Research Article

Content image retrieval using combination of dominant and LBP based features

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Abstract
This paper provides the analysis of content based image retrieval (CBIR) system. The previous results indicate that there are lot of works in the direction of CBIR are already done but the work is going on for the hunt of improving the retrieval precision. In this paper dominant, local binary pattern (LBP) and color moment (CM) have been hybridized with the combination of colour, shape and texture features for efficient image retrieval system. First the dominant colors have been extracted and then LBP patterns are vectored. The combination is then process to CM and then index vector are calculated based on the color, shape and texture features. The results obtained clearly indicate that it is better than LBP, CM and LBP and CM in combination.

Keywords
Dominant colour, Content retrieval, Colour, Shape and texture.

1.Introduction

Searching and image retrieval process is called image retrieval from an image dataset [1]. The main challenging issue in these systems is to retrieve the images efficiently. So different algorithms are designed to make the system efficient in retrieval. Most of the algorithms support the searching algorithm based on keyword and text [2]. The main two drawbacks of text based retrieval are human labor is needed for manual annotation and chances of inaccuracy in annotations due to human perception [3]. CBIR technique was introduced to remove the limitations of text based image retrieval [1-5].

In CBIR frameworks, picture preparing methods are utilized to extricate visual highlights, for example, color, texture and shape from pictures [6-9]. The framework utilizes a query model to change over the picture into an inside portrayal of inquiry, in light of highlights removed from input pictures [10-12]. A recovery demonstrates performs picture recovery by registering similitudes between pictures in query and the inquiry picture [13-16]. Fundamentally, most CBIR frameworks work comparably: a part vector is expelled from every photograph in the database and the arrangement of all feature vectors is made as a database record [17].

At ask for time, a section vector is expelled from the inquiry picture what's more; it is encouraged against the part vectors in the record. The key contrast between the particular frameworks lies in the parts that they evacuate and in the tallies that are used to look at feature vectors [18].

The shading parts are the most all things considered utilized visual segments in picture recovery in light of how they are less asking for to seclude separated and surface and shape data. Shading feature is sensibly powerful to foundation multifaceted plan and free of picture size and introduction. Quantifiably, it demonstrates the joint likelihood of the forces of the three shading channels.

Surface is a key segment of conventional pictures. Blends of strategies have been made for measuring structure resemblance. Most strategies depend on after looking of what are known as second-request estimations figured from demand and set away pictures [19]. These calendars figure measures of picture surface, for example, the level of refinement, coarseness, directionality and consistency [20-21]; or periodicity, directionality and intercession [22]. Elective techniques for surface examination for picture recovery unite the utilization of Gabor channels [23] and fractals [24]. The aim of this paper is to perform image retrieval by CBIR technique

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using combination of dominant and LBP based features.

2.Literature review

In 2011, Schaefer et al. [25] suggested that the image accumulations are developing at a quick rate, spurring the requirement for proficient and viable devices to question these databases. CBIR methods remove includes specifically from picture information and utilize these, combined with a likeness measure, to look through picture accumulations. They presented a portion of the essential picture includes that are utilized for CBIR.

In 2014, Pérez-Pimentel et al. [26] suggested the purpose of CBIR consists in classifying pictures maintaining a strategic distance from the utilization of manual marks identified with comprehension of the picture by the individual vision. They have proposed another CBIR technique which works with neighborhood surface investigation, and which is created in a non-managed mold, clustering the nearby accomplished descriptors and arranging them with the utilization of a k-means calculation upheld by the hereditary calculation. They have been sent their technique in LabVIEW programming, programming each piece of the methodology so as to execute it in equipment. The outcomes are extremely encouraging, coming to up to 90% of review for characteristic scene order.

In 2014, Ghuge et al. [27] suggested that the adequacy of recovery technique relies upon how the picture is recovered with most extreme points of interest and how much memory space is spared amid recovery process. Execution of compelling CBIR frameworks includes the mix of picture creation, stockpiling, security, transmission, investigation, assessment highlight extraction, and highlight mix with a specific end goal to store and recover pictures viably. The objective of CBIR frameworks is to help picture recovery in view of substance i.e. shape, shading, surface. They have actualized CBIR procedures utilizing regular Histogram and Radon Transform. Radon change depends on projection of picture force along an outspread line arranged at a particular point. They have test comes about on COREL1000 database. They have utilized Euclidean separation as a measure to compute remove between two pictures and plot precision and recall curve to show the effectiveness of the system.

In 2015, Alvanitopoulos et al. [28] presented a new approach for product recognition by utilizing a set of crawlers our assignment is to remove useful substance from website pages and naturally perceive items found on site pages. An arrangement of pictures is extricated from each site page and afterward another "substance based" picture recovery strategy is performed to rank the pictures from our item index. Their proposed content-based picture recovery strategy uses the empirical mode decomposition and procedures the primary extricated segment of the source picture. This part keeps up the most noteworthy neighborhood spatial varieties of the source picture. A versatile nearby limit procedure is connected for the extraction of edges. A quantized and standardized histogram is made for the portrayal of pictures. Their outcomes uncover that the proposed strategy is a promising device for the test undertaking of item acknowledgment.

In 2015, Dubey et al. [29] presented an analysis and survey on CBIR techniques. They have suggested the variations used in CBIR techniques like texture, edges and string fusion. Their study demonstrates the suggestions and discoveries of the past research work. Detail examination is exhibited likewise on the favorable circumstances and holes of these procedures.

In 2015, Stefan et al. [30] presented a study on the effectiveness of hierarchical clustering techniques application and characterization for imaging setting in the CBIR. The examination has the reason to look at the acquired outcomes from utilizing diverse progressive grouping calculations with different information parameters and designs utilizing two sorts of correlation methods. The points are likewise to feature the execution changes and the expenses raised by the mix of such methods in the substance based picture recovery.

In 2015, Juneja et al. [31] suggested that the unstable development of picture databases, enormous measure of picture and video document prompted ascent of another innovative work of productive technique to seeking, finding and recovering of picture. For this reason, a proficient apparatus for looking, finding and recovery of picture is required. An overview on low level element portrayal procedures for CBIR is given its different applications.

In 2016, Jaworska et al. [32] overview of inquiry sorts and cases of frameworks utilizing these specific inquiries are exhibited here. For our CBIR, they prepared the dedicated GUI to construct user designed query (UDQ). They plot the new internet

searcher which matches pictures utilizing both nearby and worldwide picture highlights for a question formed by the client. For our situation, the spatial question area is the worldwide component. Our coordinating outcomes consider the kind and number of articles, their spatial design and protest include vectors. At last, they have contrasted our coordinating outcomes with some other web crawlers.

In 2017, Lesch et al. [33] suggested that there is currently no adequate framework for CBIR to help situational mindfulness in powerful and sensor rich conditions. They proposed an extensible framework for CBIR to support all-encompassing comprehension of the earth through the robotized search and recovery of significant pictures and the setting of their catch. This constitutes helped CBIR as typified in the multi-sensor assisted CBIR system (MSACS). They design the MSACS framework and implement the core CBIR system of MSACS using the best in class bag of visual words worldview. The framework is assessed utilizing a dataset of GPS labeled pictures to demonstrate ideal exactness and review of spatially related pictures. Applications for limitation and scan for Wi-Fi get to focuses exhibit enhanced situational mindfulness utilizing the framework. Helped CBIR could empower vision based comprehension of a situation to facilitate the weights of data over-burden and increment human trust in independent frameworks.
subheadings.

3.Proposed method
In this paper dominant color and content based image retrieval system have been proposed using the combination of colour, shape and texture features.

K-dominant color have been extracted, it is started from the pixels finding. Then it should be gathered in the form of cluster or color clusters for forming a cluster bins. The alike colors can be fetched based on the distance calculations between the color combinations. Then the combination of hue, saturation and brightness are calculated.

We have proposed dominant and LBP based content based image retrieval (DLBP-CBIR) using combination of colour, shape and texture features.

Hue shows the exact color, the color purity is shown by saturation and the brightness of the percentage degree increasing from black to white. Basis on these aspects dominant colors have been extracted.
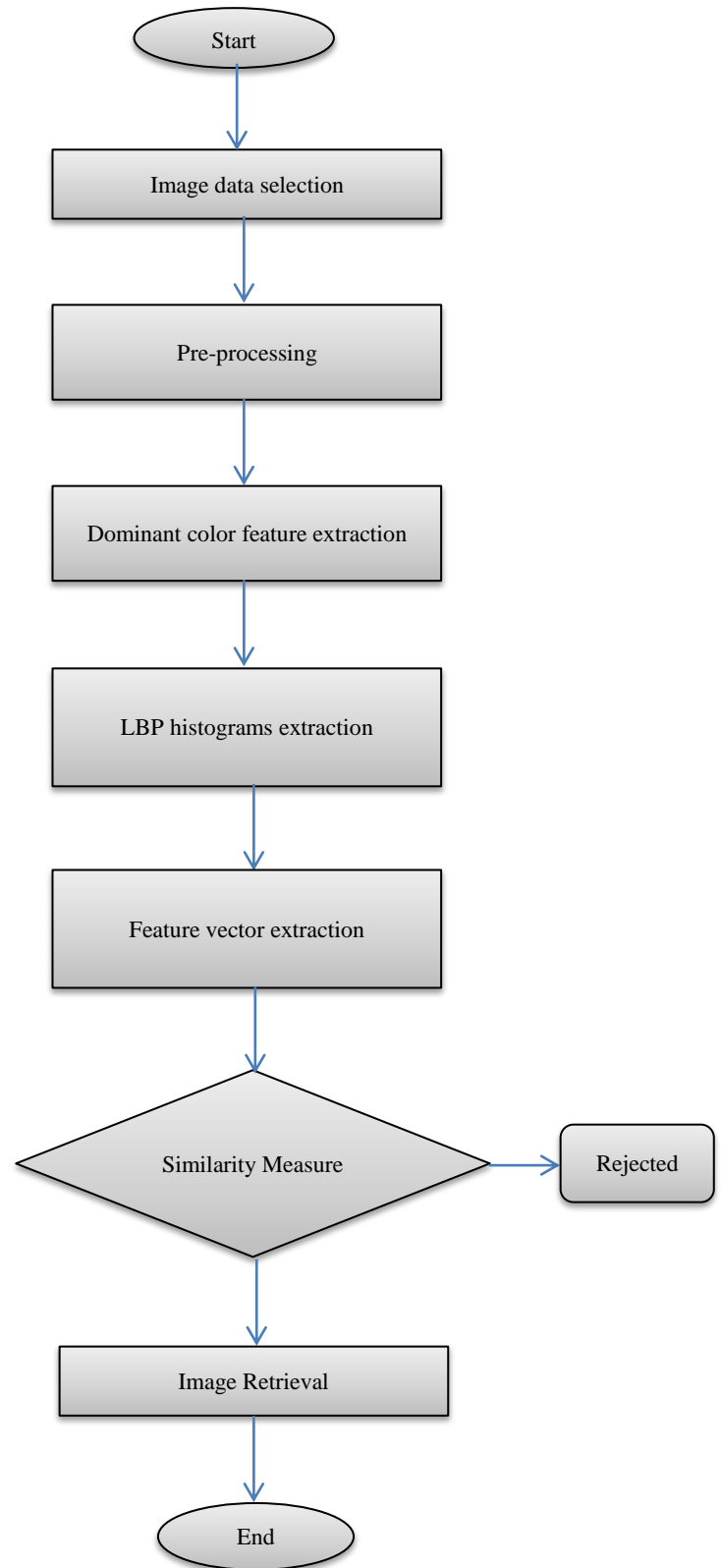

Figure 1 Flowchart Algorithm for dominant color extraction

The gathering of color separated in light of the dominant color which is the cluster of dominant perspective is extracted. Before isolating the shading traits of a photo, all pixels on database pictures are orchestrated into practically identical sorts of social occasions according to the likeness of their tones. A shading will be browsed predefined tones which are particularly near picture pixel shading and it is put away as another pixel. The distance between colors can be calculated as follows:

$$D_c = \min (\sqrt{(R_i - R_{iT})^2 + (Gi - G_{iT}) + (B_i - B_{iT})^2})$$

D_c represents the distance between colors. Red, green and blue color intensity is represented by R_i, Gi and Bi respectively. The color table indexes are represented by R_{iT}, G_{iT} and B_{iT}. The maximum percentage color component is selected as the dominant color and stored.

Local binary patter (LBP) is used for efficiently extraction of the local information. It helps in removing nearby elements of a question. The primary idea driving utilizing the LBP system is to ascertain the nearby structure of a picture by contrasting the pixels and the area.

$$LBP (C1, C2) = \sum_{n=0}^{n-1} 2^n G (PI_n - PI_c) \qquad (1)$$

Where C1 and C2 denotes the central pixel. G can be expressed as follows:

$$G(X) = \begin{cases} 1 & if\ x \geq 0 \\ 0 & else \end{cases} \qquad (2)$$

Neighbour pixel intensity is denoted by PI_n and central pixel intensity is denoted by PI_c.

Then the position of neighbours based on the center vector C1 and C2 are calculated as follows:

$$C1 = C1 + R \cos \frac{2\pi n}{S} \qquad (3)$$

$$C2 = C2 - R \sin \frac{2\pi n}{S} \qquad (4)$$

R and S is the radius and sample point respectively.

Then color moment is calculated. It is a strong estimation which can be utilized to separate pictures in light of the shading highlight. It is ascertained in light of the closeness of pictures. This can be essentially controlled by the ordinary circulation or by ascertaining their mean and difference. It demonstrates an example of minute which can help in distinguishing the picture in light of shading. Three minutes are utilized for the most part mean, standard deviation and skewness. The shading can be characterized as the tint, immersion and splendor. At that point the minutes are computed for the different

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divert in the photo. Shading minute can be planned as takes after:

Firstly it is calculated as the average color of the image by the following formula:

$$C_i = \sum_{j=1}^{N} \frac{1}{N} P_{ij} \qquad (5)$$

The number of pixels is represented by N. P_{ij} shows the value of the j pixel of i color image.

Standard deviation is then calculated for the mean deviation calculation which is as follows:

$$\sigma_X = \sqrt{\sigma_X^2} \qquad (6)$$

$$\sigma_X = \sqrt{\frac{1}{n}\left\{\sum_{i=1}^{n} X_i^2 - \frac{1}{n}\left(\sum_{i=1}^{n} X_i\right)^2\right\}} \qquad (7)$$

Then skewness is calculated to measure the asymmetric of the color distribution. It is as follows:

$$sk = \frac{\mu - \mathrm{mode}}{\sigma} \qquad (8)$$

In this paper a hybrid framework based on dominant color, LBP, color, shape and texture features have been applied for efficient image retrieval. It can finish higher recuperation viability using transcendent shading highlight by the above system showed. The components drawn from unexpected co-occasion histograms between the photo tiles and relating supplement tiles, in RGB shading space, fill in as neighborhood descriptors of shading, shape and surface. We apply the coordination of the above mix, and then pack considering alike properties. In light of overpowering tones we recuperate the practically identical pictures. We similarly make the histogram of edges. Picture information is discovered with respect to edge pictures figured using Gradient Vector Flow fields. Invariant minutes are then used to record the shape highlights. By then we apply the closeness measures. The mix of the shading, shape and surface components amidst picture and its supplement in conjunction with the shape components give a healthy rundown of capacities to picture recuperation. By the reasonability estimation, Precision and audit we can exhibit that the result our procedure is better. The accompanying region shows the result appraisal of our system in examination to the past technique. *Figure 1* shows the flowchart of the working mechanism. The working mechanism suggests that the image is selected first and then pre-processing is applied. Then dominant color based extraction is performed. It is then processed for LBP

mechanism. Then feature vector calculation is performed for similarity matching and then finally based on he similar features data is extracted.

The proposed algorithm is shown below:

Algorithm:
Input: Image database
Output: Image retrieval based on the similarity index

Step 1: Image data is selected.
Step 2: Pixels data pre-processing is started.
Step 3: Dominant color feature extraction.
Step 4: The mean of the separated index are then calculated and applied.

$$\text{Mean} = \frac{\sum ci}{n} \tag{9}$$

Standard Deviation =
$$\sqrt{1/N \sum_{i=1}^{N}(ci - \mu)^2} \tag{10}$$
$$\mu = \frac{y2 - y1}{x2 - x1} \tag{11}$$

Step 5: It is then send to the color moment process and LBP extraction process.
Step 6: Then feature vector extracted in the form of matrix.
Step 6: Based on the Euclidean distance similarity measure have been calculated.

$$\sqrt{\sum_{i=1}^{N}(xi - yi)^2} \tag{12}$$

Step 7: Finally similar images are extracted.

4.Result analysis

The database is considered from wang database [32]. 1000 pictures are there in the database of Wang. Total 10 classes are in the database with 100 different images in each category. We consider each grouping one by one for examination. In any case order we taken that are an African man. The accompanying class is shown which is of Building. We take the entire above class autonomously and find the similar recuperation of pictures. When we apply our count in the above database, then we watch that our result is better in relationship to the regular system.

For the comparison and result discussion precison is used.

$$\text{Precision (p)} = \frac{Tp}{Tp + Fp} \tag{13}$$

Where Tp = True Positive
Fp= False Positive
Tn= True Negative

$$\text{Accuracy} = \sum P / n \tag{14}$$

The accuracy is calculated based on the overall precison obtained from the whole.

A conventional way to deal with depict the execution of a classifier is to look at how precision and audit change as you change the point of confinement. A better than average classifier will be incredible at situating veritable plane pictures near the most noteworthy need on the once-over, and have the ability to recuperate an extensive measure of plane pictures before recouping any geese: its precision will remain high as audit augmentations. A poor classifier should take a broad hit in precision to get higher survey. When in doubt, a generation will acquaint an exactness survey twist with show how this tradeoff looks for their classifier. Some of the results obtained by our methodology is shown in *Figure 2 to Figure 5*. Category 1 shows African man, category 2 shows Beaches, category 3 shows Buildings, category 4 shows Buses, category 5 shows Dianosaurs, category 6 shows Elephants, category 7 shows Flowers, category 8 Horses, category 9 Mountains and category 10 shows Food category.
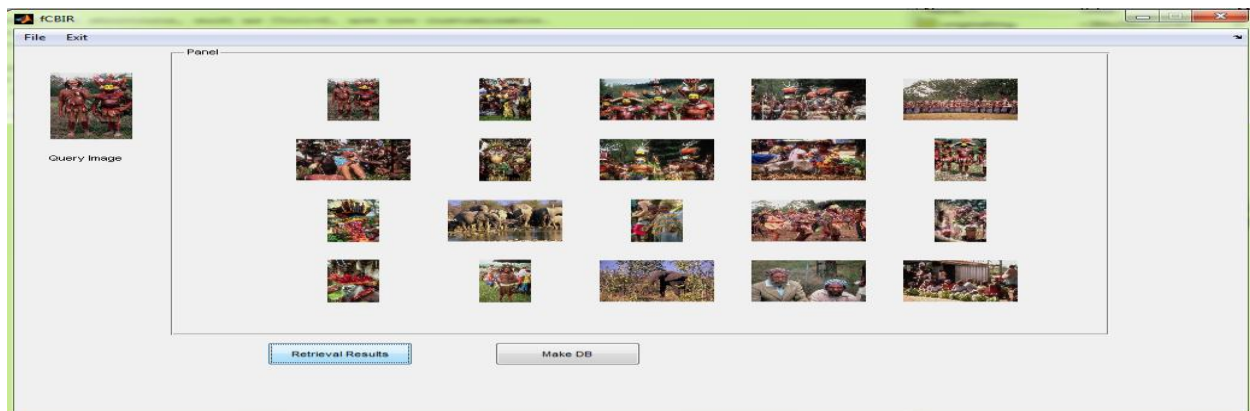

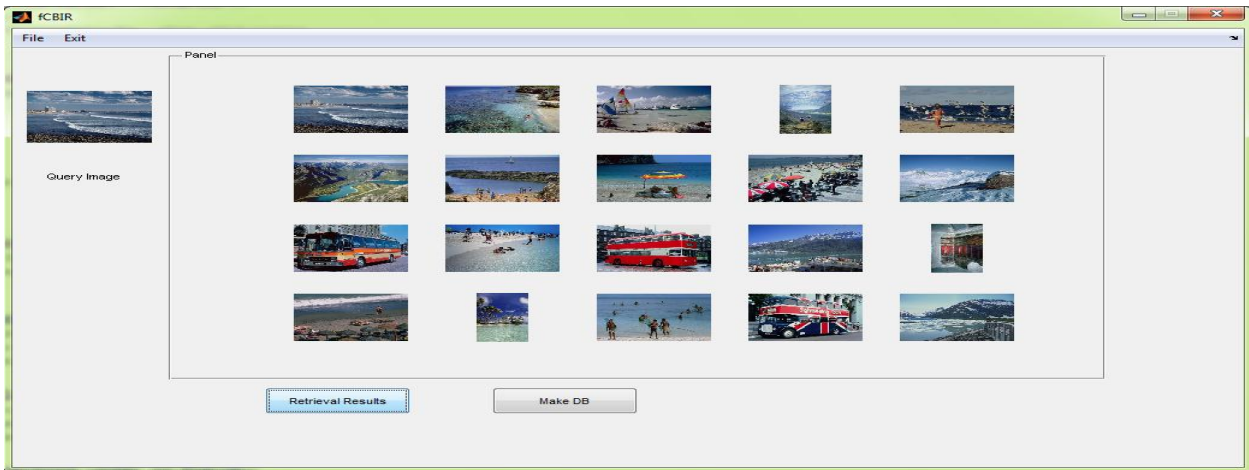**Figure 2** Results from the class 1 category

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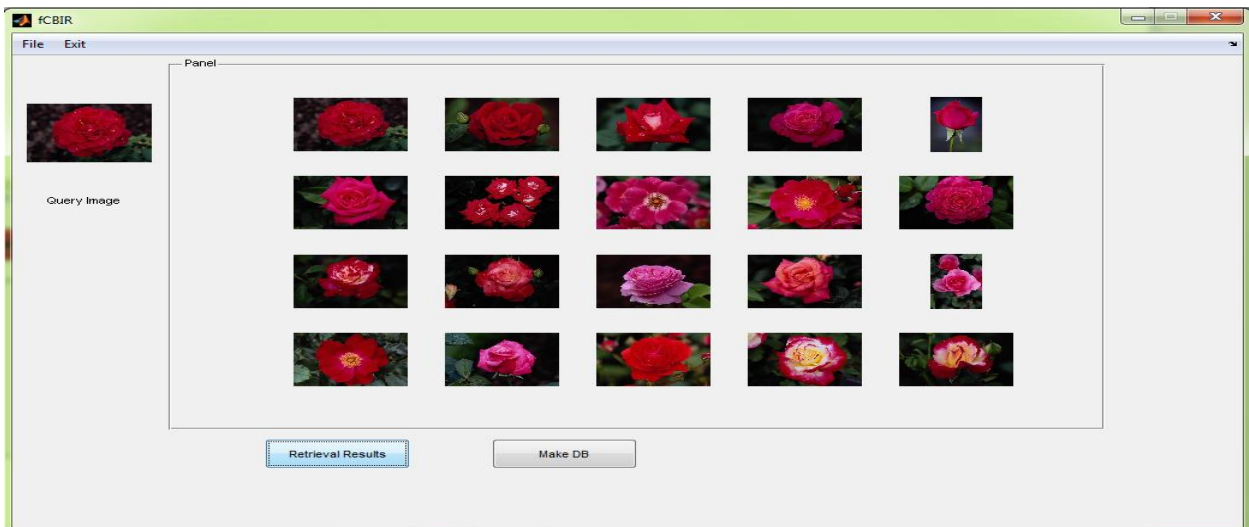**Figure 3** Results from the class 2 category

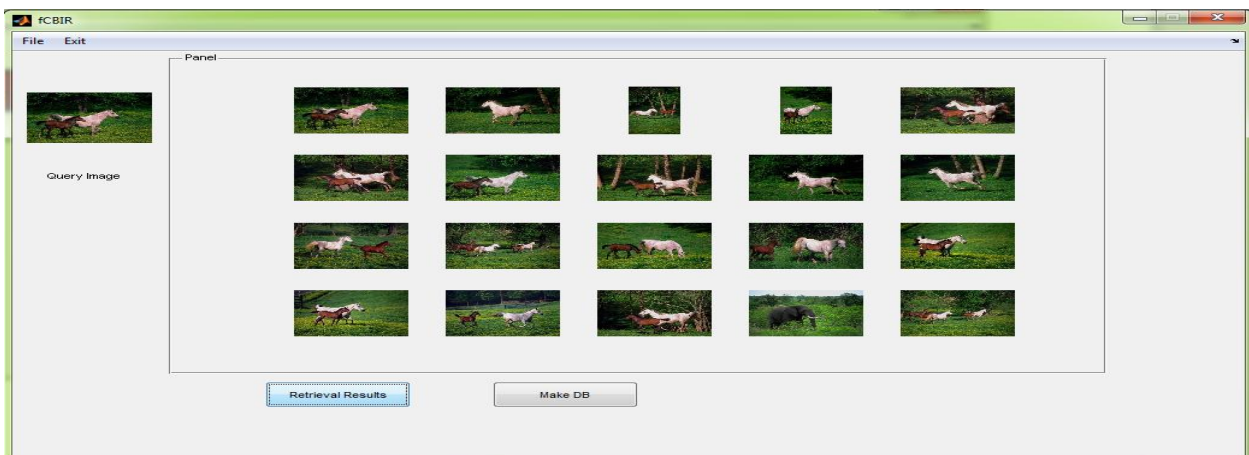**Figure 4** Results from the class 6 category

Figure 5 Results from the class 7 category

Table 1 presents the comparsion between different methodologies and our approach. The comparison discuss the results based on ten categorizes on the precison values. It clearly shows that our DLBP-CBIR approach outperforms from all other approaches. *Figure 6* shows the graphical representation of the comparison shown in the table. The *Figure 7* shows the overall compariosn from all the approaches based on the overall accuracy according to the formulla 14.

Table 1 Comparison table

| S.NO	Category	Dlbp-cbir (proposed method)	Hybrid approach[34]	Cm alone [34]	Lbp alone [34]
1	African man (Classification 1)	0.9	Not calculated	Not calculated	Not calculated
2	Beaches (Classification 2)	0.8	0.5	0.31	0.35
3	Buildings (Classification 3)	0.85	0.7	0.28	0.3
4	Buses (Classification 4)	1	0.98	0.31	0.8
5	Dianosaurs (Classification 5)	1	1	0.93	0.97
6	Elephants (Classification 6)	0.6	0.6	0.44	0.19
7	Flowers (Classification 7)	1	0.89	0.61	0.79
8	Horses (Classification 8)	0.95	0.8	0.28	0.32
9	Mountains (Classification 9)	0.9	0.7	0.49	0.12
10	Food (Classification 10)	0.55	0.6	0.28	0.34
	Overall accuracy	0.85	0.75	0.43	0.46
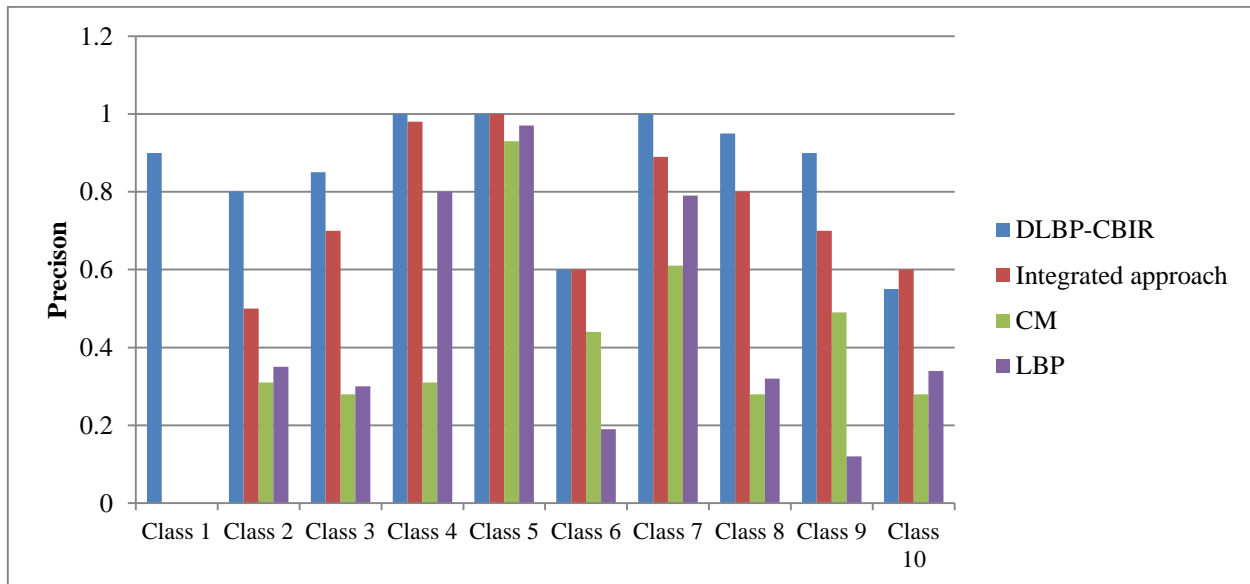
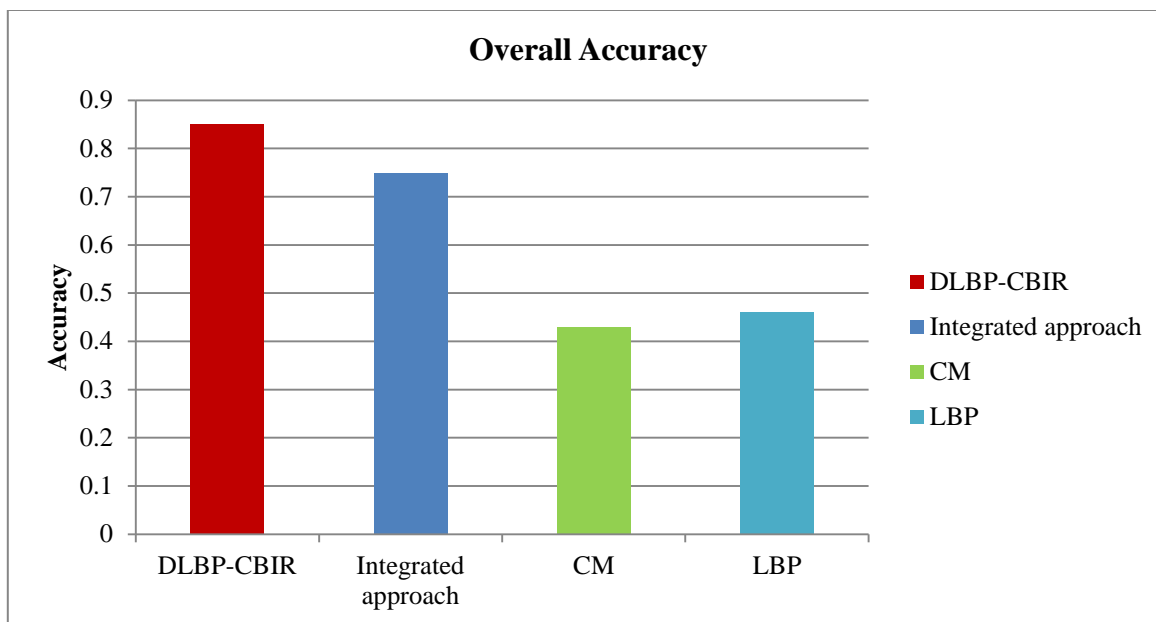**Figure 6** Methods comparisons based on precison

Figure 7 Overall accuarcy comparison

5.Conclusion

In this paper a generalized layout for the content base retrieval system. It demonstrates the impacts of various strategies in proficient picture recovery. It additionally highlighted the impact with their recovery points of interest and hole recognizable proof. It is apparently examined with their outcomes and investigation. In light of the examination and investigation a half breed framework is required for CBIR system with the combination of color, shape and texture. In this paper an efficient approach based on dominant color and the combination of LBP and CM features with the inclusion of color, shape and texture have been applied. The results show the effectiveness of our approach.

Acknowledgment
None.

Conflicts of interest
The authors have no conflicts of interest to declare.

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