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Research Article

Secure and Efficient Content-Based Image Retrieval in Cloud Computing

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Abstract

Many cloud stages rise to meet earnest requirements for extensive volume of individual image store, sharing and search. In fact most of those images contain sensitive secure data and individuals' protection concerns ruin their investment into untrusted services, the present cloud stages give little support to image security assurance that is privacy protection. Confronting extensive scale images from numerous clients i.e. user's, it is extremely challenging for the cloud to keep up the record structure and schedule parallel calculation without learning up anything about the image contents and indices. In this work, present : a Privacy-protecting Image Search framework on Cloud, or, in other words towards possible cloud services which give secure content based extensive scale image search with fine-grained access control using global color algorithm. Users can search on others' images on the off chance that they are approved by the image owners. Larger part of the computationally serious part is handled by the cloud, and a querier can now simply send the query and get the search outcome. Specially, to manage enormous images, will designed our framework suitable for distributed and parallel calculation and introduce several optimizations with further facilitate the search procedure.

Keywords *Cloud Computing,Large-scale Image Search, Privacy Protection,Encryption*

Introduction

With advancement in digital technology powerful electronic devices like mobiles, digital cameras with high resolution capacity and quality are developed. Using such devices the craze of capturing photos and selfi is increased which results in rapidly increasing images and photos. Storing of all images on personal device like mobile or laptop requires large memory. With rapid increase in images it is inefficient to store them on personal device due to limited storage and performance reasons. Thus need to use cloud storage as service. The personal images consist of user's private information that needed to be prevented from unauthorized access. So to store these images there is need of secure personal Image storage that protects user's privacy from unauthorized users. The drawback of cloud computing is vendor locking in and security concern. The cloud administrator has full rights to access data on cloud .so the cloud can able to learn about user's contents, user interest and can gain knowledge about user using user search queries and data storage on cloud. Also sharing of images as it is on cloud is not secure .So there is need to store share and search images privately with privacy protection on cloud. Image consist of sensitive information about user like users face , location details, event details that are needed to keep secure from unauthorized access to maintain user's privacy. On internet most of copyrighted images with watermark are displayed as it is but download option is not provided to prevent its misuse. But using watermark the image contents cannot protected as they are displayed so any one can copy its content and can misuse it. Also watermark can be removed using different techniques eg Zhang's algorithm can extract watermark. Most of services provided on internet are not trusted. Some hackers create phishing websites or spoofed site to hack users confidential information by gaining belief of user. Some mobile applications like antivirus applications and cloud based storage applications steal users' information without users knowledge. So, risk of un-trusted services is increased Content based image search retrieves the images based on its content. In content based image search, image features are extracted based on colour, edge and texture detection and using this image feature vectors image is searched. Content based image search gives good matching search results.Once images are uploaded on internet they are at risk and not remain secure as internet is highly used for information sharing purpose. Number of service providers support image or video services based on cloud. Content based image search allows searching images /videos based on their contents and

used in many applications like criminal investigation and personal image or video management. Image search system extracts the distinctive feature descriptors of images to measure their content similarity. Image usually consists of hundreds of feature vectors .Large number of images uploaded on cloud will consist of billions of feature vectors. So, it's necessary to use indexing for search process. But most of efforts taken previously did not support image privacy protection.The image can be reconstructed using feature vectors and is seem to be absolutely identical to original image and gives a good match with original image. So to protect personal images the private content based system is necessary. TRIC –will keep the user images secure from cloud service provider using homomorphic encryption. The images, user data and search results are prevented from cloud learning. Upload image on TRIC first, so it will be protected with unique DImId which act as user's copyright, then download it and use that downloaded image on internet to protect image and prevent its misuse.

Review of Literature

This System provides privacy protection for photo sharing and searching without leakage of query contents and result. Personalized private content can be defined using checkbox configuration. This system either automatically or manually determines rectangular ROP(Region of Privacy).Then ROP is separated into public and secrete part. To prevent sensitive information, secrete part is encrypted. Only legitimate users can access secrete part and retrieve ROP with key. For ROP separation the technique reviewed are Mask, P3,Blur [1].

This system aims to minimize redundant data for enhancing query proficiency and minimizing operation cost. The main function is to fast identify similar images from massive image dataset in cloud [2].

In this system, without exposing owner's data privacy the feature descriptors which are based on secrete data are acquired. First each image set is encrypted and then cipher text is distributed to two independent servers. Then server returns encrypted feature descriptors to owner of data who is able to retrieve actual feature descriptors [3].

The proposed system supports CBIR over encrypted images without leaking the sensitive information to the cloud server. Firstly, for representing images their feature vectors are extracted. Then, by using locality-sensitive hashing the pre-filter tables are constructed to enhance search proficiency. The water marking technology used to prevent illegal distribution of images. Watermark is directly implanted into images that are encrypted. It also allows searching over encrypted images [4].

In this work problem multi-keyword ranked search over encrypted data with privacy-protection in cloud computing (MRSE) is defined and solved. Performs multi keyword ranked search over encrypted data. Encrypted index that is searchable from data documents is used. For measuring similarity coordinate matching and inner product similarity is used [5].

The proposed framework provides storage and retrieval of images in large image repositories with privacy protection.

It is based on Image Encryption Scheme called IES-CBIR that displays properties dependent on Content-Based Image Retrieval. All data sent to cloud is encrypted for ensuring users privacy. Image texture is encrypted using probabilistic encryption for protection purpose. Colour information is encrypted using deterministic encryption. Colour information is used for image retrieval and content based image indexing. The solution enables encrypted storage as well as searching using CBIR queries with privacy protection [6].

This proposed work, allow to deploy the CBIR service and image database to the cloud with privacy protection without displaying the real content of the database to the cloud server. Uses the local features for retrieving image based on its content. Uses EMD –Earth Movers Distance for calculating similarity of images. For improving search efficiency similar images are grouped together. The owner is responsible for producing searchable index before forwarding data to cloud. This scheme allows searching and CBIR on encrypted data. Authorised user uses encrypted query for searching image on cloud [7].

This framework is designed to store search and retrieve images that are dynamically updated with privacy protection on cloud. The main aspect is to reduce overhead of client. Image colour information and texture information is separated that allows to use different encryption techniques. Global Colour features are encrypted using deterministic encryption and used for indexing and searching of images based on similarity. Encrypted images stored on cloud and Search query is encrypted [8].

In this paper SIFT(Scale Invariant Feature Transform) and homomorphic encryption is used for preserving privacy of images Difference of Gaussian transform is executed for extracting the feature points. The images are twisted together with Gaussian Filters. Dissimilarity is calculated between two adjoining Gaussian blurred images. Using homomorphic encryption image is encrypted to maintain user's privacy. Focus on homomorphic comparison of encrypted data. Two encrypted data are compared based on their locations.

Pixels, locations are not encrypted and thus SIFT feature location is public and will not break privacy as feature vectors related to them are in encrypted form. Demanding issue of homomorphic comparison is resolved in this paper [9].

This system is designed to perform social discovery based on images to increase the friends list of user depending on their common interest securely and

efficiently using encryption. The social interest of user determined based on BOW(Bag Of Word) representation. Then compact and secure similarity index is designed which enables fast and scalable similarity based search on millions of encrypted images of user's profile vectors and is done by using BOW model by extracting visual content with similarity [10].

In this work, the problem of verifiable privacy preserving multiparty computation is focused. They presented ranging protocol based on two party thresholds which is justifiable for both input and output and provides privacy protection. They also proposed testable ranking protocol for participant and aggregator model [11].

In this paper, without using secure communication channel or trusted key issuers the privacy protected sum and product calculation protocols are accomplished. They proposed some protocols that give assurance of data privacy under semi honest cloud model. Then also proposed some advanced protocols which sustain up to k passive adversaries who do not interfere with computation [12].

In this work, they designed searchable encryption that supports precise multi-keyword ranked search and flexible functioning on document. Top search efficiency can be achieved by implementing proposed Greedy Depth First Search algorithm. The proposed system is designed to support multi keyword query, ranking accurate results and also provides dynamic insertion and deletion operation on document collection [13].

In this work, effectual usage of encrypted data which is remotely stored on cloud is accomplished by solving problem of giving support to efficient ranked keyword search. Also the accuracy of file retrieval is established.

In this approach, the problem of feature selection and vehicle detection classification is focussed. They have designed enhanced normalization algorithm for chosen feature values to minimize in intra class difference and to increase inter class variability. The proposed solution for vehicle detection is based on features like Haar and RBFSVM. To show its efficiency this approach is theoretically and experimentally analysed [15].

Proposed Methodology

The Aim of proposed approach is to prevent the image privacy of user from unauthorized access for that it uses access policy-Public, Private and Only me. To implement CBIR - First, image feature vectors, image and image data should be encrypted using homomorphic image encryption. System store this encrypted Image data on cloud. Third, the images with private access policy when searched, the result is displayed in encrypted form and cannot downloaded without a secrete key. Finally user will be able to store search and share images on cloud with privacy protection. For implementing these following algorithms will provide support1. Global Color

2. Homomorphic Encryption

A. Architecture

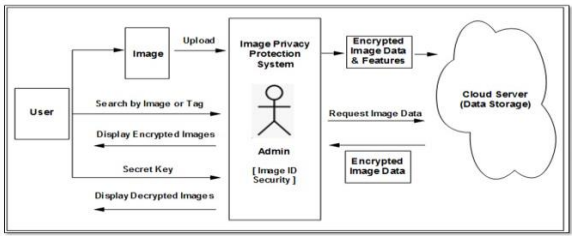


Fig. 1. Proposed System Architecture

B. System Specification Requirements

Hardware Requirements:

1. Processor - Intel i3/i5/i7
2. Speed - 1.1 GHz
3. RAM - 2 GB(min)
4. Hard Disk - 40 GB
5. Floppy Drive - 1.44 MB
6. Key Board - Standard Windows Keyboard
7. Mouse - Two or Three Button Mouse
8. Monitor - SVGA

Software Requirements:

1. Operating System - Windows 7/8/10
2. Application Server - Apache Tomcat 7/8/9
3. Front End - HTML, JDK 1.8, JSP
4. Scripts - JavaScript.
5. Server side Script - Java Server Pages.
6. Database - My SQL 5.0
7. IDE - Eclipse Oxygen

C. Algorithm

1. Homomorphic Encryption

Java provides a class Base64 to deal with encryption. You can encrypt and decrypt your data by using provided methods. You need to import java.util.Base64 in your source file to use its methods. Base64 is used to prevent data from being modified while in transit through information systems, such as email, that might not be 8-bit clean (they might garble 8-bit values). For example, you attach an image to an email message and want the image to arrive at the other end without being garbled.

2. Global Color Algorithm 1. The procedure to search in a repository R with query image Q.

2. The input for this operation on the user side is IDR, Q,repository key rkR, and parameter k (the number of most similar results to be returned).

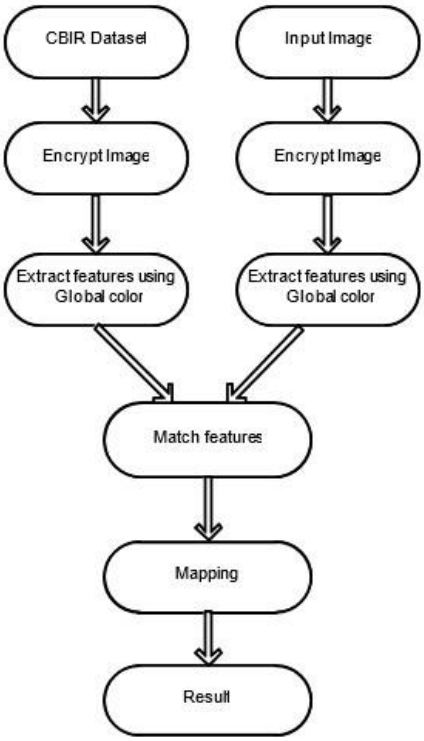
3. User U starts by generating Q's searching trapdoor CQ,through IES-CBIR.

4. Then sends it to the cloud server, along with k and IDR,as parameters for the Search remote invocation.

5. The cloud starts by extracting CQ's feature-vector, stemsit against CBR to determine its visual words vwCQ, and accesses IdxR with them to retrieve the respective posting lists PLvw.

6. Then, for each image referenced in each of the postinglists retrieved, the cloud calculates its scaled tf-idf score and adds it to the set of results for the query. In this set, scores for the same image but different visual word are summed.

7. Finally, the cloud sorts this set by descending score andreturns the results to user.



D. Mathematical Model

1. Mathematical Equations of Color Feature ExtractionMethod

The color distribution information can be captured by the low-order moments, using only the first three moments: mean, variance and skewness, it is found that these moments give a good approximation and have been proven to be efficient and effective in representing the color distribution of. These first three moments are defined as:

$$\mu_i = \frac{1}{N}\sum_{j=1}^{N} P_{ij}$$

$$\sigma_i = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(P_{ij} - \mu_i)^2}$$

$$S_i = \left[\frac{1}{N}\sum_{j=1}^{N}(P_{ij} - \mu_i)^3\right]^{\frac{1}{3}}$$

Where, Pij is the value of the ith color channel of the jth image pixel. Only 3 x 3 (three moments for each color component) matrices to represent the color content of each image are needed which is a compact representation compared to other color features.

2. Mathematical Equations of Canny Edge Detector MethodStep1: Smooth the image with a Gaussian filter to reduce noise and unwanted details and textures.
Step2: Compute gradient of g (m, n) using any of the

$$g(m,n) = G_\sigma(m, n) * f(m, n)$$

$$G_\sigma = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(\frac{m^2+n^2}{2\sigma^2}\right)$$

gradient operations (Roberts, Sobel, Prewitt, etc) to get:

3. Mathematical Equations of Texture Feature Extraction

$$M(n, n) = \sqrt{g_m^2(m,n) + g_n^2(m,n)}$$

And

$$\boldsymbol{\theta}(m, n) = tan^{-1}[\, g_n(m, n) / g_m(m, n)\,/]$$

Step3: Threshold M:

$$M_T(M, n) = \begin{cases} M(m,n) \text{ if } M(m,n) > T \\ 0 \qquad\qquad Otherwise \end{cases}$$

Method

According to co-occurrence matrix, there are several textural features measured from the probability matrix to extract the characteristics of texture statistics of remote sensing images. Correlation measures the linear dependency of grey levels of neighboring pixels.

$$\text{Correlation} = \frac{\sum_{i=0}^{Ng-1}\sum_{j=0}^{Ng-1}(i,j)p(i,j) - \mu_x\,\mu_y}{\sigma_x\,\sigma_y}$$

Results and Discussion

Experimental evaluation is done to compare the proposed system with the existing system for evaluating the performance. The simulation platform used is built using Java framework on Windows platform. The system does not require any specific hardware to run; any standard machine is capable of running the application.

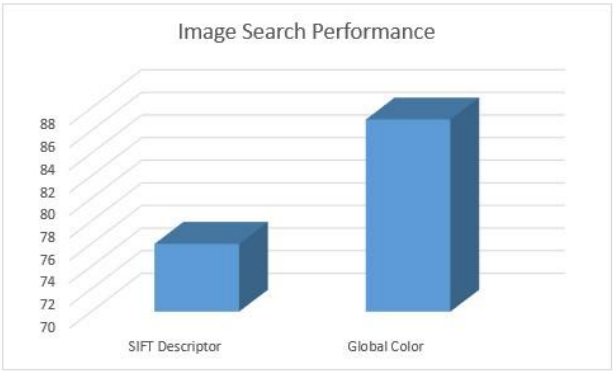


Fig. 2. Algorithm Comparison

Table 1:Accuracy Analysis

Sr. No.	Sift Descriptor	Global Color
1	76%	87%

Conclusion

The proposed system-CBIR will search store and share images securely with Image privacy protection on cloud. Images are searched using encrypted feature vectors so; query privacy will be preserved from cloud. Images are encrypted using homomorphic encryption and then stored on cloud so, image privacy will be prevented against cloud learning. Only authorized users will be able to share images using secrete key.

Future Scope

In this proposed approach we studied and analyzed only image privacy protection, in future multimedia content privacy protection is needed. In Proposed approach we have used stegnography to provide hidden copyright to images which will identify image owner. In future stegnography can be used to provide hidden copyright for multimedia contents like image, video, audio etc.

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