A Novel Query Adaptive Image Retrieval Framework with colour Averaging Techniques

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Abstract- **The capacity of quick comparability picture look in light of visual similitude in an expansive scale dataset is of awesome significance to numerous sight and sound applications. In spite of the fact that hashing has been demonstrated successful for visual pursuit, among different hashing approaches semantic hashing (SH) has indicated promising execution. It quickens closeness seek, by outlining smaller paired codes for an expansive number of pictures with the goal that semantically comparable pictures are mapped to close codes. Recovering comparable neighbors is then basically refined by recovering pictures that include codes inside a little Hamming separation of the code of the inquiry. However in this strategy the memory usage and question execution time are the significant issues, so by proposing a consolidated arrangement of strategies in light of shading averaging system to accomplish higher recovery proficiency and execution. Right off the bat, a normal mean based strategy with lessened component measure is proposed. Also, a component extraction strategy in view of focal inclination is proposed. Analyses on a Flicker picture dataset demonstrate clear upgrades from this proposed approach.**

IndexTerms— Picture, Semantic Hashing

I. INTRODUCTION

Image search is particular information seek used to discover pictures. To scan for pictures, a client may give question terms, for example, Watchword, picture document or connection, or tap on some picture, and the framework will return pictures "comparable" to the inquiry. The similitude utilized for seek criteria could be metatags, shading dispersion in pictures, area or shape traits, and so on. Picture meta look - inquiry of pictures in light of related metadata, for example, catchphrases, content, and so forth. Content-based image recovery (CBIR) – the use of PC vision to the picture recovery. CBIR goes for maintaining a strategic distance from the utilization of printed depictions and rather recovers pictures in view of similitudes in their substance (surfaces, hues, shapes and so forth.) to a client provided inquiry picture or client determined picture highlights.

1.1 PROBLEM STATEMENT

The blast of pictures on the Internet, there is a solid need to create systems for productive and adaptable picture seeks, while conventional picture web search tools vigorously depend on printed words related to the pictures, adaptable substance based hunt is getting expanding consideration. Aside from giving better picture look understanding to normal Web clients, vast scale comparative picture seek has additionally been exhibited to be extremely useful for settling various difficult issues in PC vision and media, for example, picture order. For the most part a substantial scale picture look framework comprises of two key segments a compelling picture highlight portrayal and an effective inquiry instrument. The nature of list items depends intensely on the portrayal energy of picture highlights. A productive inquiry component, is basic since existing picture highlights are for the most part of high measurements and current picture databases are immense, over which thoroughly contrasting a question and each database test is computationally restrictive. Pack of-visual-words (BoW) framework, where nearby invariant picture descriptors (e.g., SIFT) are removed and quantized in view of an arrangement of visual words. The BoW highlights are then implanted into conservative hash codes for proficient hunt. Best in class methods including semi-administered hashing and semantic hashing with profound conviction systems. Hashing is best finished tree-based ordering structures (e.g., kd-tree) as it by and large requires incredibly diminished memory and furthermore works better for high-dimensional examples. With the hash codes, picture closeness can be effectively estimated (utilizing legitimate XOR tasks) in Hamming space by Hamming separation, a whole number esteem got by checking the quantity of bits at which the twofold esteems are unique. In extensive scale applications, the measurement of Hamming space is generally set as a modest number to lessen memory cost and maintain a strategic distance from low review.

One disadvantage of the traditional tree-based strategies is that they typically don't function admirably with high-dimensional component. Hashing has a noteworthy favorable position in speed since it allows steady time look .In perspective of the constraints of both upset record and tree-based ordering; inserting high-dimensional picture highlights into hash codes has turned out to be extremely prevalent as of late. Hashing fulfills both question time and memory necessities as the paired hash codes are minimized in memory and proficient in seek by means of hash table query or bitwise activities. Hashing techniques regularly utilize a gathering of projections to partition an info space into numerous basins with the end goal that comparable pictures are probably going to be mapped into a similar pail. The

vast majority of the current hashing systems are unsupervised.

II. RELATED WORKS

Literature review deals with analyzing the existing system and Implementing new technologies to develop the existing system. It is the process of gathering information and diagnosing the problems in the existing system, thus suggesting ideas for the improvement of the existing system. There are very good surveys on general image retrieval task. See Smeulders *et al.* [11] for works from the 1990s and Datta *et al.* [12] for those from the past decade. Many people adopted simple features such as color and texture in systems developed in the early years [13], while more effective features such as GIST [14] and SIFT [3] have been popular recently [2], [15]. In this work, we choose the popular bag-of-visual-words representation grounded on the local invariant SIFT features. The effectiveness of this feature representation has been verified in numerous applications. Since the work in this paper is more related to efficient search, this section mainly reviews existing works on efficient search mechanisms, which are roughly divided into three categories: inverted file, tree-based indexing, and hashing. Inverted index was initially proposed and is still very popular for document retrieval in the informational retrieval community

III. SYSTEM DESIGN

Systems design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements.

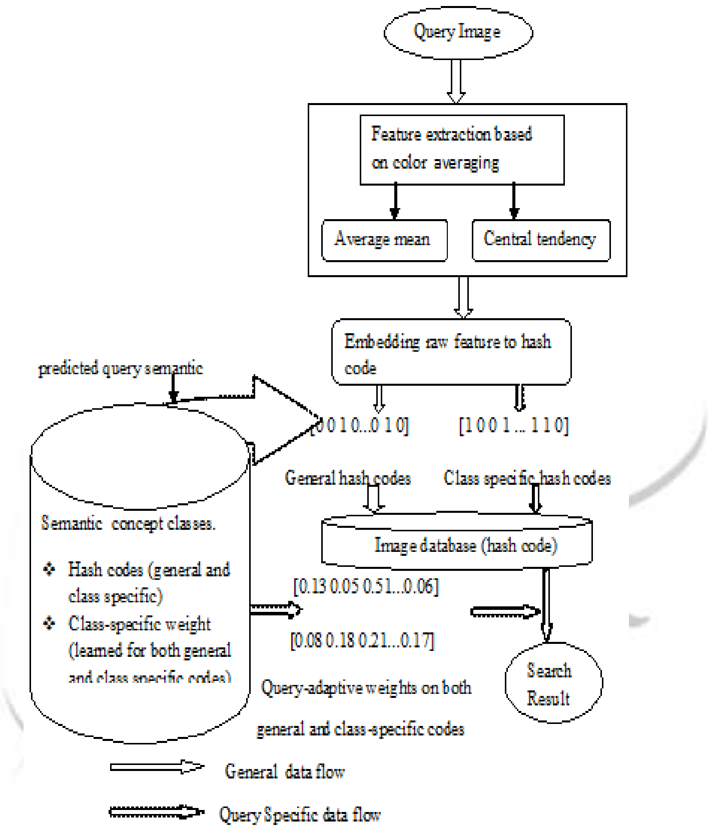


Fig. 3.1 Proposed System design

The overall design of the Query adaptive image retrieval system is shown in Fig.3.1. In the proposed system an image is given as query. The first step is feature extraction of the image, which mainly concentrate on the color feature. Then the average mean and central tendency of the color feature is calculated which reduce the color feature of the image. In the hash coding technique, Bag of Words is used, to split the extracted feature in to character manner in-order to calculate the hamming distance of query image .Relate to query image distance, the image is searched from the database. This method takes place by two hash code method. General hash code and Class specific hash code. Related to hamming distance, the appropriate image is retrieved from the image database ,then query adaptive weight is calculate for both hash code ,both code which generate different value, the class specific hash code generate better result than the general hash code . The minimum values are taken for retrieval which relate to hamming weight of query image. Such images are retrieved from the database and the results are generated according to the ranking of each image, as a retrieved image result.

3.1.1 system modules

The different modules that constitute this project are listed below. Each module has its own specific functionalities. Techniques which implemented in this work is,

1. Feature extraction based on color averaging
2. Embedding Raw Feature Of hash code
3. Query Adaptive Ranking
This extraction is done by two ways,
a. Average Mean
b. Central Tendency
The Query adaptive image search can be done by using this module and are described below,

3.1.1.1 Feature extraction based on color averaging:

One of the fundamental operations of CBIR is feature extraction. In this work, color averaging based feature vector is used. It involves averaging the intensity values of row mean and column mean of an image. The advantage of taking average color as the feature vector is that, the complexity is minimum and the technique gives better performance with high precision and recall values compared to other efficient techniques.

3.1.1.2 Average Mean

Feature extraction is based on the combination of row mean, column mean and diagonal mean of a gray scale image .The size of feature vector is 3 for a gray scale image and features of an RGB image is extracted using a combination of row mean and column mean of an image. Here, the size of the feature vector is 6, which includes 3 features for row mean and 3 features for column mean which is given by,

Feature vector (Kekre) = [(Rrm,Rcm) (Grm,Gcm) (Brm,Bcm)] ***(1)***

The size of feature vector plays a major role in optimization of algorithm. As the feature vector size is reduced, the memory space required for storing the feature vector also gets reduced. In order to reduce the dimension of the feature vector a new approach based on the mathematical property is proposed which states the average of row-mean or the average of column-mean of an *mxn* matrix results to be same.

$$RowMean = \sum_{i=1}^{n} Rm_i / nr \qquad (2)$$

$$ColumnMean = \sum_{i=1}^{n} Cm_i / nc \qquad (3)$$

Where,

Rm = row pixels, Cm = column pixel ***nr,nc = No.of rows and No. of Columns respectively.***

The results obtained clearly show that average of row mean is same as average of column mean. Hence, the proposed mean technique with reduced feature vector, the feature vector is generated by considering the row mean alone.

Feature vector = [(Rrm Grm Brm)] ***(4)***

It is important to note that, dimension reduction based on reduction in the size of feature vector from 6 features to 3 features does not significantly change the retrieval results. But with reduction in the dimension of feature vector greatly reduces the memory utilised for storing the image features in feature database. As the memory required for storing image features in feature database is reduced, the time taken to retrieve relevant images from image database also gets reduced.

3.1.1.3 Colour averaging techniques

A. All Image Coefficients

In this method all image pixels are considered as feature vector and Euclidean distance is used in RGB plane to find the best match, which is used to calculate precision and recall.

B. Row Mean of Image (RM)

In this method row mean of image is calculated as the feature vector and then Euclidean distance is used in RGB plane to find the best match, which is used to calculate precision and recall.

C. Column Mean of Image (CM)

Here feature vector is composed of column mean of image, calculated and then Euclidean distance is used in RGB plane to find the best match, which is used to calculate precision and recall.

D. Row & Column Mean of Image (RCM)

In this method row and column mean of image are considered together as feature vector and then Euclidean distance is used in RGB plane to find the best match, which is used to calculate precision and recall.

E. Backward Diagonal Mean of Image (BDM)

In this method backward diagonal mean of image is considered as feature vector and then Euclidean distance is used in RGB plane to find the best match, which is used to calculate precision and recall.

F. Forward Diagonal Mean of Image (FDM)

In this method forward diagonal mean of image is calculated and then Euclidean distance is used in RGB plane to find the best match, which is used to calculate precision and recall.

G. Forward & Backward Diagonal Mean of Image (FBDM)

In this method forward and backward diagonal mean both are considered together as feature vector of image and then Euclidean distance is used in RGB plane to find the best match, which is used to calculate precision and recall.

$$Precision = \frac{No.of\ the\ retrieved\ images}{No.of\ relevant\ images\ in\ the\ retrieved\ images} = \frac{A}{A+B}$$

$$Recall = \frac{No.\,of\ relevant\ images\ in\ database}{No.\,of\ relevant\ images\ in\ the\ retrieved\ images} = \frac{A}{A+C}$$

$$p' = \sum_{k \in A_q} \frac{p(i_k)}{|A_q|} \quad \text{---------------- (5)}$$

Where q=1, 2……10.

Finally, the average precision is given by:

$$p' = \sum_{q=1}^{10} p'_q / 10. \quad \text{-------------- (6)}$$

3.1.1.4 Central Tendency

Median, mode, max and min are used to represent image data or information. They are collectively called as the measures of central tendency. These descriptive measures have bit differences from one another that play an important role in feature extraction. The mode is the most dominant pixel in the image. Median is a middle pixel from an ordered set of data that is in the middle of an image. Max and Min are the maximum and minimum intensity pixel in the image. The distance between the feature vector of query image and images in database is calculated using euclidean distance. An image with minimum distance is considered as better match and it is given by,

$$D(x, y) = \sqrt{\sum_{i=1}^{n} (x_i - y_i)^2} \quad (7)$$

where x_i and y_i are the extracted features of *database image and query image respectively with size 'n'.*

IV. PERFORMANCE MEASURES

The measure of performance used in image retrieval borrows from the field of information retrieval and are based on two primary figures of metric which is precision and recall. Precision is the number of relevant documents retrieved. Recall is the number of relevant documents in the database which should have been retrieved. Where A represent the number of relevant images that are retrieved, B, the number of irrelevant items and the C, number of relevant items those were not retrieved. The number of relevant items retrieved is the number of the returned images that are similar to the query image in this case. The total number of items retrieved is the number of images that are returned by the search engine. Precision can be interpreted as a measure of exactness, whereas recall provides a measure of completeness. A perfect precision score of 1.0 means that every retrieved image is relevant but it does not provide any insight as to whether all relevant documents are retrieved. A perfect recall score of 1.0 means that all relevant images is retrieved but says nothing about how many irrelevant images might have also been retrieved. Each query returns the top 10 images from database, and the calculated precision values using the equation 5, and average precision using equation 6 are given in the Tables. The average Precision value indicates the better retrieval results than others.

4.1 EXPERIMENTAL RESULTS

The proposed method has been implemented using Matlab 7.3 and tested on a general-purpose WANG database containing 1,000 images of the Corel stock photo, in JPEG format of size 384x256 and 256x386. The search is usually based on similarity rather than the exact match. The quality of the image retrieval has been evaluated by randomly selecting 10 query images, of each category, from the image database.

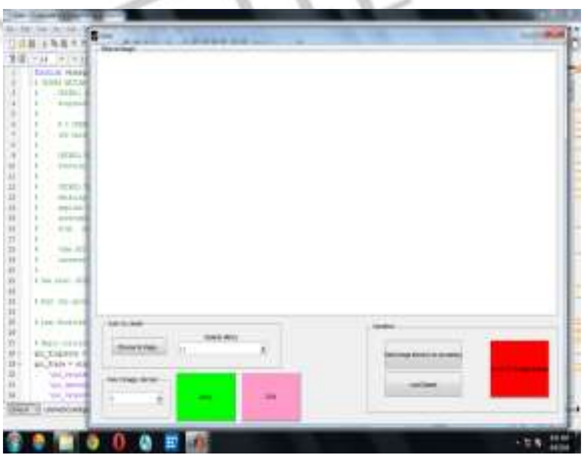


Fig.4.1 Graphical User Interface

Fig.4.2 Browsing the Image

Fig.4.3 Selecting the query image

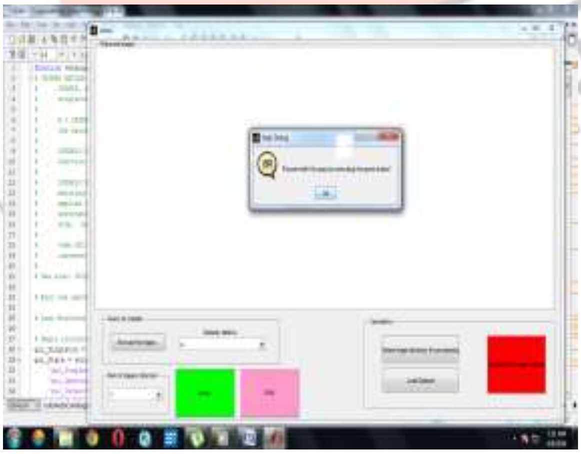


Fig.4.4 Proceeding with query

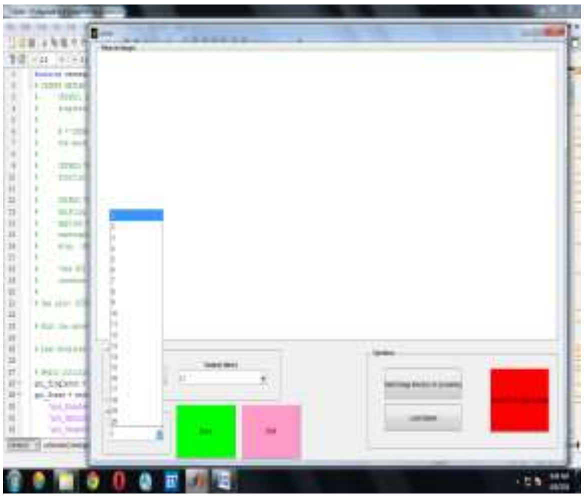


Fig.4.5 Selecting the number of image

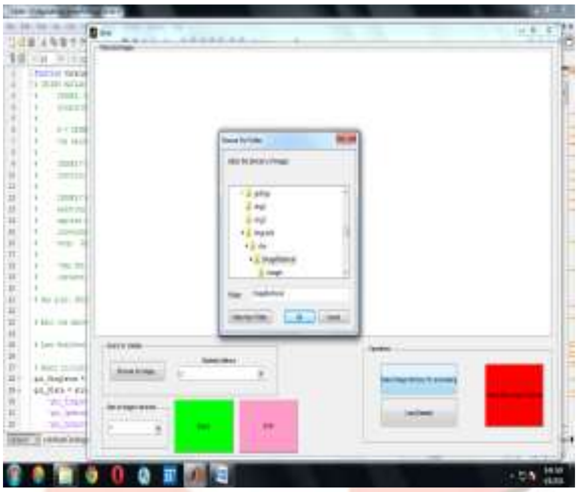


Fig.4.6 Loading image in database

Fig.4.7 Creating the database image

Fig.4.8 Loading the database

Fig.4.9 Database loading completion

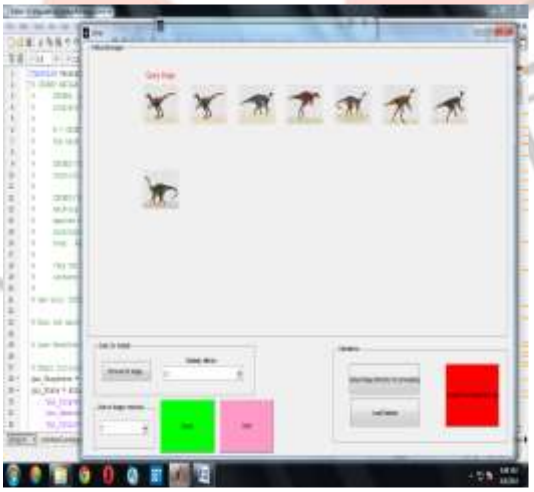


Fig.4.10 Retrieved Image

Fig.4.11 Ranking of Confusion matrix

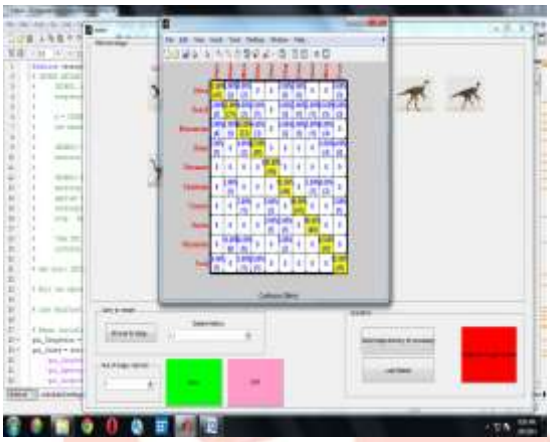


Fig.4.12 Confusion matrix

Table 1: Precision of the Retrieval by Existing & proposed methods

	Category	No of Retrieved Images	Hash method	Proposed Method
1	African People	10	0.793	0.782
2	Beach	20	0.763	0.773
3	Building	30	0.729	0.733
4	Buses	40	0.671	0.691
5	Dinosaurs	50	0.604	0.653
6	Elephants	60	0.539	0.547
7	Flowers	70	0.459	0.427
8	Horses	80	0.389	0.395
9	Mountains	90	0.360	0.364
10	Food	100	0.329	0.339
	Precision Mean		0.564	0.570

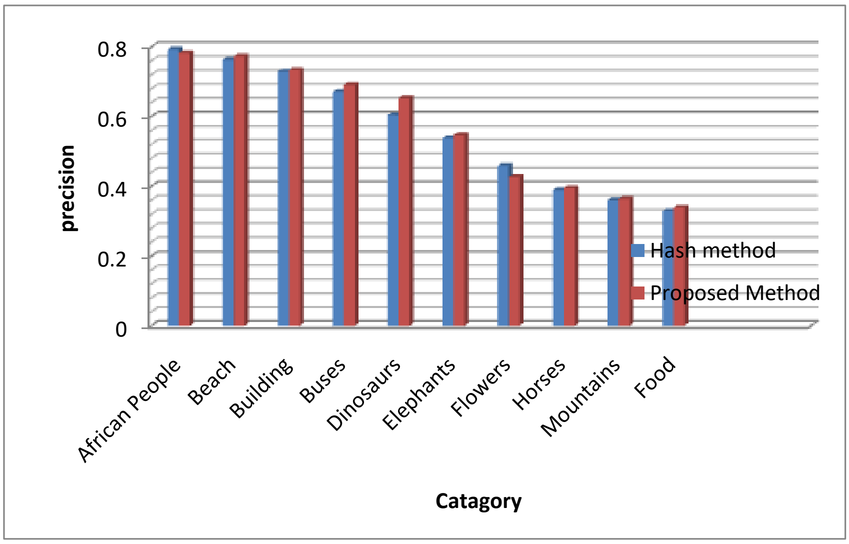


Chart 1: Precision of the Retrieval by Existing & proposed methods

Table 2: Recall of the Retrieval by Existing & proposed methods

Classes	Category	No of Retrieved Images	Hash method	Proposed Method
1	African People	10	0.207	0.241
2	Beach	20	0.229	0.266
3	Building	30	0.263	0.298
4	Buses	40	0.296	0.334
5	Dinosaurs	50	0.337	0.359
6	Elephants	60	0.379	0.311
7	Flowers	70	0.402	0.464
8	Horses	80	0.417	0.486
9	Mountains	90	0.434	0.516
10	Food	100	0.463	0.525
	Average Recall		0.34	0.38

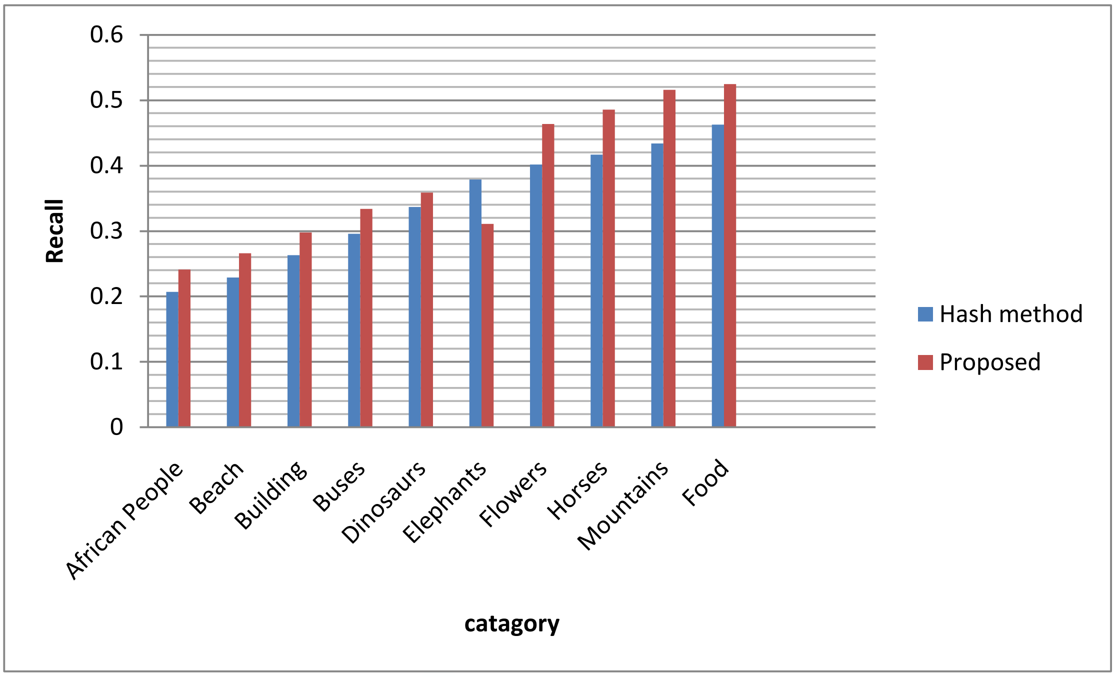
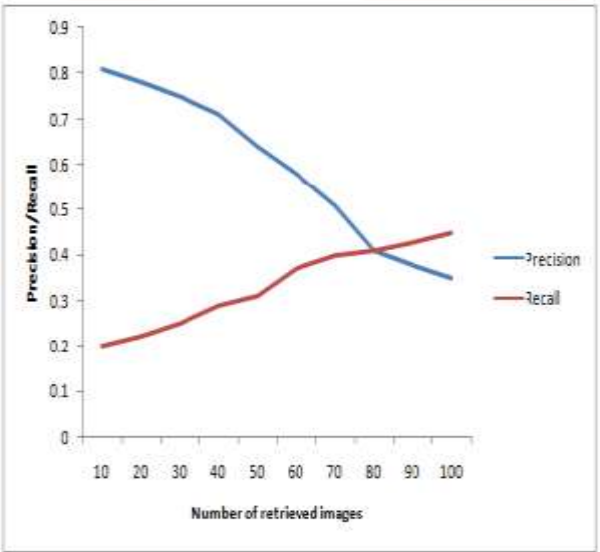
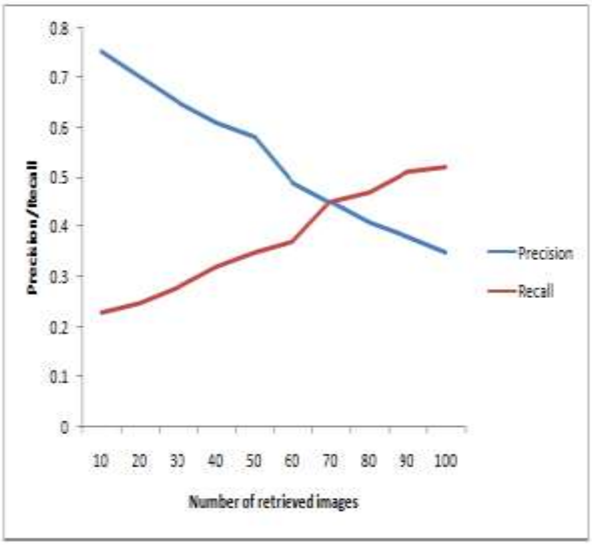


Chart 2: Average Precision Recall values of Existing Method

For each query, we examined the precision of the retrieval, based on the relevance of the image semantics. The semantic relevance is determined by manual trotting the query image and each of the retrieved images in the retrieval. The precision values, calculated by using the equation 1 and also the average precision using the equation 2 are shown in Table 1. The query retrievals by the proposed method are shown in Simulation results,
with an average retrieval time as 1min. These results clearly show that the performance of the proposed method is better than the other methods.



Graph 1: Average Precision Recall values of Proposed Method



Graph 2: Average Precision Recall values of Existing Method

V. CONCLUSION

So far numerous CBIR methods have been proposed. Yet, the scientists are till needing for better and quicker picture recovery arrangements. This undertaking has proposed a novel picture recovery method in light of shading averaging utilizing column COIL picture database with 1080 pictures. The test comes about have demonstrated that the shading averaging strategies beat the CBIR method utilizing all pixel information. In nonexclusive image database forward corner to corner mean gives most astounding accuracy and review hybrid esteem demonstrating best execution and all other proposed procedures perform superior to all pixel information. Indeed, even in COIL picture database push mean, segment mean, forward askew mean and in reverse corner to corner mean. The methods were tried on two diverse picture databases as nonexclusive picture database with 1000 pictures and procedure beats the all pixel information based CBIR. The troublesome undertaking of enhancing the execution of substance based picture recovery procedures with diminishment in time many-sided quality is accomplished here with help of shading averaging based strategies. By bridling a substantial arrangement of pre-characterized semantic idea classes, this approach can anticipate question versatile bitwise weights of hash codes progressively, with which list items can be quickly positioned by weighted Hamming separation at better grained hash code level. This capacity to a great extent mitigates the impact of a coarse positioning issue that is basic in hashing-based picture look. Test comes about on a broadly embraced Flicker picture dataset affirmed the adequacy of this proposition.

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