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## A Survey on Location Aware Keyword Query Suggestion Based on Document Proximity

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**Abstract**— *This Keyword suggestions are the most basic feature of the search engine. Naive users don't know how to express their queries correctly most of the time queries are short and unambiguous; keyword suggestion in web search assists users to access relevant information. Information will be more relevant if location of the users is considered. The location aware keyword (LKS) query suggestion method helps retrieve documents which relates to information provides by user and location where the user is located. However the search results' relevance is known to be correlated with the spatial proximity of the user. In this paper we give brief study all the techniques for the keyword suggestions and discuss about location-aware keyword query suggestion framework and improved Partition Based algorithm*

**Keywords**— *Query suggestion, spatial databases*

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### I. INTRODUCTION

Keyword suggestion is the most important and the basic feature. The Major issue in today's web search is queries entered by users are very short and ambiguous. Users try multiple queries and still don't get the required results because keywords suggested by the search engine not very much good descriptor of what actually user needs. Many search engines have made query suggestions techniques for overcoming these problems. Spatial keyword search is very important and will precisely provide keyword suggestions. Location-aware Keyword query Suggestion framework is useful. In this proposed method is based on a query clustering process in which groups of semantically similar queries are identified.

The location aware keyword(LKS) query suggestion method provide the suggested queries retrieve documents which is related to user information and located near to users location. In this paper we will study all the techniques which are used for keyword suggestions to help user to retrieve the correct information.

### II. LITERATURE SURVEY

The location aware keyword(LKS) query suggestion method provide the suggested queries retrieve documents which is related to user information and located near to users location. LKS framework, it construct and use keyword document bipartite graph(KD graph) that connect to keyword queries with their relevant document. LKS adjust weight on edges in KD graph to capture the semantics relevance between keyword queries and spatial distance between document location and user location. For distance calculation the Personalized PageRank(PPR) algorithm is used, it uses Random walk with restart(RWR) on KD graph, starting from user supplied query to find the set of keywords and spatial proximity to the user location. But RWR search has high computational cost on large graph to address this issue; a new portion based algorithm is used to reduce the cost of RWR search.

Authors in [1] propose a novel context-aware query suggestion approach which is in two steps. In the offline model-learning step, to address data sparseness, click-through bipartite is clustered in order to summarize queries into concepts. In this approach queries are suggested to the user in a context-aware manner.

Authors in [2] propose a novel query suggestion algorithm based on ranking queries with the hitting time on a large scale bipartite graph. This method captures the semantic consistency between the suggested query and the query given by user. Experiments show time is effective to generate semantically consistent query suggestions. The proposed algorithm and its variations can successfully execute huge queries, accommodating query suggestion.

Author [3] introduced novel, domain-independent and privacy preserving methods for enhancing MF models by expanding the user-item matrix and by imputation of the user-item matrix, using browsing logs and search query logs. They introduced two approaches to enhancing user modeling using these data. Authors show that CF systems can be enhanced using Internet browsing data and search engine query logs, both represent a rich profile of individuals' interests. They demonstrate the value of their approach on two real datasets each comprising of the activities of tens of thousands of individuals. The first dataset details the download of Windows Phone 8 mobile applications and the second - item views in an online retail store. Both datasets are enhanced using anonymized Internet browsing logs.

Author [4] proposed a new query suggestion paradigm, Query Suggestion with Diversification and Personalization that effectively integrate diversification and personalization into one unified framework. In the QS-DP,

the suggested queries are successfully diversified to cover different facets of the input query and the ranking of the suggested queries are personalized to ensure that the top ones that align with a user's personal preferences. They propose a new representation for query log. The proposed multi-bipartite-graph representation comprehensively captures different kinds of relations between search queries in query log. Based on the multi-bipartite-graph representation, they design two strategies to identify the most relevant suggestion candidate.

Author [5] proposed a method that computes likeness among queries based on "Query- Clicked Sequence" model. This model counts weight of clicked document term by density of documents containing this term on clicked sequence, and filters content of unrelated documents during similarity computation. Based on the characteristics of different concentration on relevant and irrelevant documents occurring on clicked document sequence, this paper proposed a query similarity computing method based on irrelevant feedback analysis, and recommended queries based on this method. This method constructs a relevant term collection for each clicked sequence of one query, from relevant document and computes similarity among queries by relevant term collection offline with recommendation of online queries based on the computation result. Query recommendation based on their method can effectively decrease the negative effect on query similarity computation, and increase accuracy of query similarity computation, therefore increase accuracy of query recommendation, especially for informational queries.

Author [6] developed the QueRIE system for personalized query recommendations. QueRIE monitors the user's querying behavior and finds matching patterns in the system's query log, identifying same kind of users. These queries are used to recommend queries which user may find helpful. They explore the use of latent factor models when, instead of ratings, the input consists of database-query log data. And explored how latent factor models, and in particular matrix factorization using ALS, affect the quality of the recommendations and computational efficiency of their framework. Such techniques have become very popular in traditional rating-based recommender systems, and in this work authors verified that they capture latent similarities between users and "items" even when the input is not explicit.

Author [7] proposed time aware structured query suggestion which clustered query suggestion along timeline so the user can narrow down his search from a temporal point of view. When the suggested query is clicked the method presents web pages from query-URL bipartite graph. After ranking those according to click count within a particular time period this method helping user to access relevant web pages. It free the users from burden of entering a specific time constraint with query, this method can be used in the context of real user search tasks.

Author [8] Explained a web recommender approach based on learning from web logs it recommends user a list of pages that are relevant to the users proposed query by comparing with historic pattern and also rerank the result pages. This system proves to be efficient as the pages desired by the users are on the top in the result list and this method reduces the search time of the user. In this the recommendation is based on the feedback of users and web log analysis.

Author [9] proposed a snippet based method to facilitate users with query recommendations. The concepts related to the users information needs are suggested to the users to satisfy their current information need, extracted the concepts from the web snippet. Authors proposed two weight functions to measure the relevance between query and concept. Related concepts with different meaning are selected and recommended as query suggestions to the users.

Author [10] presented an approach based on the users search behaviour. Their suggested query recommendation framework follows the fact that if user clicks certain result returned by search engine then it does not necessarily mean that the user is interested in that result but it probably reflects that the user is instead interested in the snippets of the result. This is because that up to that time the user clicks certain result just by viewing the snippet, the resultant document has not shown to user by that time.

Author [11] has explained a dynamic knowledge based approach which gets updated by continuously as queries are issued, to keep record of possible variations of user interest. This model extensively guesses the real hidden intent of user behind a submitted query and proves its effectiveness by dropping the effect of aging by updating & rebuilding the query recommendation model incrementally. In this the update operation runs in parallel with the query processor. Thus this dynamic knowledge based approach is better than that of all static models based on query log.

Author [12] designed a location-aware keyword query suggestion framework. They propose a weighted keyword-document graph, which captures both the semantic significance between keyword queries and the spatial distance between the resulting documents and the user location. The graph is browsed in a random-walk-with-restart fashion, to select the keyword queries with the highest scores as suggestions. To make framework scalable, authors propose a partition-based approach that outperforms the baseline algorithm by up to an order of magnitude. And design the first ever Location-aware Keyword query Suggestion framework, for suggestions relevant to the user's information needs that also retrieve relevant documents close to the query issuer's location. Also extend the state-of-the-art Bookmark Colouring Algorithm (BCA) for RWR search to compute the location-aware suggestions.

Keyword query suggestion approaches can be classified into three main categories: random walk based approaches, learning to rank approaches, and clustering based approaches. We also briefly review alternative methods that do not belong to any of these categories. To the best of our knowledge, no previous work considers user location in query suggestion.

The methods in this category use a graph structure to model the information provided by query logs, and then apply a random walk process on the graph to compute the suggestions. Craswell and Szummer [13] apply such an approach on the query-click graph and suggest queries based on personalized PageRank scores.

Some query suggestion approaches [14] are based on learning models trained from co-occurrences of queries in search logs. Another learning-to-rank approach [15] is trained based on several types of query features, including query performance prediction.

Beeferman and Berger [16] view the query log as a queryURL bipartite graph. By applying an agglomerative clustering algorithm on the vertices in the graph, query clusters can be identified.

Zhang and Nasraoui [17] create a graph with edges between consecutive queries in each session, weighted by the textual similarity between these queries. A candidate suggestion for a given query is given a score based on the length of the path between the two queries, aggregated across all sessions in a query log where the query and the suggestion cooccurred.

References [18] and [19] both study the problem of location aware type-ahead search, also known as instant search. LTAS finds documents near a user location, as the user types in a keyword query character by character.

Location-Aware Suggestions Based on User History Google [20] provides location-based query suggestions by simply selecting the user's past search queries that have results close to the user's current location. These suggestions may be insufficient if the user did not perform any historical searches near her current location. In addition, query suggestion based on location only may not match the user's search intent.

A relevant problem to query suggestion in relational databases is called query relaxation. The objective is to generalize an SQL query in case of too few or no results [21]. Query relaxation approaches cannot be applied for keyword query suggestion, because they require the relaxed query to contain the results of the original query, which is not essential in our case.

The basic structure of the KD-graph used in our model and other existing suggestion model is one type of heterogeneous graph that consists of multiple types of nodes and edges. There exist some research focus on the similarity search in heterogeneous graphs. PathRank [22] extends the Personalized PageRank algorithm on heterogeneous graphs by discriminating different paths during the random walk process guided by predefined meta-paths

### **Random Walk Computation**

Random walk with restart, also known as Personalized PageRank, has been widely used for node similarity measures in graph data, especially since its successful application by the Google search engine. Matrix-based methods [23], [24] solve PPR by precomputing the inversion matrix. Tong et al. [23] propose a matrix-based approach B\_LIN that reduces the pre-computation cost of the full matrix inversion by partitioning the graph.

MC can also be applied online, without relying on pre-computations; a number of random walks are tried from the query node and the PPR score of other nodes are estimated from these samples [24]. However, as shown later in [25], a large number of (expensive) random walks are required in order to achieve acceptable precision.

## **III. DISCUSSION**

As per our knowledge existing methods don't provide location aware keyword query suggestions (LKS) precisely. Studies show Partition based algorithm (PA) outperforms the baseline algorithm. But PA can also be used to speedup RWR on graphs having weights at the edge which are dynamic this potential is to be investigated for better results. We propose a weighted keyword-document graph, which captures both the semantic relevance between keyword queries and the spatial distance between the resulting documents and the user location.

The graph is browsed in a random-walk-with-restart fashion, to select the keyword queries with the highest scores as suggestions. To make our framework scalable, we propose a partition-based approach that outperforms the baseline algorithm by up to an order of magnitude. The appropriateness of our framework and the performance of the algorithms are evaluated using real data.

## **IV. CONCLUSION**

User satisfaction plays very important role in information retrieval. Query recommendation is best method for helping users to satisfy the users information need by suggesting queries related to current users need by maintaining query log processing files, by using past historical navigation patterns, by updating the records of query processing so that by using dynamic and static log data and so on. This paper helps to review some of these query recommendation techniques. So for further research we plan to make use of the query log for keyword query suggestion method. This method is useful when the database is big or distributed. This method reduces the cost of data communication. In our future work we want to prepare synonym suggestion for given keyword query using offline dictionary interface.

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