International Journal of Advanced Research in

Computer Science Engineering and Information Technology

Volume: 4 Issue: 3 22-Mar-2015,ISSN_NO: 2321-3337

Instant Fuzzy Search Engine with Phrase Based Ranking

Kate Sangita Rajendra , Gore Sneha Subhash, Sayyad Laila Mahamud,Solankar Punam Vitthal.
Department of Computer S.V.P.M.C.O.E. Malegaon(Bk), Baramati Pune, India.
Mrs. Dabhade A.S.(Assi. Prof.) Mrs. Sawant V.V.(Assi. Prof.)

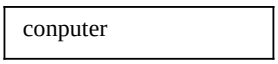
***ABSTRACT*— Instant search retrieves results as a user types keyword character by character. On every keystroke result of previously typed prefixed query is used to generate result of newly typed query with one new character. Also to make instant search result computation is done incrementally. Fuzzy search allows user to type query in the fly even he don't have more information about search. Autocompletion provides suggestions while user types query, it provides way for what to type next. Main problem of retrieving quick result is solved in this paper by using efficient trie data structure with efficient trie search technique. More relevant answers generation is based on phrases, so ranking of result becomes efficient. The records with exact phrases in the query are ranked higher to give more efficient result to user.**

Keywords*: Proximity Ranking, Autocompletion, Phrases, Fuzzy search, Incremental Computation, Trie, Active Nodes.*

1,INTRODUCTION

Instant Query Search: Instant search retrieves results to the user as they types query character by character. For example, one database has a search interface that returns results to user while user typing a query character by character. When user types in "Laptop Customer Service", then the system returns "Laptop Customer Service reviews " , " Laptop Customer Service comparison", "Laptop Customer Services ranking". This instant search technique provides user quick access of answers while typing instead of left in the blank until user types whole query and enter on search[1].

Fuzzy Keyword Search: When user makes typing mistakes in the query, then in this type the system can't find the related answers by finding keywords in the database similar to query keyword. But by using fuzzy search this problem can be solved as the system finds answers to the query that are similar to the database keywords and not exactly same. Figure 1. shows an instant fuzzy search interface. The system finds answers to query "computer" even though user mistyped a query as "conpute" then system retrieves result[3].



Result : computer

Fig 1.1. Instant Fuzzy Search.

Time Limit on Retrieving Answers*:* In current era the challenging part in searching is required very high speed. Results needs to retrieve within some milliseconds only. This time again includes the time required over the network, time taken at server and time taken by browser to execute & show results. So, our main aim to provide high speed requirement by reducing the time required at server side for finding results in database [2]. More challenging here to use perfect database and algorithms which will reduces time required to search in database as

server have lots of data and searching sequentially or by old methods of search it's difficult to achieve high speed requirement.

2,LITERATURE SURVAY

1. ***Instant Search****:* Instant search is also called type-ahead search. Recent studies contains techniques and algorithms to support instant search in [4].This was query techniques.To overcome the problems related to efficiency new system is presented in [5].The previous systems work on the relational databases which requires more time even name is instant search. This is avoided by using trie data structure in our system.

2. ***Auto-Completion***: Previous studies provides auto-completion results i.e. these provides suggestions while typing query in case 'what to type next'. There are many studies on auto-completion which includes paper [6].This suggestions include queries that starts with the partial query that user typing as prefix. This feature is extended here to make system user friendly.

3. ***Fuzzy Search:*** Fuzzy search allows user to don't worry about mistakes while typing query. The studies related to fuzzy search classified into two types gram-based technique and trie based technique. In gram-based approach sub-strings of query are used for fuzzy search to match with documents in database [7],[8]. Our system is phrase based so only the continuous sub-strings are used as phrase.

4. ***Proximity Ranking*****:** Proximity ranking means the document that are more correlated with query words are provided at higher in result. So it provides more efficient top results [9]. Studies related to this improves query efficiency by using early-termination techniques [10],[11].

3, PROPOSED SYSTEM

3.1 Terms:

Data *:* Let R= <r_1,r_2….r_n> be a set of records which contains tuples in a relational table. D be the dictionary which contain all the different words in R. Table I shows example of Book records. Each records has text attributes such as title of the book.

Query **:** A query Q is a string which contains a no of keywords W= <w_1,w_2,w_3…..w_l>. In instant search request is send to the server for each keypress. When user types a query character by character, each query is constructed by appending one character at the end of earlier query. For example when user types "language" keyword character by character the server receives the following queries one by one q1=<l>, q2=<la>,q3=<lan>,q4=<lang>……

q8=<language>.

Answers*:* A result set is a records r from the data set R. For example: for the query q=< java, security > the answers of this query is records r_1, r_2 ,r_3, r_4, r_6 because all these record contain the keyword "java". The similarity between two keywords can be checked by using various methods such as edit distance, cosine similarity. For example, the edit distance between the keywords "clear" and "clean" is 1, because the former can be transformed to the latter by substituting the character "r" with "n".

Ranking: Ranking the answer of the query is based on the relatedness of the que ry with the keywords in the dictationary D . For example, for th e query q= <java,security > record r_1 in Table 1 containing a phrase "java security" is more related than the rec ord r_1 containing the keyword "java" and "security" separately.

3.2 System:

To overcome the restriction o f previous systems, the new technique that is ba sed on phrase based indexing has been developed. A phrase is a sequence of keywords that has high probability to come in the records and queries. The answer of the query having a matching phrase in the query that has high score than the query without matching phrase. We want to access the records which includes phrases first.

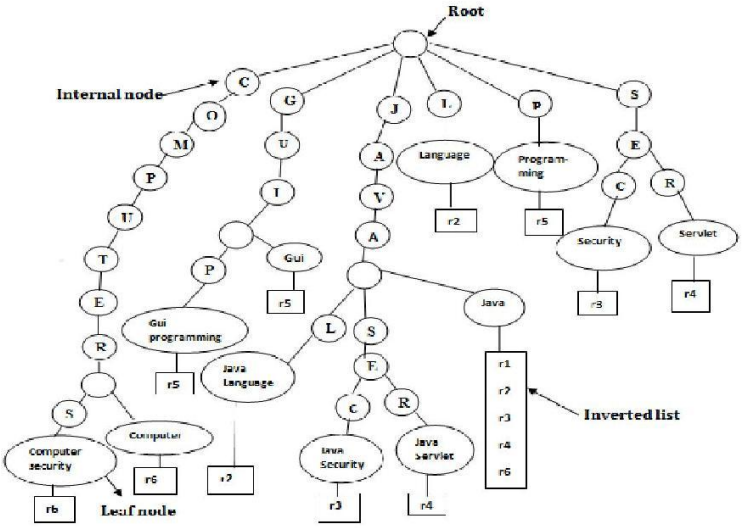


Fig 2.1: Trie with inverted list at leaf nodes

Book name	Records
Java	r_1
Java languages	r_2
Java security	r_3
Java servlet	r_4
GUI programming	r_5
Computer security	r_6

Fig. 2.2 Table I

For example, for the query q=<jav a ,security > , we need to access records whi ch includes the phrase "java security" before the records containin g "java" and "security" separately. The inverted list attached at the end of the leaf node which is sorted list based on relevancy of the keywords. Order of inverted list for keyword "security" based on the relevancy to the phrase "java security", the best processing order for a other phrase, say, "computer security", "java servlet" may be different. Fig 2.1 shows trie with inverted list attatc hed at the end of leaf for data in Table 1 .For example, the phrase "java security" is indexed in the fig 2.1 the leaf node for the keyword "java" points to the inverted list r_1, r_2, r_3, r_4, r_6.

4, SYSTEM ARCHITECTURE

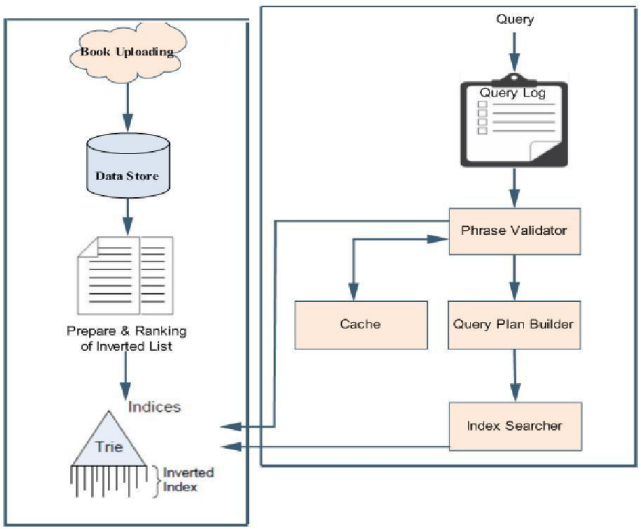


Fig 3.1. Server Architecture of Instant Fuzzy Search.

Above figure shows the server architecture of instant fuzzy search for one database server. In this architecture book database is used as a database server. Admin is responsible for uploading books on the server, when book uploaded on server trie has been built and inverted list is prepared. The input to the system is a query i.e typed characters and output of the system is a records.

When server receives request from client then server identifies all phrases in the query that are in the database. For identifying valid phrases in the query we have a module called as phrase validator. For example for the query q=< java, security > "java" is a valid phrase for the data set in Table 1, in addition "security" and "java security" is also valid phrase. Phrase validator computes all valid phrases and returns active nodes for all these phrases i.e. If query keyword come in to multiple valid phrases then query can be segmented into phrases in distinct ways. For example , "java | security " and "java security" are two distinct segmentation for query q. After identifying valid phrases Query Plan Builder generates a Query Plan Q, which includes all the possible valid segmentations in a definite order. After query plan is generated, the segmentations are passed to the Index Searcher one by one until the top-k answers are computed. Index searcher computes top-k results by using segmentation. Combining the result set of query plan and segmentation the final. For storing computed result of the previous queries that can be used for expedite the computation of later queries for that reason cache module is used. The phrase validator uses cache module for validate phrases without traversing whole trie, while Index Searcher uses cache for retrieving result of the earlier queries to reduce computation cost.

5, ALGORITHM

1. *Incremetal Computation Of Valid Phrases:*

The subsequent queries of the user differ from each other by one character and their computation of valid phrase have lot of overlap. For incrementally computing valid phrases of a query q_j cached vector is used which stores the valid phrases of a previous query q_i.

Fig 4.1 shows the active nodes of the valid phrases queries q_1 = <compute > q_2 = < computer > and q_3 = < computer , security >. For the phrase "computer" q_1 and q_2 have the active nodes n_1 and n_2 . For q_2 has an active

node n_2 for the phrase “computer”, w hich is closed to active node n_1 of the phrase “com pute” in q_1. hence to compute the n_2 efficiently we can use the active node n_1.

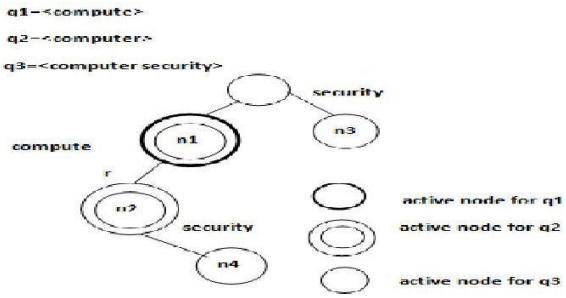


Fig 4.1 Active nodes for valid phrases

All the active nodes of q_2 i.e n_1,n_2 are also active node for q_3. q_3 has active node s n_3 and n_4 for the keyword “security“ i.e “security” and “compu ter security”. ” computer security” has a phrase from q2 as a prefix and from n2 its active nodes can be computed incrementally.

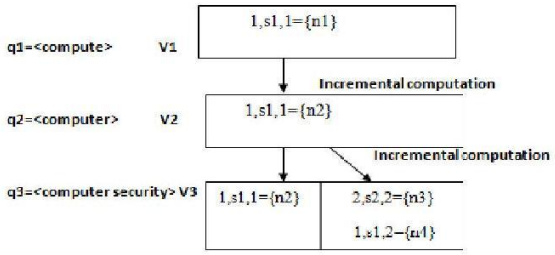


Fig 5 .1.computing valid phrases incrementally using cache

Above figure is for the queries q1,q2 and q3 with valid phrase vector v1,v2 and v3 respectively. For example the third element of v3 sho ws the starting points of all the valid phrases e nding with a prefix similar to “computer”.

Algorithm 1 is for computing valid phrases of a query using previously valid p hrase vector .
Fig 2 shows valid phrase vector which is used for incrementally computation of vali d phrases. v1 is stored in the cache then v2 can be computed incre mentally from v1 as follows :

If the first keyword is same then as it is copied into (lines of 6. in the algor ithm for copying the vector). The first element of v2 is computed incrementally starting from active node set $S_{1,1}$ i n the first element of v1(lines of 8-10 in the algorithm). The incr emental computation of v3 from v2 in this cas e where there are additional keywords in the new query. In this case the first keyword copied as it is from v2 to v3 .We compute the second element of v3 from active node set of v2 (lines of 11. in the algorithm used for third case) .

Algorithm for Incremental Computation of Valid Phrase Vector :

Input: new_q={w_1,w_2,.....,w_N}
N : no. of keywords. ANS:Active_N ode_Set
Output: new_V – Valid Phrase Vector
1. Q_Log = Read Query Log.

```
2. (old_q,old_V)= getLongestPrefix(Q_Log,new_q)
3. total = no. of words in old_q
4. All = no. of words in new_q
5. If (total>0)
6. For i=0 to total
    New_V[i]=old_V[i];                    //Copy ANS for same phrases
7. If(old_q==new_q)
   Return old_V;
8. else                                   //compute ANS for cached phrases incrementally
   new_V[total]=Find_ANS(old_V[total],new_q[0] to new_q[total]);
9. new_ANS=new_V[total]
10. if(All>total)
   for i=total+1 to All
      new_ANS=Find_ANS(new_A NS,new_q[0] to new_q[i]);
                                          //by appending new_q[i] every time
     Union(new_V,new_ANS);
11.                    //compute A NS for non-cached phrases
   Initial_ANS=compute_initial(root,threshold); for
   i=total+1 to All {
   new_V[i]= Find_ANS (initial_A NS,new_q[i]);
   new_ANS=new_V[i];
    for j=i+1 to All{
       new_ANS= Find_ANS (new_ANS,new_q[i] to new_q[j]); //by
       appending new_q[j] ever y time
     Union(new_V[j],new_ANS);} }
12. Return new_V.
```

6, EXPERIMENTAL

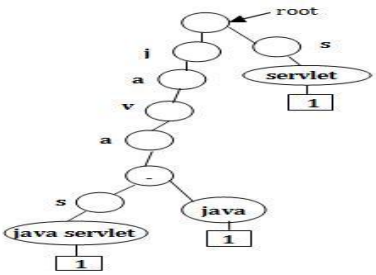
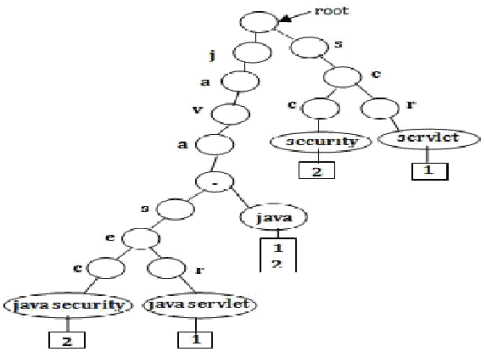
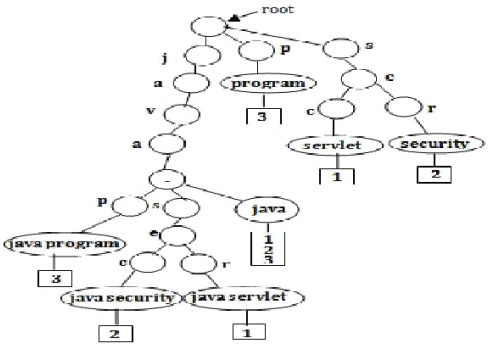
RESULT

1) Phrase Computation From Book Title:

Book Title	Phrases
Java Servlet	java,servlet,java servlet
Java Security	java, security ,java security
Java Program	java, program, java program

Volume: 4 Issue: 3 22-Mar-2015,ISSN_NO: 2321-3337

2) Trie Build from Computed Phrases :

Book Title	Builded Trie
1. Java Servlet	
2.Java Security	
3. JavaProgram	

3) Auto-Complete Result:

Partial Query	Suggestions
J	java java program java security java servlet
Java s	java security java servlet
Java sec	java security

4) Incremental Search Result:

Query	Result	Time (ms)
jva	java	62
jva s	java	187
jva se	java java security java servlet	390
jva sec	Java java security java servlet security servlet	297
jva security	Java java security security	327

VII. CONCULSION

In this paper we studied how to improve performance in case of time and space requirement in instant-fuzzy search. We proposed a system which cover the space & time efficiency problems in previous gram based system by introducing new phrase based ranking algorithm. We studied how to use and extend previous techniques to overcome the problem including early termination, using inverted list of document, ranking top-k results.

REFERENCES

[1]I. Cetindil, J. Esmaelenzhad, C. Li, and D. Newman, “Analysis of instant search query logs,”in *W,ebDB,2012*,pp.7-12.

[2]R. B. Miller, “Response time in man-computer conversational transactions,” in *Proceedings of the December 9-11, 1968, fall joint computer conference, part I*, ser. AFIPS ’68 (Fall, part I). NewYork, NY, USA: ACM, 1968, pp. 267–

277.

[3] C. Silverstein, m. R. Henzinger, H. Marais, and M. Moricz, "Analysis of a very large web search engine quary log," SIGIR Forum. Vol. 33, no. 1, pp. 6-12, 1999.

[4] H. Bast and I. Weber, "Type less,find more:fast autocompletion search with a succinct index",in *SIGIR*,2006,pp.364-371.

[5] S. Ji,G. Li,C. Li,and J. Feng, "Efficient interactive fuzzy keyword search,"in *www*,2009,pp.371-380.

[6] A. Nandi and H. V. Jagadish, "Effective phrase prediction", in *VLDB*,2007,pp.219-230.

[7] A. Behm. S. Ji. C. Li, and J. Lu, "Space-constrained gram-based indexing for efficient approximate string search", in *ICDE*, 2009, pp. 604-615.

[8] K. Chakrabarti, S. Chaudhuri, V. Ganti, and D. Xin, "An efficient filter for approximate membership checking", in *SIGMOD Conference*, 2008, pp. 805-818.

[9] R. Song, M. J. Taylor, J.-R. Wen, H.-W. Hon, and Y. Yu, "Viewing term proximity from a different perspective," in *ECIR*, 2008, pp. 346–357.

[10] R. Schenkel, A. Broschart, S. won Hwang, M. Theobald, and G. Weikum, "Efficient text proximity search," in *SPIRE*, 2007, pp. 287– 299.

[11] M. Zhu, S. Shi, M. Li, and J.-R. Wen, "Effective top-k computation in retrieving structured documents with term-proximity support," in *CIKM*,2007, pp. 771–780.