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Feedback Session Based Approach for Understanding User Search

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Abstract: The important aim of each information retrieval system is to make available the keywords and applies refined ranking algorithms to categories them. But unfortunately, the users give short and ambiguous queries which sometimes are not sufficient to clearly identify its requirement. Due to which incorrect result is formed, sorted, and offered to the user. Therefore examine user search goals are valuable in improving retrieval system relevance and user experience. In proposed system, to understand user search goals for a query, feedback session is projected. Then, optimization technique used to transform remarks session to pseudo documents that may effectively give user information desires. Subsequently, the clustering method is useful to pseudo documents to understand user seek goals. By using clustering comments periods, the overall performance of clustering increases greatly and identifies the search goals efficiently. Finally the simulated the proposed scheme in terms of recall, accuracy, and precision.

Keywords: User searches goals, User search log, feedback sessions, and pseudo documents.

I. INTRODUCTION

In today's world, information is the main need of society and key for contemporary success in every field. With the developments in the field of Information Technology, World Wide Web is changing dynamically. The most vital criterion for the sustainability of information is the excellence of its content and its fast accessibility to users. Now days, many innovative search optimization techniques have been developed worldwide and used by information retrieval system to get the utmost relevant information related to users queries. But many users are still not able to find it as they are not properly expert in framing their needs. Besides, Search engines also face struggle in understanding the semantic of user queries and thus the user's information needs. Some of the techniques used for search engine optimization are directory submission, keyword generation, link exchange, etc. By using all these techniques, but search engines to returns the huge amount of related information to users queries but the problem comes at the user end after getting so much information but not able to find the useful information out of it and thus this results into lot of time and effort wastage at user end in finding the relevant information.

Writing a query is not easy because queries are short and ambiguous. Due to this search engine respond differently to the similar query. Ex. The query question "India" Is submitted to a seek engine, some users want to find the India map., whereas some others wish to find out the travel information about the India. So how can understand what exactly user wants to search, therefore it is necessary and expected to get different user search aims in information retrieval. The main aim is to resolve ambiguity of query terms. So, figuring out what information the user really Wishes to remedy a problem is critical for a hit retrieval. In recent years, some system focuses on session level analysis to give the results when user search any query. One method used to understand user search aims for a single query is clustering its feedback sessions. Feedback session contains both clicked and unclicked URLs and at the ends of the feedback session, the last URL clicked in a single session is added.

The rest of the paper is organized as follows: In section 2 describes the literature survey of the paper. A section 3 discusses the system overview of the proposed work. Technical implementation and operative algorithm with mathematical derivation is discussed in section 4. In section 5 present the detailed explanation of database representation of the work. In section discussed the experimental results analysis and discussion. Finally, conclude the proposed work in section 7.

II. LITERATURE SURVEY

In the literature review, detail studies of relevant work done so far are discussed and also different technique used for implementation. Some of the following papers referred for literature survey are. The work given in [1] describes the previously viewed web pages is a common yet uneasy task for users due to the large volume of personally accessed

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information on the web. The work given in [2] presents the study the of user behavior feedback based on result of clustering. The similarity calculation formula used to give the sorted results. An experimental result shows that using this technique they improve the clustering accuracy. The clustering threshold and number of iterations also affect clustering accuracy. The work given in [3] is carried out to improve the search engine performance and to save user searching time. In this work, the Improved Page Rank algorithm proposed. Cheating similarity and cheating relevance are two factors added to revise the original Page Rank value.

The web pages are ranked using search engine transaction logs are discussed in [4]. After that results are sorted according to topic, relevant, and the documents that are essentials are at the top of the results. Panda algorithm used, in which web pages of all URLs are clustered. To cluster the URLs query clustering tool used, before that similarity analyzer tool used to calculate similarity between URLS. The work given in [5] presents the user search goal is identified using feedback session. Frequent and sequential patterns are analyzed. Using semantic clustering algorithm documents is clustered. Numbers of clusters are created on demand; they are not created by the user. The work given in [6-15] proposed that QuS-RWTC method uses random walk and topic concepts. Query suggestions are taken from other mature search engines, because of that suggestions are extra comprehensives. An experimental result shows the results show the result of QuS-RWTC and QuS-RW systems. The term mismatch problem with query expansion is described in [16-25]. This work uses the QECK technique based on Rocchio's model for searching of information. First pass retrieval, word selection and second pas retrieval are the three steps included in the method. Experimental results shows that the effectiveness of QECK and evaluate the effectiveness for refining the performance of code search algorithms, and discover the enactment of QECK Rocchio. The work given in [25-38] describes the optimize rank of web pages using search engine transaction logs. The proposed algorithm performs the better accuracy of data based on the needs of users. In this work, the proposed approach used to find similarity among queries based on two silent features i.e. query keywords and clicked URLs.
In [39-50] provides search engine have to make completely progressive, progressive adjustments for the following generation of search, which is called "big seek". This paper first researches the improvement desires of massive seek. Then, a huge search is defined, and the 5s homes (sourcing, sensing, synthesizing, answer, and protection) of huge seek, which can be specific from those of conventional search engines like google, are elaborated. Additionally, the paper affords system structure for big search, explores the key technologies that assist the 5s residences, and describes capability utility fields of massive search technology. One-click remarks device for mapping user search dreams is offered in [51-62]. Analysis of seeking logs enables in coming across search desires for ambiguous queries, for which proposed device clusters feedback sessions. One click of a user in been incorporated to generated comments classes that present data been searched via the person. Pseudo-text documents are created for classes grouping. Better okay-method cluster is been incorporated to reduce looking time producing dynamic clusters. The some of the works are given in [63-73].

III. PROPOSED WORK

The proposed system architecture to understand special consumer seek goals for a question by using clustering remarks classes is depicted in Fig.1. The structure comprises an entered ambiguous query. User click-through logs contain a large amount of data related to user search behaviour like all the clicked and unclicked URLs related to query. From the user click-through logs extract all the feedback sessions of a query. Feedback session contains both the clicked and unclicked URLs and last URLs clicked in a session.

For different queries and different click- through logs feedback sessions will be different. Thus inappropriate to use different feedback sessions. Therefore, after extracting comments classes, map comments sessions to pseudo-documents. Pseudo documents display consumer data necessities. Then clustering pseudo-documents gives the user search goals. The description about the feedback sessions and the procedure to convert feedback session to pseudo documents has been detailed out. Usually, for web search a session is a sequence of queries to fulfill a single information requirement and selected clicked search results. In this paper, we emphasis on understanding user search goals for a single query. Thus a single session containing only one query is presented. The clicked and unclicked URLs and the remaining clicked URL in a single session together form the feedback session. The fig.2 shows how the feedback session is formed with the first search consequences and ends with the end result that was clicked in a session.

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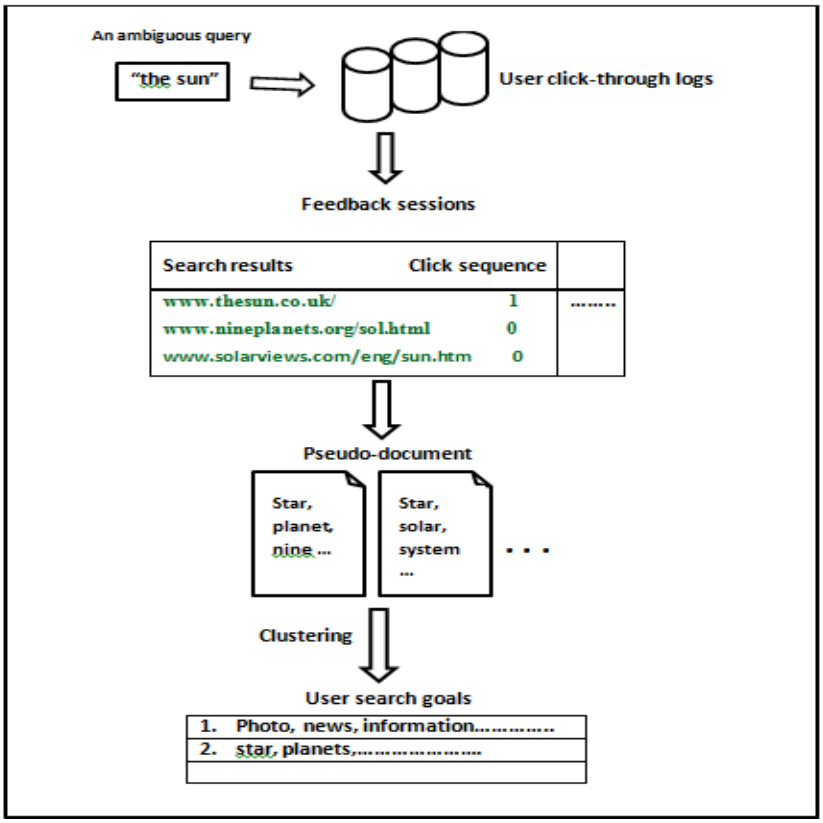

Fig.1. System architecture.

For example, in figure feedback session for the query "railway enquiry".

Search results	Click sequence
https://enquiry.indianrail.gov.in/mntes/	0
www.indianrail.gov.in/	1
https://enquiry.indianrail.gov.in/	0
etrain.info/	1
https://www.travelkhana.com/travelkhana/indian-railways-time-table4	0
www.irctc.com/enquiry_En.jsp	1

Fig. 2. Feedback session for query "railway enquiry".

For different queries and click-through, there are different feedback sessions. Therefore, It is wrong to without delay use feedback classes for information person search dreams. A few illustration methods is needed to describe feedback periods in an extra smooth and greenway. Initially the binary vector method and goal texts are two different feature representation of feedback sessions used. In binary vector representation of feedback sessions, the clicked URLs are represented by "1" and the unclicked URLs by "0". But this method is not explanatory to express the contents of user search goals. In another method of goal text, the user usually uses some ambiguous keywords to represent their interest in minds like newspaper, weather, earth star, etc. Using that keyword users search the related document. Name these keywords "goal texts". Even though goal texts can replicate the user statistics want, they're no longer that plenty expressive. Hence, present pseudo-documents used to conclude user search goals.

To convert feedback sessions to pseudo-documents consist of two steps. First is to represent the URLs in the feedback sessions and the second is the creation of pseudo file is primarily based on URL representations. In the first step by

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means of extracting the titles and snippets enhance the URLs of comments periods. Like this each URL in comments session is denoted by using small textual content containing identify and snippet. After that textual preprocesses are carried out to the ones text paragraphs, like stemming, removing stop words and convert all letters to lowercase. We are dealing with text documents.

. Hence we use Term-Frequency-Inverse Document Frequency (TF-IDF) vectors. They convert text into numbers, so that represented by vectors. And that Term Frequency Inverse Document Frequency vector applied to indicate each URLs title and snippet. In the second step, for the creation of pseudo-document, an optimization method use. In optimization, from the feedback session combine clicked and unclicked URLs. From pseudo document we understand the significance of a term in the feedback session. It shows what users exactly want and what they don't want. It can be used to tell what exactly the user in mind. A proposed system comprises the different steps, for know-how exceptional person seek desires for a query. Representation of feedback session and implementing operative algorithm is mathematically discussed as below.

A. Represent URL in the Feedback Session

Here improve the URLs in the feedback session, then do some textual preprocesses and lastly denote each URLs title and snippet by a TF-IDF vector, as below in (1) and (2)

$$\boldsymbol{T_{ui}} = [\boldsymbol{t_{w1}}, \boldsymbol{t_{w2,\ldots\ldots,t_{wn}}}]^{\boldsymbol{T}} \quad (1)$$

$$S_{ui}=[s_{w1}, s_{w2}, \ldots., s_{wn}]^T \quad (2)$$

Where,
T_{ui} TF-IDF vectors of the URL's title, S_{ui} TF-IDF vectors of the URL's snippet, u_i ith URL in the feedback session, w_j(j=1, 2….n) jth term present in the improved URLs, and t_{wj} and s_{wj} the TF-IDF value of the jth term in the URLs. A is a number in the document collections. Now consider URLs titles and snippets have different importance. So, assign different weights to them. From experiment it is clear that titles are more important than snippets. Therefore, the weight of name ought to be better. Set w_t to be 2 or 1.5 and w_s to be 1. After assigning weight, the enriched URL is the weighted sum of T_{ui} andS_{ui}, looks like in (3),

$$\boldsymbol{F_{ui}} = \boldsymbol{w_t T_{ui}} + \boldsymbol{w_s S_{ui}} = [\boldsymbol{f_{w1}}, \boldsymbol{f_{w2}}, \ldots, \boldsymbol{f_{wn}}]^{\boldsymbol{T}} \quad (3)$$

$\boldsymbol{F_{ui}}$ is the feature representation of the ith URL in the feedback session. Every term of $\boldsymbol{F_{ui}}$gives the significance of term in that particular URL.

B. Formation of Pseudo Document Based on URL

As par the overview of the system, has both licked and unclicked URLs in the feedback session for the formation of pseudo-document, as shown in equation (4) and (5).

$$F_{fs}=[f_{fs}(w_1), f_{fs}(w_2), \ldots \ldots f_{fs}(w_n)]^T \quad (4)$$

$$f_{fs}(w) = \arg\min_{f_{fs}(w)} \{\sum_M [f_{fs}(w) - f_{uc_m}(w)]^2 - \lambda \sum_L [f_{fs}(w) - f_{u\bar{c}_l}(w)]^2\}, f_{fs}(w) \in I_c \quad (5)$$

Where,
w is a term, $f_{fs}(w)$ The value for the term w, F_{fs} Feature representation of feedback session, F_{uc_m}(m=1, 2 …M) Representation of clicked URLs , $F_{u\bar{c}_l}$ (l=1, 2… L) Representation of unclicked URLs, $f_{uc_m}(w)$ and $f_{u\bar{c}_l}(w)$ - The values for the time period w in vector, and λ - Balancing parameter.

Calculate sum of distances between $F_{fs}$and each F_{uc_m} and are reduced and combine of between F_{fs} and each F_{uc_m} are is maximized. There could be more number of unclicked URLs than clicked URLs, so λ is used as a balancing parameter.

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I_c be the interval $[\mu f_{uc}(w) - \sigma f_{uc}(w), \mu f_{uc}(w) + \sigma f_{uc}(w)]$

$I_{\bar{c}}$ be the interval $[\mu f_{u\bar{c}}(w) - \sigma f_{u\bar{c}}(w), \mu f_{u\bar{c}}(w) + \sigma f_{u\bar{c}}(w)]$

Where,

$\mu f_{uc}(w)$ and $\sigma f_{uc}(w)$- mean and mean square of $f_{uc}(w)$, $\mu f_{u\bar{c}}(w)$ and $\sigma f_{u\bar{c}}(w)$ - mean and mean square of $f_{u\bar{c}}(w)$.

If $I_c \subseteq I_{\bar{c}}$ or $I_{\bar{c}} \subseteq I_c$, then it is reflect that the term w not in users mind. Now, each dimensions of F_{fs}shows the importance of term on this remarks session. And this F_{fs} is the pseudo-document. This pseudo-document reveals what user exactly wants and what they don't want.

C. Clustering Pseudo Documents to Understand User Search Goals

This segment shows how to understand user search goals. The cosine similarity is the most successful similarity measures, which measures the angle between query and document vector. Similarity measures are used so that documents with the highest scores are the most similar to the query. Similarity between two pseudo-documents is calculated as in (6),

$$Sim_{i,j} = \cos (F_{fsi,} F_{fsj}) \frac{F_{fsi,} F_{fsj}}{|F_{fsi}||F_{fsj}|} \quad (6)$$

Where, F_{fsi} and F_{fsj} are two pseudo-documents.

The distance between two feedback sessions is calculated as in (7),

$$Dis_{i,j} = 1 - Sim_{i,j} \quad (7)$$

K-means clustering is use to cluster pseudo-document. So set the value of K which is number of cluster and perform clustering. After clustering each pseudo-document, get cluster and each cluster means (8).

$$F_{centeri} = \frac{\sum_{k=1}^{ci} F_{fsk}}{ci}, (F_{fskCClusteri}) \quad (8)$$

Where,

$F_{centeri}$ ith Clusters center, ci Number of pseudo-documents in the ith cluster.

Finally, the terms with have highest values in the center points are used as the keywords to represent user search goals. This extracted keyword can also be used in query recommendation and hence represent user information requirements more efficiently.

IV. RESULTS AND DISCUSSIONS

The fig. 3 shows the comparison between the retrieved documents and relevant documents results. The queries are searched using feedback session technique. For query, "Mars Brands" leads the relevant and retrieved documents are 14 and 3 respectively. For query "School", retrieved documents are 18 and relevant are 5, and so on.

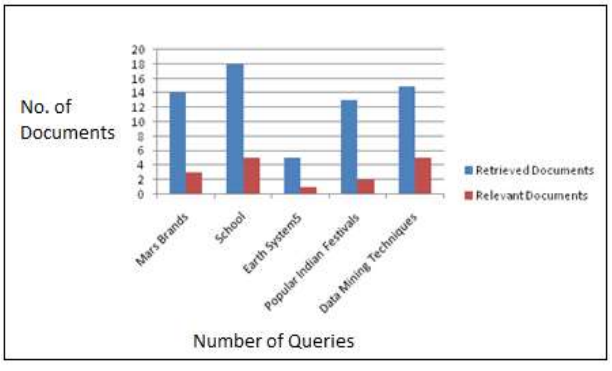

Fig.3. Number of documents versus queries.

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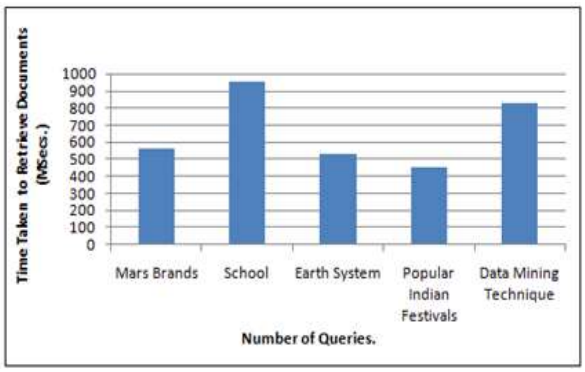

Fig.4. Time taken to retrieve documents versus Number of Queries.

The time taken to retrieve documents versus number of queries is shown in fig.4. The time required to retrieve documents for query "Mars Brands" is 564 Milliseconds, the results on user click-through logs demonstrate the effectiveness of the approach. It is clear that the inferred user search goals are significant. Hence this method can infer user search goals good. The time required to retrieve the documents for different types of queries is as shown in below,

Total time required for execution is $T = E_T - S_T$

Where, $\boldsymbol{S_T}$ represents the execution start time, $\boldsymbol{E_T}$represents the execution end time.

Recall measure use to measure how relevant documents are retrieved in search is as shown in figure 5. Recall can be calculated by using formula:

$$\text{Recall} = \frac{\{\text{relevant documents}\} \cap \{\text{retrieved documents}\}}{\text{relevant documents}}$$

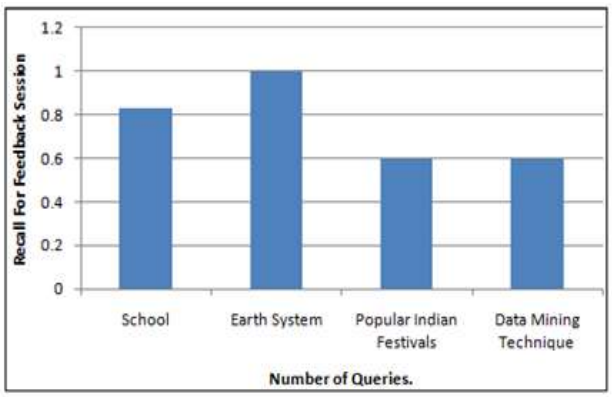

Fig.5. Recall versus number of queries.

The precision measure use to measure how retrieval documents are relevant in search is as shown in fig. 6. Precision can be calculated by using formula:

$$\text{Precision} = \frac{\{\text{relevant documents}\} \cap \{\text{retrieved documents}\}}{\text{retrieved documents}}$$

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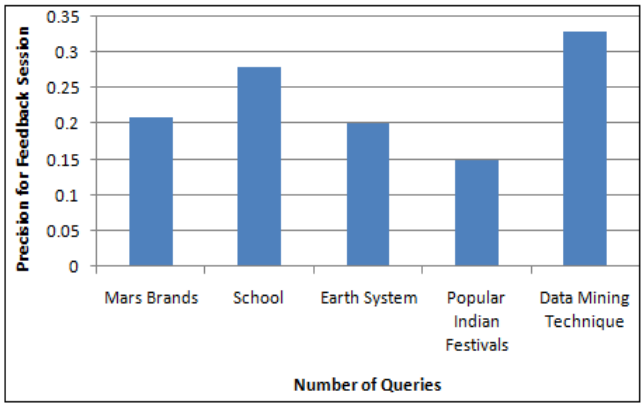

Fig.6. Precision for feedback session versus number of queries.

The accuracy analysis gives details about the how system is correct in finding the relevant results. On relevant document basis we can calculate the accuracy of the system. The accuracy for "Home décor" is 75%. And similarly for Earth system, Sun news, Songs of Mars Bruno and Car is calculated and is listed in table. Finally the average accuracy for feedback session is found to be 74.2 %. The fig.6 shows the precision values for all queries. Accuracy of feedback session versus number of queries is shown in fig.7.

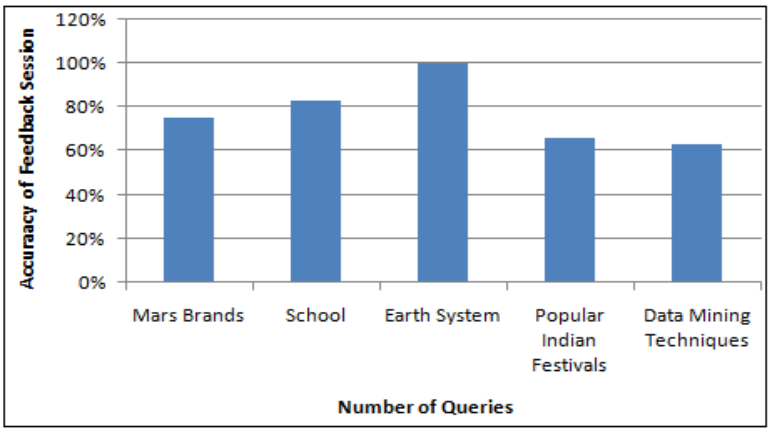

Fig. 7. Accuracy of feedback session versus number of queries.

CONCLUSION

This paper is focused on resolving the ambiguity of query terms and find accurate information immediately. The clustering technique is useful to pseudo documents to understand user search goals. It's miles an optimization technique used to transform remarks consultation to pseudo documents, which can correctly supply consumer facts wishes. The performance of clustering increases greatly and identifies the search goals efficiently. Also task level analysis provides better understanding of user's goal. It provides query suggestion as complementary outcomes to the user.

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