. However, the current query recommendation methods mainly focus on optimizing user's current query which is far away from satisfying user's information needs of the whole search session. To support exploratory search, we observed and analyzed the search logs of exploratory search process performed by different users, and we found that there are a lot of search goal shift phenomenon in exploratory search. To identify the user information need, we proposed exploratory query recommendation by detecting the search goal of the user as well as semantic searching mechanism to improve fetch relevant links as per the user need.

Also, we have discussed about how proposed system came into role to improve performance and overcome limitations of existing systems. Comparatively it represented that how research gap is available for deployment of proposed approach to optimize search over search engines.

This paper is organized as follows. Section II shows the literature review. Section III introduces the proposed work of the new method and Section IV concludes the paper.

II. LITERATURE REVIEW

To meet the perfect goal while browsing on the internet through the exploratory search method, many

researchers are suggested different ideas and new techniques in their paper work. The depth study of many scholars provides an efficient technique which refines the user requirement and the desired information. But they are failed to stick on the searcher interest on the novel concepts.

A.Topic oriented

In the previous work of exploratory search, the topic-oriented searching method set a new frontier in the world of searching. This work set a new criterion of clarity, novelty, relevance and diversity to analyze the effectiveness of exploratory search[1] The webpage category is assumed as a query topic and hence in this work, the webpages are categorized into two major classes.

- Classification
- Clustering

Classification is the best method to identify the webpage categories. The semantic association graph is generated which contains all webpages. The semantic association graph includes the construction of algorithms which is based on topics and hyperlinks. The popularity of topics is used over the semantic association graph through which the efficient exploratory search is achieved.

B. Concept understanding ability

Xinwei Liu [2] presents the estimation of concept understanding ability for exploratory search query recommendation which is depend on the basis of user knowledge model and concept association model. The author also estimates the probability of user understands based on the PageRank algorithm and personalized PageRank algorithm.

C. Query reformulation

Belal Al-Khateeb [3] presents query reformulation using the WordNet and Genetic Algorithm which returns the most relevant results. Wordnet helps to find out the exact meaning of the keywords. It has been done through the synonym and antonym of the keywords. Synonym of the keywords expands the search space and the degree of precision get increases. If there are a greater number of synonym then it leads towards the genetic algorithm. The genetic algorithm finds out the result from the google and gives the more specific one result.

D. Personalized citation recommendation

Dejun Mu. Et.al propose a novel recommendation framework i.e. MMRQ incorporating the query information into a multi-layered graph and conducting ranking schema utilizing mutual reinforcement rules which are used to construct a mutually reinforced and query focused model. The personalized query information is incorporated into the multi-layered graph to achieve the query focused and mutually reinforced recommendation.

E. Ranking interface

Ramon Bespinyowong [4] presents an ExRank an interactive interface for exploring the data which helps user to understand the relationship between the attribute values and find the interesting dataset. The PageRank algorithm and KNN graph is used for the choices of in particular attributes which affects the distribution of values in other attributes for candidate objects.

F. Random Walk and Topic Concepts

This paper suggests the method of a query suggestion based on the random walk and topic concepts (QuS-RWTC). [5] The query log data and suggestions from other mature search engines are the basic of this method. This method helps to make the suggestion pervasive and obtain a higher coverage. The topic concept method is also used in this procedure so that more accurate and relevant result will be display. This method constructs the Bipartite graph and generates the candidate related query set and computed the transition probabilities which provides higher coverage.

G. Negative Relevance Feedback

In this paper the modeled user intent is shown as interactive visualization and the exploratory search system which is proposed [6] allows both positive and negative feedback directly given to the model user intents. In the successful experiment it is also observed that using negative relevance feedback the results were more varied and novel.

H. Cuckoo optimized query recommendation

Cuckoo search optimization method is used to solve the problem like similarity measures in existing queries. The cuckoo search is used to choose the query flow graph and its weight through which the efficacy of this method is shown. The IR *i.e* information retrieval and techniques like AI and also statistics like machine learning, classification and visualization are used. The information retrieval meant to be work in the field of analysis, structure, storage, searching, organizing and finally retrieving information.

I. Subtopic Discovery

Li. Gao et. al presents the novel query expansion problem for exploratory search. In this work, the method which is proposed is CqaQuExp. The method contains three subtask-question retrieval, subtopic mining and candidate concept discovery. The three subtask methods are used particularly for query expansion. The query expansion techniques are widely used for the mining for exploratory search. In this work the experiment is done on real world data from yahoo and it shows the effectiveness of the proposed methods in the field of subtopic mining and exploratory search.

III. PROPOSED METHODOLOGY

In the proposed system, the exploratory search has been done using query recommendation method. In this system we built our own search engine. Once the query input is given the keywords are extracted from the query and search for semantic keywords in the dataset.

So, the query reformulation has also been done. After query reformulation, if the query is matched the results of the proposed search engine are based on the different types of query recommendation technique that are followed within system like relevancy, preference and profile-based searching. Otherwise the query gets shifted with the help of search goal shift graph in which the result shown by the search goal wise query recommendation using KNN graph and profile wise query recommendation using KNN graph.

IV. CONCLUSIONS

This paper mainly describes the various methods of query recommendation for an exploratory search. The method works thoroughly for the user satisfaction and helps them to achieve their perfect search goal. Secondly, according to the users search query, the KNN graph and profile wise query work efficiently to provide the related result. The keywords are also set for the reformulation after semantic keywords are found at the wordnet. The experiment will be carried out according to the proposed method and models.

REFERENCES

[1] Sun H C, Jiang C J, Ding Z J, et al. “Topic-Oriented Exploratory Search Based on an Indexing Network.” IEEE Transactions on Systems, Man, and Cybernetics: Systems, vol. 46, no.2, pp. 234-247, 2016.

[2] Xinwei Liu.,”Estimating Concept Understanding Ability for Exploratory Search Query Recommendations” 978-1-5090-6238-6/17/$31.00 ©20 17 IEEE

[3] B. Al-Khateeb, A. J. Al-Kubaisi and S. T. Al-Janabi, "Query reformulation using WordNet and genetic algorithm," 2017 Annual Conference on New Trends in Information & Communications Technology Applications (NTICT), Baghdad, 2017, pp. 91-96.

[4] Ramon,Wei Chen ,H. V. Jagadish ,”ExRank: An Exploratory Ranking Interface”. Proceedings of the VLDB En-dowment, vol. 9, no. 13, pp.1529-1532, 2016.

[5] J J. Liu, Q. Li, Y. Lin and Y. Li, "A query suggestion method based on random walk and topic concepts," 2017 IEEE/ACIS 16th International Conference on Computer and Information Science (ICIS), Wuhan, 2017, pp. 251-256.

[6] Peltonen J, Strahl J, Floréen P. “Negative Relevance Feedback for Exploratory Search with Visual Interactive Intent Modeling,” in *Proc*. The 22nd ACM International Conference on Intelligent User Interfaces, pp.149-159, 2017.

[7] Zahir, A. El Qadi and S. Mouline, "Access plan recommendation: A clustering-based approach using queries similarity," 2014 Second World Conference on Complex Systems (WCCS), Agadir, 2014, pp. 55-60.

[8] Bahareh sarrafzadeh, Edward lank, “improving exploratory search experience through hierarchical knowledge graph” SIGIR 17, august-2017 shinjuku,Tokyo,Japan.

[9] L. P. Nanni and V. D. Feltrim, "Desire: A Dynamic Approach for Exploratory Search Results Recommendation," 2015 Brazilian Conference on Intelligent Systems (BRACIS), Natal, 2015, pp. 288-293.

[10] Hassan A, White R W, Dumais S T, et al. “Struggling or exploring?: disambiguating long search sessions,” in Proc. The 7th ACM international conference on Web search and data mining, pp. 53-62, 2014.

[11] R. Umagandhi and A. V. S. Kumar, "Time independent query recommendations from search engine query logs," International Conference on Software Engineering and Mobile Application Modelling and Development (ICSEMA 2012), Chennai, 2012, pp. 1-6.

[12] M. A. Potey, D. A. Patel and P. K. Sinha, "A survey of query log processing techniques and evaluation of web query intent identification," *2013 3rd IEEE International Advance Computing Conference (IACC)*, Ghaziabad, 2013, pp. 1330-1335

[13] S. D. *et al*., "QRGQR: Query Relevance Graph for Query Recommendation," *2015 IEEE Region 10 Symposium*, Ahmedabad, 2015, pp. 78-81.