

## Content based image retrieval system techniques: a review and analysis

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### Abstract

*The role of content based image retrieval (CBIR) system is very important and crucial for efficient image retrieval. These systems are efficient in indexing, search, image retrieval, and searching image databases. It is used in different areas like medical diagnosis, military, security and other recognition system. The explorations in this area by the researchers are wide. Researchers have done several works with their own advantages and limitation. In this paper a review and analysis based on these methods have been presented with the focus on the advantages and limitations. It explores the possibility to find out the gaps presented in these techniques and the suggested solutions.*

### Keywords

*CBIR, Content retrieval, Image retrieval, Searching, Indexing.*

### 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 goal of this paper is to explore the opportunity in the retrieval efficiency from the image database and find out the pros and cons in the several methodologies used earlier.

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## 2.Related works

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.

### 3.Result analysis based on the literature

Table 1 show the comparison based on the literature. The below comparison discussed the method used in previous research work along with the advantages of the algorithms. It also highlights the limitations of the work so that it can be further extended in the direction suggested.

**Table 1** Comparisons based on the literature

S.NO	Reference	Method used	Advantages	Gap identification
1	[34]	Visual feature description techniques	Relevance feedback (RF) has been used to modify the retrieval process in order to generate perceptually and semantically more meaningful retrieval results.	Online CBIR system will be developed.
2	[35]	Overview of content-based image retrieval techniques	They have reviewed of various content-based image retrieval systems.	How the algorithm applied on the limited cases.
3	[36]	Image retrieval through sector histogram	A weighted undirected graph for each color, called GHSG, and applied in landscape images.	It may be applied on different applications with different parameters.
4	[37]	Content-based image retrieval using texture color shape and region	They have presented a survey on the CBIR techniques based on texture, color, shape and region.	Semantic gap between the user and the CBIR system
5	[38]	Content based image retrieval using memetic algorithm	Their proposed CBIR system is assessed by inquiring number of images and the efficiency of the system is evaluated by calculating precision-recall value for the results.	They have suggested that the filtering techniques will be employed to get more accurate results in the content based image retrieval system.
6	[39]	Content Based image retrieval systems using clustering techniques for large data sets	Their method makes use of hierarchical and divide and conquer k-means clustering technique with equivalency and compatible relation concepts to improve the performance of the k-means for using in high dimensional datasets.	Orthogonal space have been suggested for the future image retrieval techniques.
7	[40]	Content-based image retrieval techniques to provide new services for tourism industry	Edge histogram descriptor (EHD) and color layout descriptor (CLD) algorithms have better retrieval performances than the others.	Different other parameters have been considered.
8	[41]	Content based image retrieval of	The techniques included color based extractions using neighborhood rules and	Region based extraction will be improved.

S.NO	Reference	Method used	Advantages	Gap identification
		satellite imageries using soft query based color composite techniques	histograms. An estimation of the features and available resources from the imageries have been made using the color spectral graphs.	

#### 4. Problem statements

The following problem statements have been found after discussing several research works.

1. Region based clustering is missing in traditional methodologies.
2. Edges with other attributes are missing in the combination in the image retrieval.
3. Semantic searching and low-level data processing are missing in several research works.
4. There is a need of improvement of the precision accuracy of image retrieval systems and to reduce the semantic gap will help in efficient image retrieval.
5. A combination of dominant, color, shape, texture and edges are missing in several research works.
6. Boundary values can be extracted properly to enhance the recovery.

#### 5. Conclusions

This paper explores the image retrieval techniques in detail manner. It includes the methodological review with the detail analysis. The gaps and advantages have been discussed in detail. It provides detail and explorative way for finding the research gaps and focus on it with different combinations. We have also highlighted the gaps as well as the combination for achieving the goal. We have also highlighted the areas where there is need of improvement. In future boundary values can be extracted with the combination of dominant, color, shape, texture and edges for the better image retrieval system.

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#### Conflicts of interest

The authors have no conflicts of interest to declare.

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