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Promising Large Scale Image Retrieval by using Intelligent Semantic Binary Code Generation Technique

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Abstract

A scalable content based image retrieval system for large-scale www database is designed and implemented. Million images on internet is big challenge for accurate and efficient image retrieval as per user requirement. Proposed system exploits semantic binary code generation techniques with semantic hashing function, fine and coarse similarity measure technique, automatic and manual relevance feedback technique which improve accuracy, speed of image retrieval. With dramatic growth of internet technology, scalable image retrieval system is a need of recent web based image retrieval applications such as biomedical imaging, medical diagnosis, space science application etc. Proposed system accomplish requirement of scalable, accurate and swift image retrieval system. Experimental result clearly shows that performance of image retrieval is improved in term of accuracy, efficiency and retrieval time.

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Keywords: Accuracy; content based image retrieval; hashing function; large scale database; retrieval time; web based image retrieval;

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1. Introduction

Advance development in Internet technologies result in generation of large-scale image data which help to decipher crisis in existing computer vision and numerous real-world applications. These large scale image dataset need competent large-scale processing techniques for efficient and effective image retrieval system. For browsing and searching image from large data, user necessitates compelling interfaces and functionalities for capturing visual attributes. Image retrieval is related to the fields of image processing, multimedia, digital libraries, remote sensing, astronomy, database applications and others related area.

1.1. fundamental of content based image retrieval

Image retrieval is deal with searching and retrieving digital images from a huge database. An effective image retrieval system is able to operate on the collection of images to retrieve the relevant images based on the query image which conforms as closely as possible to human perception. According to database management and computer vision communities, there are two different perspectives, text-based and content or visual based. Text-based image retrieval techniques use text to describe the content of the image and content based image retrieval used image visual features to describe the content of images.

- Conventional or text based image retrieval

Conventional image retrieval is text based retrieval system where keywords are used as descriptors to index an image. Text-based image retrieval techniques use text to describe the content of the image which often causes vagueness and insufficiency in performing an image database search and query processing. Weakness of text based image retrieval is difficulty in specifying exact terms and phrases in describing the content of images as keywords. Textual annotations are based on language, difference in annotation change retrieval result totally.

- Content or visual based Image Retrieval

Visual Image Retrieval is content based image retrieval system use visual features such as colour, texture, shape and spatial relations and or high level which extracted from the image itself.

1.2. Need of improvement in large scale image retrieval

Large scale image search is challenging search for particular image through a large database to find similar target images. It involve internet search to find similar images. Basic requirement of today's search engine is that it should be fast, accurate and scalable to large data set. As per prerequisite of many real word application such as medical application, space application etc., they need fast and accurate retrieval result. Internet is full of millions of images which increase rapidly as with growth of internet, hence, it is really challenging to measure similarity between images and image retrieval system with large and growing database. Existing image retrieval systems are slightly imprecise, time consuming and not scalable. To overcome these issues, research need to improve accuracy and speed of existing image retrieval system.

2. Recent related work

In this section, we discuss some recent innovative development in large scale image retrieval field such as Sentiment of image detection, image search boosted with iterative quantization hashing method, removal of noisiness in retrieval by two sage searches with query log analysis. New-fangled techniques in large scale image retrieval technique are also involved such as latent semantic analysis, query-adaptive reranking, and dimensionality reduction methods, a novel indexing based on a graphical model or a matrix factorization.

Coupled Binary Embedding for Large-Scale Image Retrieval is introduced with successful and accurate image retrieval [1]. Proposed system exploits multiple binary features at indexing level, multi-IDF scheme, hamming embedding and the fusion of binary colour feature into image retrieval. Content-based large-scale image retrieval using framework of VLAD and Product Quantization is proposed [2]. The system is employing more efficient and discriminative local features, improving the quality of the aggregated representation; and optimizing the indexing scheme. Latent semantic analysis is applied successfully and cost effectively to large-

scale medical image databases [5]. The Latent semantic analysis is applied effectively to large dataset by skipping the SVD solution of the feature matrix. Iterative quantization hashing method is successfully implemented large scale image retrieval system with query-adaptive reranking to achieve good search performance [7]. High Dimensionality is one of the main problems faced by large scale image retrieval. Dimensionality reduction methods are reduced the dimensions of feature vectors while maintaining high performance [4]. These methods can be used to generate vocabulary trees based on it process large-scale image retrieval. Sentiment of image detection in Large scale image retrieval are effectively performed by using Large-scale visual sentiment ontology and detectors using adjective noun pairs with significant improvement in detection accuracy [8]. This system understands sentiment in image and constructs a large-scale Visual Sentiment Ontology and Second concept proposed SentiBank. Many text indexing techniques have been applied in large-scale image retrieval systems to support accurate visual search [9]. But, different indexing techniques are expected for image query and text query as there is lot of difference between these two types of queries. Large scale visual search with new indexing technique is proposed which implements decomposion achieved via a graphical model or a matrix factorization approach.

A new document image descriptor based on multi-scale run length histograms used for large-scale applications [10]. The contextual visual vocabulary merges both spatial and semantic clues which provide best in both retrieval precision and efficiency for large-scale near-duplicated image retrieval [11]. Large scale image retrieval is present with sketched based image feature where image search is start with similar structure, analyzing gradient orientations [12]. The query log of a real CBIR system is designed for large scale retrieval [14]. In this system, similarity caching system stores the results of recently/frequently submitted queries and associated results. To deal with especially noisiness in large scale image retrieval based content, a dynamic two-stage retrieval approach is proposed which improve effectiveness [15]. Dynamic two-stage method can be significantly more effective and robust by using local feature derivatives in the visual stage instead of global.

3. Design and implementation of large scale CBIR

Proposed large scale image retrieval system consists of feature extraction, content database, semantic binary code generation, similarity matching, retrieval and inverted indexing, and automatic relevance feedback as shown in fig.1.

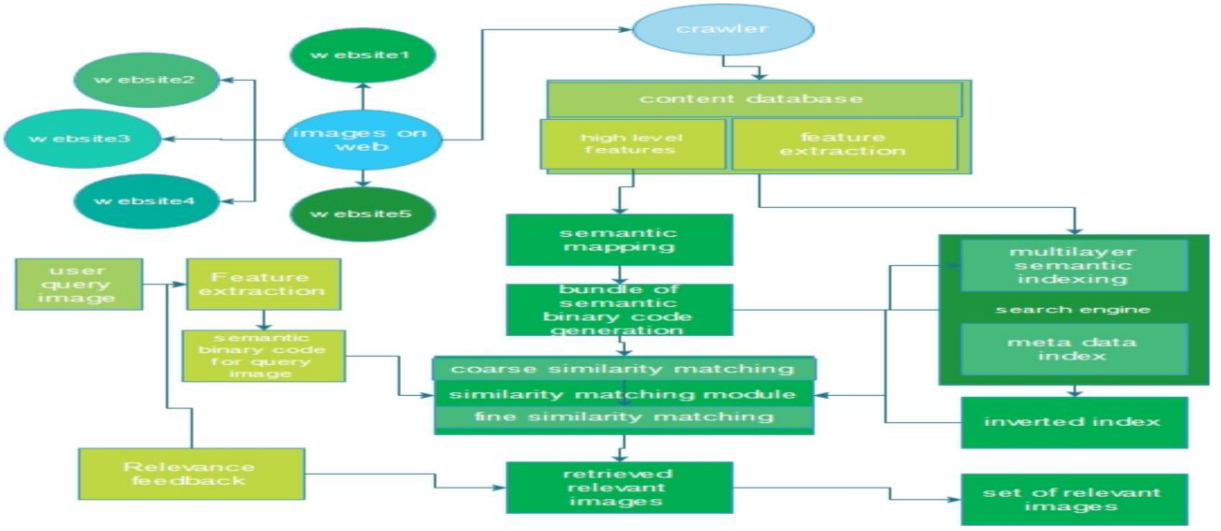

Fig.1. Framework for large scale image retrieval system

- Feature extraction

  When user give input in the form of query image its features are extracted and store in feature vector which

convert into semantic small binary code and compare with binary code of images stored in address space.

- Web Crawling

User fired query to internet and discover required image on the hundreds of millions of Web pages that exist, a search engine utilize special software robots, spiders, to build lists of the words found on Web sites. When a spider is building its lists, the process is called Web crawling. Features of images after web crawling are extracted, Association rule mining is applied to the domain of large-scale feature data find semantic relationships between keywords and visual features. Finally binary code for them generate through semantic hashing function.

- Content database

It consists of low level features extracted from images which are mapped to semantic high level features by using machine learning techniques. It has multi layer indexing system for fast and accurate image retrieval. It has also indexing for metadata associated with image.

- Bundle of semantic binary small code

Compact binary codes are store image in very small space only with a few hundred bits per image. Proposed It is very efficient technique to retrieve image from huge database. In proposed system, semantic hashing function exploit for binary code calculation and presentation in image feature database as shown in fig.2 (a) and (b). Semantic hashing function is used to produce binary code for image and store it into address space of memory by using the hamming distance and make bundle of similar binary code which used for fast image retrieval.

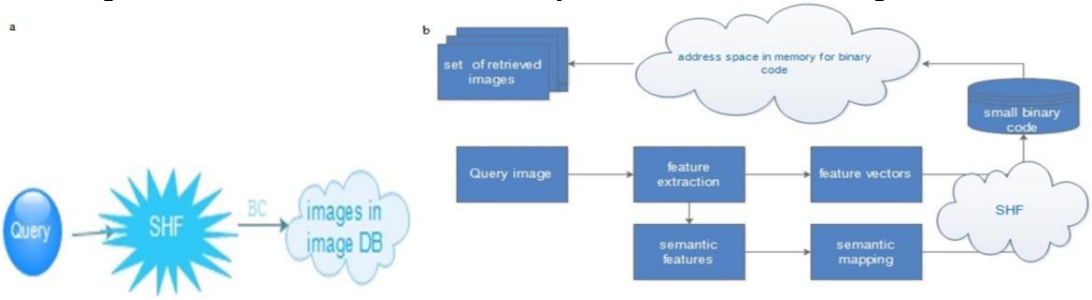

Fig.2. (a) Semantic hashing for binary code in image retrieval; (b) image retrieval flow

- Indexing and retrieval

An inverted-file index for large-scale indexing and retrieval is use for proposed system. An inverted index is an index data structure storing which mapping from content, such as words or numbers, to its locations in a database file. After similarity matching, images relevant to query image are retrieved.

- Similarity measure

The large-scale image retrieval process involves of two major steps: the first step generate the inverted index of the database for filtering a large number of irrelevant images swiftly and decrease the number of entrant images, the second step is coarse-to-fine similarity measure which carried out matching of candidate images to the query in more minutiae. Then coarse similarity measure is performed still with large number retrieved images. Finally, fine similarity measure ranks the final retrieval results. a hierarchical retrieval structure is generated.

- Relevance feedback

After retrieving set relevant images, automatic or manual feedback is given to set of retrieved images. Relevance feedback improves accuracy of image retrieval.

4. Experimental evaluation

A completely working large scale image retrieval system has been proposed, implemented and tested by using four large dataset. As per typical image retrieval system as shown in fig. 3(a), input to system is given by user in the form of query image and output from system is set of relevant images which are mark as relevant or irrelevant by user in relevance feedback mode to improve accuracy of the system. Table 1 shows efficiency of the proposed system for given query images.

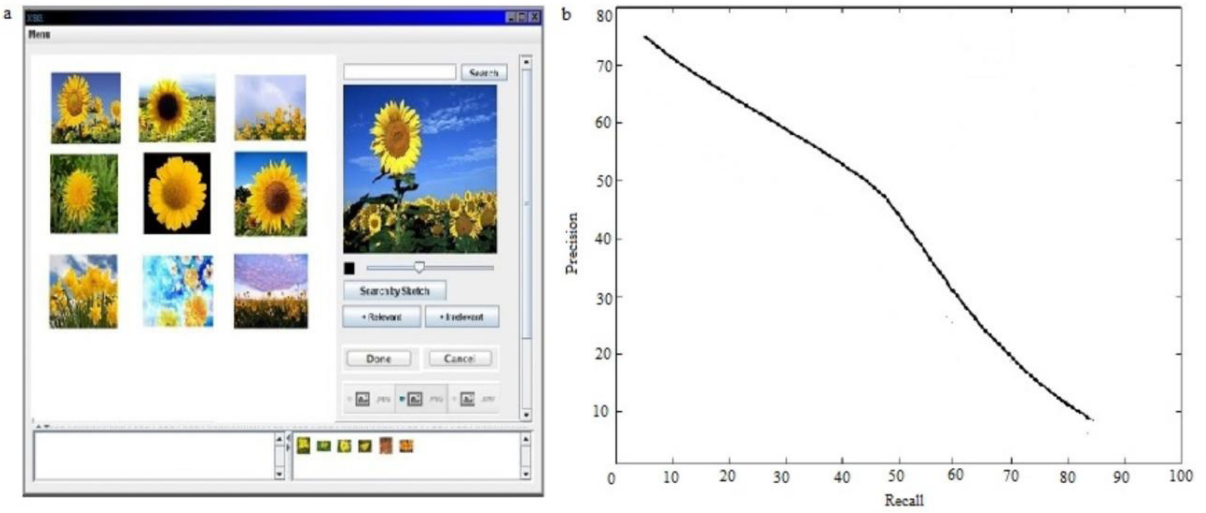

Fig.3. (a) Search result; (b) precision and recall curve for given query image.

The system crawled large number of images from four data sets and select 150 representative images from the ground truth set as images for queries. For each query image, we calculate its precision-recall curve as shown in fig.3 (b), from which get its average precision and then obtain the mean value over all queries. Precision and recall for given set of databases is calculated as shown in fig.4.

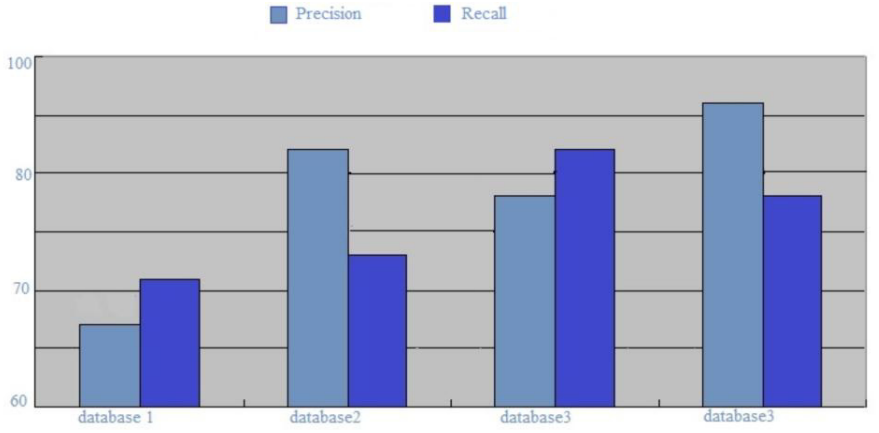

Fig. 4. Precision and recall for given datasets

Table 1. Efficiency measure for proposed system.

User queries	Efficiency achieved			
	Data Base 1	Data Base 2	Data Base 3	Data Base 4
Query1	51%	49%	48%	46%
Query2	48%	44%	46%	41%
Query3	66%	55%	48%	39%
Query4	55%	42%	48%	51 %

5. Conclusion

This paper introduced large scale image retrieval system which address the crisis caused due to every day huge growth of internet technology. Large scale image retrieval is related to the field of computer vision, computer graphics, image processing. Proposed system successfully implement semantic binary code generation techniques with semantic hashing function, automatic and manual relevance feedback technique and improve accuracy, speed of image retrieval.

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