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Retrieve Top-K Search results for Multi-keyword Synonym Query over Encrypted Cloud Data

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Abstract: In Proposed system has solution is very effective and efficient for multi-keyword ranked searching in a cloud environment. Variety of cloud services are delivered to consumer with the premise that is an efficient cloud search service is a chieve. They find most relevant data is highly desirable in the pay as you use. The data of consumer which is on the cloud that are sensitive data for example emails, personal record, health reports, personal photos, financial data etc. This data which are to be outsourcing to cloud. Data which is on cloud encrypted before outsourcing to cloud. Existing search approaches cannot accom-modate such requirements like ranked search, multi-keywords search, semantics-based search etc. Proposed Encryption and then searching technique must be applied on encrypted cloud data, but traditional keyword search technique are useless. So existing search approaches over cloud data support only exact or fuzzy keyword search. That is, there is no tolerance of synonym substitution and/or syntac- tic variation which, on the other hand, are typical user searching behaviours and happen very frequently. Therefore, synonym-based multi-keyword ranked search over encrypted cloud data remains a very challenging problem. Therefore to apply an effective searchable system with support of ranked search that is very challenging approach. This paper proposes an effective approach to solve the problem of multi-keyword ranked search over encrypted cloud data supporting synonym queries. The Ranked search enables cloud customers to find the most relevant information quickly. Ran ked search can also reduce network traffic as the cloud server sen ds back only the most relevant data. Therefore after experiment on real dataset shown proposed solution is very effective and effi-cient for multi keyword ranked searching in a cloud environment.

Keywords: Cloud computing, consumer-centric cloud, keyword search, ranked search.

I. INTRODUCTION

Encrypted data search required new approach. Old search techniques are not useful. To achieve this multi-keyword ranked searching over encrypted data on cloud [1] provides us great solution. This base paper [1] incorporates encrypted data search where we can get search result by provide actual keyword as well as synonym word. Since data on cloud is sensitive sometime and in worst case for profit purpose there are chances of sharing this information with other resources. Since cloud is semi-trusted but curious, user has to take care of data on it. For this reason user has to encrypt data. This encryption raises several issues like searching of such encrypted data because old search methods are not having efficiency. In case of transaction and view result he has to first download the data and then decrypt it, which impractica l since huge amount of raw data can be transact. Hence proposed system should have solution over encrypted data search present on cloud with the help of synonym multi keyword ranked search. Along with text file, labeled image file can be present on cloud. Hence proposed system should also support to search labeled image. In this case using OCR algorithm labels are extracted and matched while searching is performed.

II. LITERATURE SURVEY

[1] is the base paper for the system proposed by Zhangjie Fu, Xingming Sun, Nigel Linge, Lu Zhou named Achieving Effective Cloud Search Services: Multi-keyword Ranked Search over Encrypted Cloud Data Supporting Synonym Query launched in February 2014. This paper discussed idea regarding searching of data present on cloud in encrypted format. It is also having scope for multi-keyword search which are in ranked format. It helps us to find way for effective search for encrypted data.

In Year 2009, Georgia Koutrika presented a data cloud in which cloud search is performed on the basis of query summarization approach. He performed a query refinement model based on the summarization. Now based on summarization the query is presented to the web architecture and relatively the search is performed for reliable and effective cloud service [2].

A multimedia search for the cloud architecture is suggested by Wei-Ying Ma. In this work different multimedia services are suggested such as client PC, phone, TV etc. On the basis of the knowledge based search is performed to retrieve the multimedia analysis and will perform the search respective to the client request for the particular multimedia service [3].

Another tag based summarization approach is suggested by Byron Y.L. Kuo for the web search. The presented work is suggested on the public cloud. In which the integration of the web architecture and the database extraction is integrated. The work includes the refinement of the user query based on the cloud tags. The words extracted from the query are been summarized and this summarized query is passed to the public cloud. The cloud interface enabled the extraction of new and required information [4].

Another cloud search is suggested by Daniel E. Rose based on the information retrieval. The author presented his work on Amazon cloud service. The work is tested under different criteria such as scalability, configuration etc. The presented search reduce the barrier to allow a person or the organization to perform the content oriented search and the search is tested under the enterprises environment as well as on web search [5].

Very basic search for encrypted data is presented by Li et al [6] that gives basic search idea. But this searching was for fuzzy keywords.

In Year 2012, Cengiz Orencik presented a rank based keyword search on the data cloud. In this work the document retrieval is performed on cloud server based on the keyword analysis and the information search is performed relative to the defined information. The presented work is performed on the encrypted data that has improved the security and the reliability of the retrieval. On this basis a secure protocol is suggested called Private Information Retrieval. The system will performed the query and present final results on the basis of parametric ranking. The presented work is the efficient computation and communication of the requirement analysis [7].

Mathew J. Wilson performed a work based on web search engine based for the keyword cloud. In this work the clouds are represented by some tags called the Meta data. The Meta data defines the cloud with relative parameters in terms of the services will be done under different parameters. The first parameter considered here is the most appropriate of its security, efficiency and the reliability criteria. On the basis of this the keyword match is performed on different cloud keywords. The work includes the learning stage for the keyword extraction and the comparative analysis is performed to extract the related cloud services from the system [8].

S. Kamara, and K. Lauter proposed a paper [9] that consider the problem of building a secure cloud storage service on top of a public cloud infrastructure where the service provider is not completely trusted by the customer. I. H. Witten, A. Moffat, and T. C. Bell proposed a technique for indexing [10] containing text compression ideas, indexing, querying, index construction and image compression.

S. Grzonkowski, and P. M. Corcoran proposed a concept [11] of system which analyze and use the viewing pattern of consumers to personalize the program recommendations. So-lution works for user centric approach helps to share important document and services through TCP/IP structure.

While uploading labeled images , text must be extracted from image so that it will be helpful for searching images. This can be achieved by using OCR technique [12] proposed by Ayatullah Faruk Mollah, Nabamita Majumder, Subhadip Basu and Mita Nasipuri. Optical Character recognition technique is discussed and observed that 92.74 % accuracy is achieved.

Other related techniques. Allowing range queries over encrypted data in the public key settings, where advanced privacy-preserving schemes were proposed to allow more sophisticated multi-attribute search over encrypted files while preserving the attributes privacy. Though these two schemes provide provably strong security, they are generally not efficient in our settings, as for a single search request, a full scan and expensive computation over the whole encrypted scores corresponding to the keyword posting list are required. Moreover, the two schemes do not support the ordered result listing on the server side. Thus, they cannot be effectively utilized in our scheme since the user still does not know which retrieved files would be the most relevant.

III. PROPOSED SYSTEM

Proposed system flow is as follows

A. System Flow

Cloud server , data owner and data user are the entities involved in proposed system as per figure 1. Data owner is responsible to upload the collection of document to the server. This document can be text file or labeled image. Text documents are DC are encrypted first and then save on cloud. Hence cipher text is C is preserved on it. For searchable encrypted data , owner will also generate an index I that helps for efficient searching. Keywords are first extracted from DC and then set of distinct keywords are finalized and indexing is done. Actual data hosted on cloud will contain encrypted files C and searchable index I by data owner and data saving / uploading process is done.

While searching of data , based on keywords or synonyms of the predefined keywords entered by the user (has been authorized by data owner) system generate encrypted trapdoor using which cloud refers index I and manage to return search result. Encrypted documents are the part of search result. These documents are ranked and set of K documents are return. User can set the K parameter at time of search. System will then returns top K documents.

The proposed system works under following 4 sections.

- 1) Setup
 - 2) GenIndex
 - 3) GenQuery
 - 4) Search
- 1) **Setup:** In this phase, the system is initialized. The data owner generates the secret key SK and picks a random key sk .
 - 2) **GenIndex:** The data owner calls procedure buildindex (DC) to generate index for File F. Built index function uses stemmer, stopword, frequent word, ocr algorithms to generate index. User encrypts the index as well as File using SK. And upload the document and index to the cloud.
 - 3) **GenQuery:** Data user generates trapdoor after getting the access to the data from data owner. With t keywords of interest in W , the query vector Q is generated. The word is query is encrypted and query is uploaded to the cloud.

- 4) **Search:** With the given interest of keyword application searches for a desired document using BST algorithm. And return the top K result to the user. While searching for the data it uses Latent semantic analysis technique to search for synonym keywords.

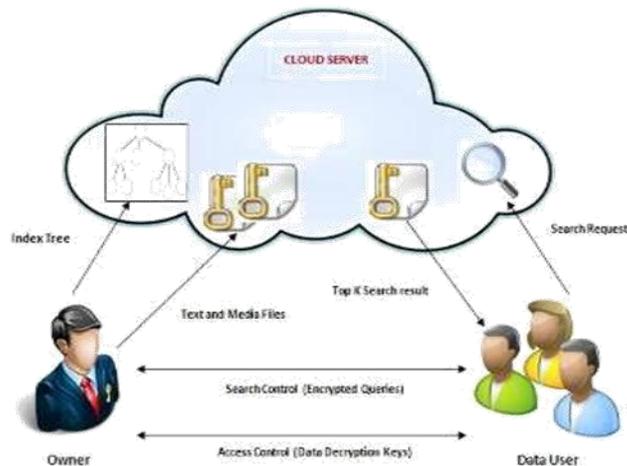


Fig. 1. System Diagram

B. Algorithm Used

1. Stemmer:

used in linguistic morphology and information retrieval to describe the process for reducing inflected (or sometimes derived) words to their word stem, base or root form e.g. word running is converted into run. This algorithm is used for index generation. **Input :** When user upload particular document then its inflected words are input **Steps :** Step 1 : Get rid of plurals and ed or ing suffixes Step 2 : Turns terminal y to i when there is another vowel in the stem Step 3 : Maps double suffixes to single ones ization , -ational etc. Step 4 : Deals with suffixes , -full , -ness etc. Step 5 : Takes off ant , -ence , etc. Step 6 : Removes a final e **Output :** Normalize word forms eg. Destructiveness =_g destruct.

2. Stop word:

In this algorithm stopword like: punctuation marks, words like a,an,the are removed from the given text. **Input :** Stemmed words and sentences **Steps :** Step 1 : Get word list Step 2 : Calculate word count of frequently occurred words Step 3 : Create own stop word list Step 4 : Match these frequent words from stop word list Step 5 : Remove most frequent words **Output :** Filtration of words like the , and , a , to , of , was , it , in , that , he etc.

3. Frequent word calculation:

Most frequent words above the threshold are calculated in this algorithm **Input :** Raw data with stemmed and without stop word **Steps :** Step 1 : Frequent words are buffered in hash table and word and its count is calculated Step 2 : Rank K is decide by the user and such top K results are shown to user from all calculated word counts **Output :** Dataset with word and its word count

4. OCR:

For image tagging words are extracted from labeled image. **Input :** Labeled Image **Steps :** Step 1 : Get labeled image Step 2 : Rough Pre-processing of image Step 3 : Search and recognition of the first character Step 4 : If feasible accuracy achieved then goto step 5 else goto step 1 Step 5 : Position Evaluation of next character Step 6 : Again preprocessing of image Step 7 : Search and recognition of first character Step 8 : If feasible accuracy is not achieved goto step 5 else goto step 9 Step 9 : All characters are recognize and stop **Output :** Text extracted by labeled images

5. Keygen: Input :

Selection of key generation option **Steps :** Step 1 : Public key is generated Step 2 : Private key is generated **Output :** Public key for encryption and private keys for sharing is generated

6. RSA:

RSA is used to encrypt and decrypt data stored on cloud **Input :** Raw text **Steps :** Step 1 : Choose two prime numbers, Prime1 and Prime2 to get the ProductOfPrime1Prime2 variable Step 2 : Find the Totient of ProductOfPrime1Prime2 (ProductOfPrime1Prime2) = (Prime1 -1) * (Prime2 -1) Totient = (Prime1 -1) * (Prime2 -1) Step 3 : Get a list of possible integers that result in 1 mod Totient EncryptPrime * DecryptPrime = 1 mod Totient (Totient * AnyInteger) + 1 = 1 mod Totient Step 4 : Choose a 1 mod Totient value with exactly two prime factors: EncryptPrime and DecryptPrime Step 5 : Actual Encryption CipherText = Plain- TextEncryptPrime mod ProductOfPrime1Prime2 Step 6 : Actual Decryption PlainText = CipherTextDecryptPrime mod ProductOfPrime1Prime2 **Output :** For encryption we get cipher text and for decryption we get plain text

7. BST :

Binary search tree. To find appropriate document from I : searchable index tree **Input :** Keyword for search **Steps :** Here k is the key that is searched for and x is the start node. BST-Search(x, k) Step 1 : y = x Step 2: while y != nil do Step 3: if key[y] = k then return y Step 4: else if key[y] > k then y = right[y] Step 5: else y = left[y] Step 6: return (NOT FOUND) **Output :** Expected Search result

C. Mathematical Model

$$S = \{ I, O, P, U \} \quad U = \{ DO, DU \}$$

Where, DO = Data owner DU = Data User

$$I = \{ DC, UAD, SK, PK, W \}$$

where, DC = Uploaded Document UAD= User Authentication SK = Secret key W = set of n keyword to search

$$O = \{ EDC, DDC, In, TPK \}$$

where, EDC = Encrypted Document DDC = Decrypted Document In = Index Tree TPK = Top K document

$$F = \{ UA, KG, ENC, DEC, GI, SE, GQ, SS \}$$

where, UA = User Authentication KG = Key Generation ENC = Encryption of Document using RSA DEC = Decryption of document using RSA

GI = Generation of index tree

SE = search GQ = Query generation for W keywords SS = Synonym search

D. Set Theory

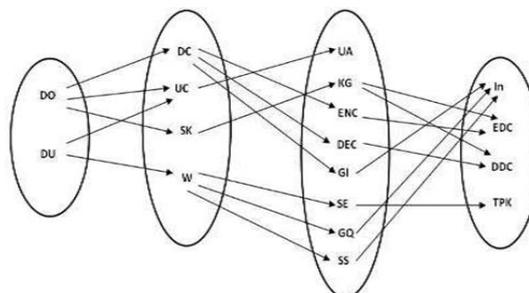


Fig. 2. Set Diagram

IV. CONCLUSION

Proposed system is decentralized system in which distributed nodes work together for data security on cloud by implementing encryption facility, also these nodes manage multi user tasks like sharing, writing data, reading data etc. Due to this decentralized approach keys are managed at different nodes hence cloud is not having keys for decryption hence data security is assured. Also KDC is not having data hence only encryption keys are not useful to it. Three types of users like owner, writer and reader have respective access control to the data. Hence this system also manages hierarchical scenarios as far as user's role is concerned.

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