

Adaptive Content Based Image Retrieval System Using Neural Network

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ABSTRACT:

Methods for image retrieval does not sustain for the ever extending image dataset. There are some limitations of keyword based image retrieval, like manual annotation is not always accessible, is not possible for a large database, and is not correct. These limitations can be removed by using contents of the image for image retrieval. This type of image retrieval is called as Content Based Image Retrieval (CBIR). CBIR is concern around the visual features like color, shape and texture. In this paper, we have establish a method that has no previous information about the images inside the dataset, yet retrieval is carried out taking into consideration the content information of the images likely to be called as CBIR. Scale-invariant feature transform (or SIFT) is an algorithm to identify and explain local features in images for computer vision. Radial basis function (RBF) networks are feed forward networks which are trained using a supervised training algorithm. They typically consist of a single hidden layer of neurons whose activation function is selected from a set of functions called basis functions. Here, by using CBIR methodologies we have taken out multiple image features which are then clustered using K- means clustering algorithm; which are then given to radial basis function neural network for retrieving relevant images.

The retrieval method has been implemented on two CBIR systems, one using multiple features and the other using only RBG feature. The results obtained are positive and we have obtained higher precision (81.93%) using multiple features than that of using only RGB (41.18%). Experiment demonstrates that the proposed system get better results of retrieval system.

KEYWORDS- Image retrieval; CBIR, Neural Network; k-means clustering; SIFT

INTRODUCTION:

The large development of digital images in our lives obliges efficient image content management framework for image storage capacity and retrieval. The early image retrieval methods are taking into account physically explained depictions and have the emanating drawbacks. Firstly, manually annotation is an excessively costly for vast database. Next, the annotation is subjective and context dependent. In previous days, content based image retrieval (CBIR) turned into a dynamic and quick developing area of research. CBIR is a strategy for image retrieval that ventures images (from the database) that are like the query images focused around visual content.

In CBIR framework, [1] it is likely to retrieve images identified with one picked by an individual. Accordingly we have the capacity beat the downsides of the content central recovery frameworks .The chief advantages of this technique is the likelihood of a automatic retrieval system, differing to the time and efforts expected to explain images. In this paper [2] it was centered on images of particular area that are stored in databases. Generally Classification can be completed with the backing of various filtration repeatedly however to have the capacity to classify the image an advanced framework named Neural Networks is utilized. Following figure 1 depicts general CBIR system.

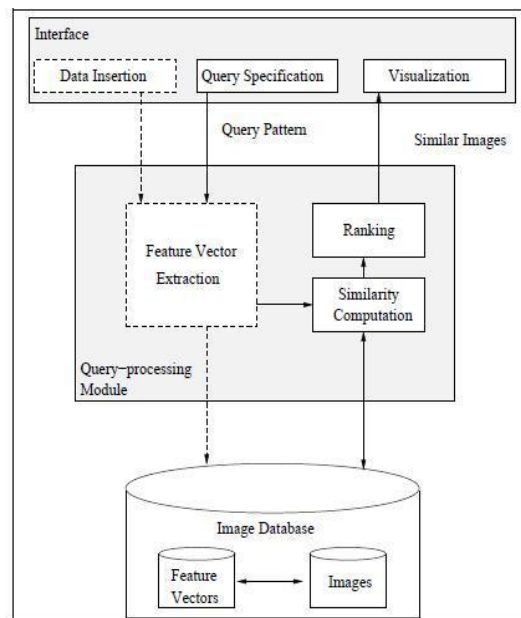


Figure 1. Content Based Image Retrieval-CBIR systems[1]

An invariant technique for Content Based Image Retrieval (CBIR) make use of Scale Invariant feature Transform (SIFT) algorithm for binary images and gray scale. The encouragement to exploit SIFT for CBIR is because of the way that SIFT is invariant to translation, rotation and scale also invariant to comparative distortion and some changes. Aggravated by these information, [3] discover the basic possessions of SIFT for CBIR by employing image dataset. Their technique utilizations distinguished various key points as well as its descriptors to contest between the input images and images from the dataset. CBIR methodologies are originally in searching for specific images; vary for an individual specific category from a dataset of digital images. There are several sorts of images to be measured, for example grayscale, binary and listed images. All in all, binary representations are normally proper if the image being be taken into consideration is of contour. It brings in a method to focus the topological formation of a input binary image. Frequently, a binary image is made out of two colors; white and black. For a CBIR methodology, the use of a binary image prompts many points of interest when differentiate with using valued bit-wise operations. Here, in our projected method we are extracting various features like GLCM features, image shape features, HSV features and SIFT. So it will give better result that is we can get all the content based images related to input image. The paper is composed as takes after. Section 2 describes the related work of image retrieval. In Section 3, we give a illustration of the CBIR model with K-means. Summary and Test results are explained in Section 4. At last, Sections 5 talk about our future works and conclusion.

RELATED WORK:

In this paper [4], global picture property based CBIR utilizing a feed-forward back propagation neural network is proposed. At the outset, the neural system is organized for the peculiarities of images in the dataset. The picture peculiarities considered here are color histogram, GLCM as composition descriptor and edge histogram. The preparation is done utilizing back proliferation calculation. Veera Jyothi et al.[5], stated that, in the initial approach the retrieval strategy must be flexible such that it can provide the preferences of different users. Relevance feedback (RF) understanding has been projected as a strategy directed at reducing the semantic gap. This paper [6] represents references about hundreds of images regarding content based image retrieval. They have mentioned different techniques used for content based image retrieval, role of semantics, different types of images, sensor gap etc. In this paper author also discussed about sorting techniques by texture, color, various different features like HSV, shape, entropy, correlation, texturefeaturesetc. In this paper [7], the key point of the image mining is to reduce the information reduction and extracting the important data onto the individual expected requirements. The snap are preprocessed with diverse methods and the texture calculation is extremely focused. Here,

photos are clustered predicated on Texture values, RGB Components and Unclear C mean algorithm. Chun et al. [8] proposed a CBIR technique predicated on an efficient grouping of multi resolution organization and shade features. The shade uniqueness utilized in this paper are color autocorrelation programs of the saturation and hue aspect pictures in HSV shade space are used. The structure distinctiveness used contains huge difference of block deviation and inverse probabilities of local relationship coefficient moments of the value aspect image. In this paper [9] Y Zhu utilize phantom histogram highlights, the histograms of sifted pictures to catch the spatial relationship among pixels and in addition worldwide appearance of the pictures. They then locate the ideal technique of histogram components utilization with variable investigation to lessen the measurement of components and expand the separation. Test results on a subset of Corel dataset exhibit the viability of the proposed strategy and correlations show that the proposed technique gave noteworthy change over different techniques In this paper [10] proposed by D. Mahidhar retrieves the pictures based on the content in the picture and it also displays the association between available picture in the database with the objective image we are searching for. This is very quick and resourceful method for retrieving the exact picture from large databases. In this paper [11] C.R.Durai proposed method to extract different features from pictures using DCT extract related features by utilizing information obtained and by using Gaussian Fuzzy FFNN algorithm for sorting and optimizing the learning rate and momentum by means of genetic algorithm. This paper [12] first merges segmentation and grid module, neighborhood and K-means clustering module as well as feature extraction module, to build the CBIR system. Moreover, the concept of neighborhood module which recognizes the side of every grids of image is first contributed to this paper. This scheme architecture uses concept of fragment based code book into the CBIR system. The result of experiment verify that the proposed CBIR system architecture effort better result for image retrieval This paper [13] allows one of the well-organized retrieval strategies in CBIR, where the usage of IGA permit useful and accurate effects in association to the conventional technique that are resulting from visible features; the IGA policy has an active system to link the dissimilarity between individual perception and visible features. As these features & behavior of IGA technique of image retrieval comes up a job of CBIR at more considerable level. This paper [14] provides a broad review of new utility of narrowing down the 'semantic distance'. We've recognized five key types of state-of-the-art method Using object ontology to decide high-level spotlight on the differences between CBIR with traditional techniques with low-level functions and high-level semantics, this paper also offer for good ideas of how to obtain salient low-level functions to aid 'semantic functions, this paper also provides for good ideas of how to acquire salient low-level functions to aid 'semantic distance' reduction. In addition, recent techniques in picture likeness calculation are explained.

The SIFT (Scale Invariant Feature Transform) key points defined in this report [15] are specially useful for their distinctiveness, which allows the correct fit for a key point to be selected from a big repository for other key points. Any key points may be extracted from common pictures, this leads to robustness in removing little items among clutter this report presents the key points recognition by utilizing the Radial Basis Function.

It is shown in this paper [16] that a composite of a proper set of sigmoid functions may still be good for RBF networks. In addition, a network of this type of activation function presents powerful capability for function approximation, especially for constant valued functions.

In this paper [17] an RBF network is proposed which is based on series of a robust objective function and sigmoidal functions. The former restore the Gaussian functions as the beginning function of the network so that constant valued functions can be approximated accurately by an RBF network, while the latter is used to restrain the influence of large errors.

In this paper [18], author initiates Image Retrieval of image based on Neural Network (NNIR) system, an approach to CBIR using Radial Basis Function network (RBF). This method shows nonlinear relationship between features so that much precise correspondence comparison between images can be supported and allows the user to submit a coarse initial query and continuously refine his information need via relevance feedback.

IMPLEMENTATION DETAILS:**A. SYSTEM ARCHITECTURE:**

Following Figure 2 shows proposed system architecture. The detailed description is as follows:

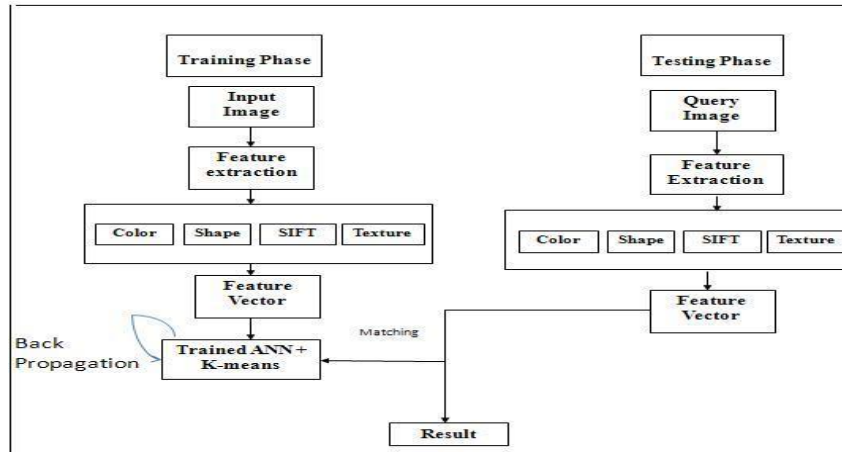


Figure2. Proposed System Architecture

TRAINING PHASE:

1. Input Images: We are processing dataset of different images (wang dataset). At the training stage consider available dataset of images only as input for indexing process.
2. Feature extraction: At this stage we are extracting the different features of the image like color, shape (GLCM features), SIFT, Texture etc. Indexing of all the extracted features can be done here. This information can be utilized for searching the image related to query image.
3. Feature Vector: All the extracted features are stored in vectors for future use. Trained ANN and K means clustering: Here different feature vectors are classified using k means clustering; storing this feature (indexing) data into different cluster will make retrieval of images quicker.

TESTING PHASE:

1. Query Image: It is the input image by the system user. User gives any image as input that he/she wish to search.
2. Feature extraction: In this stage, all the features of the input image are extracted using SIFT, this extracted feature are used for comparing it with data stored in different cluster.
3. Feature vector: Extracted features are store in feature vector.
4. Matching: At the end system compare extracted features for input image with features stored in different clusters. Images whose features match the most with the features of input images are retrieved as the output.

B. ALGORITHM**TRAINING PHASE:**

Input: Image dataset with number of images.

Step1: Extract different features from every image, like shape features, texture features, color features, SIFT.

Step2: Differentiate all these images into number of clusters on the basis of extracted features.

Step3: Store feature values for comparing with query image.

TESTING PHASE:

Step1: Accept Query image

Step 2: Extract different features of images that we have extracted at the time of Training Phase.

Step3: Match feature values with values from dataset.

Step4: Display all related content based images as an output.

Output: Collection of content based images.

RESULTS AND DISCUSSION:

A. DATASET:

The Proposed System uses Wang database which consist of 1,000 images, divided into 10 classes, including African people, beach, buildings, dinosaurs, buses, elephants, food, horses, mountains and glaciers and flowers, and each category contains 100 images each.

This dataset is available at <http://wang.ist.psu.edu/~jwang/test1.tar>

B. RESULTS:

PERFORMANCE

Table no. Shows the performance of our system in terms of number of relevant images retrieved using only RGB feature.

Only RGB					
Class ID	Category	Image number	No of images retrived	No of relevant images	No of irrelevant images
1	African People	3	20	5	15
2	Beach	111	20	5	15
3	Building	228	20	7	13
4	Bus	330	20	10	10
5	Dianasaurus	418	20	20	0
6	Elephants	506	20	6	14
7	Flowers	610	20	7	13
8	Horse	721	20	5	15
9	Hills	818	20	4	16
10	Food Plates	912	20	5	15

Table no. 1. Performance Results (using only RGB)

Fig.3. shows the performance graph on the values drawn from the table of images retrieved using Only RGB.

On x-axis we have shown the image on which the performance is calculated.

On Y-axis we have shown the image count.

The blue bar indicates the number of total images retrieved. The red bar indicates the number of relevant images retrieved. And the green bar point to the number of irrelevant images retrieved.

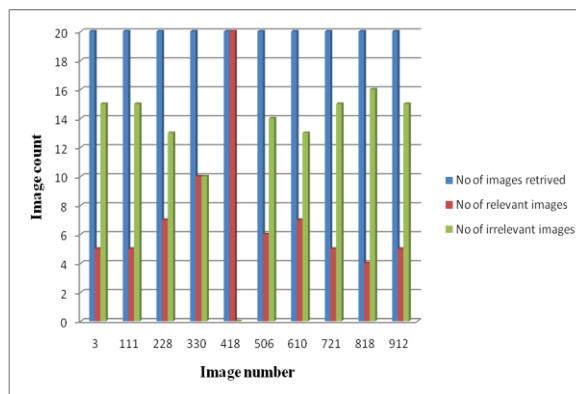


Figure3. Performance graph (using Only RGB)

Table no. 2 shows the performance of our system in terms of number of relevant images retrieved using multiple features.

All Features					
Class ID	Category	Image number	No of images retrived	No of relevant images	No of irrelevant images
1	African People	3	20	19	1
2	Beach	111	6	4	2
3	Building	228	7	6	1
4	Bus	330	18	16	2
5	Dianasaurus	418	15	15	0
6	Elephants	506	20	18	2
7	Flowers	610	4	4	0
8	Horse	721	20	19	1
9	Hills	818	12	8	4
10	Food Plates	912	15	13	2

Table no. 2. Performance Results (using multiple features)

Fig.4. shows the performance graph on the values drawn from the precision table of images retrieved using multiple features.

On x-axis we have shown the image on which the performance is calculated.

On Y-axis we have shown the image count.

The blue bar indicates the number of total images retrieved. The red bar point to the total number of relevant images retrieved. And the green bar indicates the number of irrelevant images retrieved.

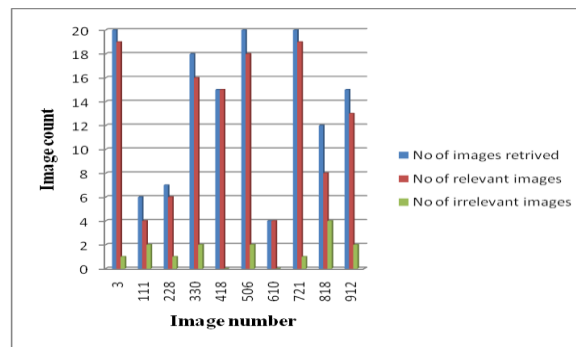


Figure4. Performance graph (using multiple features)

PRECISION:

Table no. 3. Shows the precision we got using Only RGB feature for each different class.

We have tested images from each class and calculated the average precision.

RGB features		
Class ID	Category	Precision
1	African People	28.80134
2	Beach	24
3	Building	30
4	Bus	37.26
5	Dianasaurus	98.12941
6	Elephants	36.53846
7	Flowers	61.6
8	Horse	39.6
9	Ice-Hills	27.2
10	Food Plates	28.73333
Average		41.18625

Table no. 3. Precision Results(using only RGB)

Table no. 4. shows the precision we got using Only RGB feature for each different class. We have tested images from each class and calculated the average precision.

All Features		
Class ID	Category	Precision
1	African People	86.82222
2	Beach	72.46
3	Building	78.25465
4	Bus	76.67165
5	Dianasaurus	100
6	Elephants	78.4127
7	Flowers	93.68645
8	Horse	81.63248
9	Hills	77.4729
10	Food Plates	73.9
Average		81.9313

Table no. 4. Precision Results(using Multiple features)

Fig 4.shows the precision graph from the values drawn from the precision results table of multiple and RGB features.

On X axis we have taken the images classes of the wang dataset.

On the Y axis we have taken the precision percentage.

The blue bar indicants the precision obtained using Multiple features. The red bar indicates the precision obtained using only RGB feature.

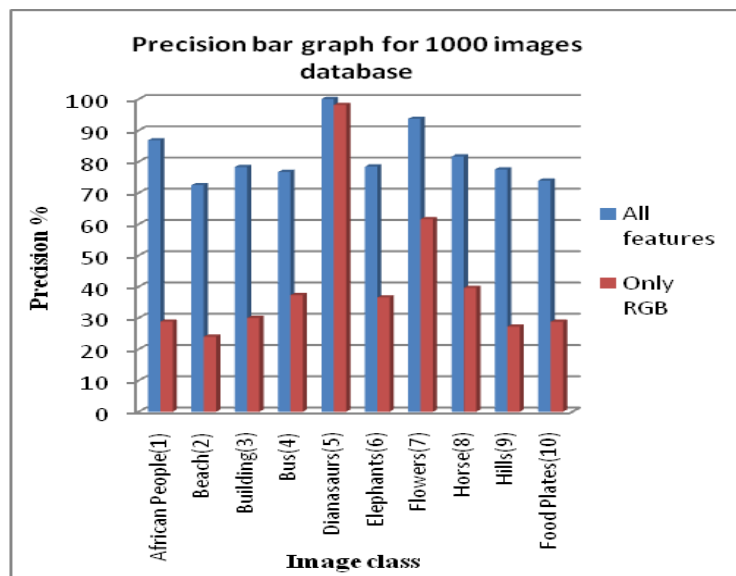


Figure5. Precision Graph (for Wang dataset)

RESULT ANALYSIS:

The system is evaluated on Wang dataset which consists of 1000 images which is divided into 10 classes, each containing 100 images. Both of our system i.e. Using only RGB and Using multiple features are implemented on wang dataset images and is tested for all 1000 images. Average precision has been calculated for each class. We have observed that the total average precision using multiple features is 81.93% and the total average precision obtained using Only RGB is 41.18%

Thus it is observed that the CBIR system using multiple features is more efficient than CBIR using only RGB feature.

CONCLUSION AND FUTURE WORK:

Content based image retrieval has been popular now a day, as it improves the image search. Images are retrieved on the basis of its contents. Searching images on the basis of its title and metadata is not efficient. So we have proposed new technique for image retrieval. Here we are extracting different features of images like shape features, texture features, color features, SIFT to improve the outcomes of image search. Clusters of images are created on the basis of these features to minimize the time of image retrieval.

Machine learning and other AI methodologies have pulled in expanding premiums in the CBIR. Numerous techniques and algorithms works have been led, which prompted very much a couple of empowering accomplishments. Notwithstanding, there remain various developing difficulties and open issues to be tended to.

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