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Survey on Content Based Image Retreival System and Gap Analysis for Visual Art Image Retreival System

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Abstract— **Content Based image Retrieval (CBIR) system is one of the prominent area of study identified with wide area of applications in recognition system. The main purpose of the study is to review and analyze all the prime works in CBIR system, its efficiency in recognition rate and understand the types of challenges focused by prior research work in this area. The prime outcome of the result in this area is analyzed to identify the work done considering visual art images as we believe the work is considerable small in number owing to the complexities of visual art images. Finally, the paper will also discuss about the research issues addressing to visual art images.**

Keywords-component; content based image retrieval, image retrieval, similarity measures, visual art images.

I. INTRODUCTION

The earliest use of the term content-based image retrieval in the literature seems to have been by Kato [1], to describe his experiments into automatic retrieval of images from a database by colour and shape feature. The term has since been widely used to describe the process of retrieving desired images from a large collection on the basis of features (such as colour, texture and shape) that can be automatically extracted from the images themselves. The features used for retrieval can be either primitive or semantic, but the extraction process must be predominantly automatic. Pictures or images captured by a computer system are stored in the form of a matrix of binary values. The matrix is how the computer looks at an image from its own perspective. An image data has certain parameters called as 'metadata'. Metadata is some kind of data that defines a certain subject data that is taken into consideration. Metadata with reference to images would be the keywords, tags and descriptions that are associated with the images. In earlier days, using metadata as the reference for retrieval did the retrieval of images. This technique however had many disadvantages. Firstly, a search engine that relies on metadata produces a lot of garbage results. Secondly, it is difficult to manually search for the keywords of an image. A method was required which would give us more accurate retrieval results. Thus, the concept of recognizing images with respect to their content came into being. Content could be color, shape, texture or any piece of information, which we obtain from the image itself. Using content as a parameter for retrieval, it greatly increases the accuracy of the search and thus content based image retrieval techniques are now in favor. The concept of retrieving images based on their content is called as CBIR (content based image retrieval). The process of CBIR consists of three stages: (1) Image acquisition (2) Feature Extraction (3) Similarity Matching [2]. The process of CBIR is depicted in Fig. The query image passes through three stages as mentioned earlier. The query image is then compared with the images in the image database. All the images in the database undergo feature extraction so that the resultant feature vector can be compared with the feature vector of the query image. The closest image in comparison with the query image from the feature database is retrieved.

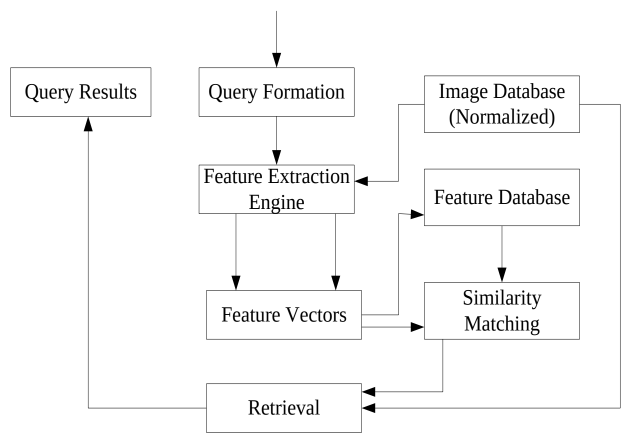

Fig 1 Flow of CBIR System

Retrieval of images by manually-assigned keywords is definitely not CBIR as the term is generally understood – even if the keywords describe image content. CBIR differs from classical information retrieval in that image databases are essentially unstructured, since digitized images consist purely of arrays of pixel intensities, with no inherent meaning. One of the key issues with any kind of image processing is the need to extract useful information from the raw data (such as recognizing the presence of particular shapes or textures) before any kind of reasoning about the image's contents is possible. Image databases thus differ fundamentally from text databases, where the raw material (words stored as ASCII character strings) has already been logically structured. Gupta et al. have considered search of information in visual media [3]. There is no equivalent of level 1 retrieval in a text database.

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CBIR draws many of its methods from the field of image processing and computer vision, and is regarded by some as a subset of that field. It differs from these fields principally through its emphasis on the retrieval of images with desired characteristics from a collection of significant size. Image processing covers a much wider field, including image enhancement, compression, transmission, and interpretation. While there are grey areas (such as object recognition by feature analysis), the distinction between mainstream image analysis and CBIR is usually fairly clear-cut. An example may make this clear. Many police forces now use automatic face recognition systems. Such systems may be used in one of two ways. Firstly, the image in front of the camera may be compared with a single individual's database record to verify his or her identity. In this case, only two images are matched, a process few observers would call CBIR. Secondly, the entire database may be searched to find the most closely matching images. This is a genuine example of CBIR.

This paper discusses about various techniques adopted for increasing the efficiency of CBIR system in order to find out the research gap in its implementation process on Visual Art images. In section 2, an overview of frequently adopted techniques on CBIR system which identify the entire major work being done in this area is presented. Section 3 highlights about the issues explored in CBIR process in visual art images. Related Work is discussed in Section 4 followed by research issues in CBIR in Section 5 and finally in section 5 we make some concluding remarks.

II. TECHNIQUES ADOPTED

Various techniques have been adopted widely by many researchers in the area of improving Content based image retrieval system. This section highlights the categories of techniques that were frequently added till the date.

2. Feature Extraction Techniques

Discussion on feature extraction [4][5] requires a knowledge of how the data is acquired in a system. When data in the form of images is acquired in a system, we feed the input to an algorithm, which runs on the data. For the algorithm to be really effective, it needs to be computed accurately and fast. If the input data is too large or redundant, then the algorithm might be less effective. To make sure that the data fed into a system is not large and redundant, we perform feature extraction on our data. Feature extraction is basically a case of reducing the dimensions of an object. By reducing dimensions we mean that data in higher dimensional space is transformed into data in a few lower dimensions. Once feature extraction is performed the input data is transformed to give a set of features collectively called as the feature vector. This feature vector is supposed to extract the relevant information from the data set to serve our needs. In the following sub-sections we will discuss various feature extraction methods that have been used for different applications.

2.1. Boundary Detection Feature Extraction

To understand the various feature extraction techniques some already existing systems are surveyed. In the boundary detection method, the binary image is scanned until a boundary is found. Scanning is done on the basis of K- Nearest Neighbor Method. We take a foreground pixel P and a set of foreground pixels that are connected with P are called the connected component containing P [6]. The tracing is done such that the initial position is set to indicate the origination of the boundary. The feature vector that is computed in this method is called as Fourier Descriptors. With the help of Fourier Descriptors we compute the Fourier Coefficients. To make sure that our boundary has been completely covered, we check if the first and the last position co-ordinates are equal.

2.2 Color Averaging Techniques for Feature Extraction

The color averaging technique is a method of feature extraction in the spatial domain [7]. Feature extraction is done in the spatial domain to reduce the size of the feature vector. Color averaging based image retrieval techniques are augmented using the even part of images obtained by adding the original image with the flip image. The even image is obtained by

Even Image = [(Original Image + Flip)/2]

Row column mean, Forward Diagonal Mean, Row Column, Forward Diagonal Mean of image is used as feature vectors.

2.3 Gradient and 12 Directional Feature Extraction

In this method [8], first the gradient of the handwritten character by applying Sobel's Mask is computed. After computing the gradient of each pixel of the character, we map these gradient values onto 12 direction values with angle span of 30 degree between any two adjacent direction values. Once we get the direction features, we feed them into a neural network system.

2.4 Image Retrieval by Extraction of Shape Features using Slope Magnitude technique

For extracting shape features the extracted edges need to be connected in order to represent the boundaries [9]. This is the main reason why use the slope magnitude method is used. The slope magnitude method is used along with gradient operators to extract shape features in the form of connected boundaries. In this method the shape feature vector is formed by applying by slope magnitude method to the gradient of images in the vertical and horizontal directions. However, the problem with this technique is that, all images must have the same dimension as that of the query image.

2.5 Feature Extraction using Transforms

In this method the DCT transform is used to design the sectors required for the search and retrieval of images from a

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database. This method has been proposed in [10][11] in performance comparison of four, eight, and twelve Walsh Transform Sectors Feature vectors for image retrieval from image database. The rows in the discrete cosine transform matrix have a property of increasing sequence. Thus zeroeth and all other even rows have even sequences, whereas, all odd rows have odd sequence. To form the feature vector plane we take the combination of coefficient of consecutive odd and even co-efficient of every column and putting even co-efficient on x axis and odd co-efficient on y axis.

In this method the DST transform is used to design the sectors to generate the feature vectors for the purpose of search and retrieval of database images. Like DCT the property of increasing sequence of the transform matrix is used.

2.5.3 Feature Extraction using Fast Fourier Transform

The Fourier transform is used to generate the feature vectors based on the mean values of real and imaginary parts of complex numbers of polar coordinates in the frequency domain [12]. The 8 mean values of 4 upper half sectors real and imaginary parts of each R, G and B components of an image are considered for feature vector generation. Every complex number can be represented as a point in the complex plane, and can therefore be expressed by specifying the point's Cartesian coordinates. This helps to generate eight components of a feature vector based on the complex plane as mentioned above.

2.5.4 Feature Extraction using Walsh Transform

This method [13] makes use of the Walsh Transform to design the sectors to generate the feature vectors in CBIR. The Walsh transform of the color image is calculated in all three R, G and B planes. The complex rows representing imaginary components of the image and the real rows representing real components are checked for the sign change according to the quadrants lying in. The imaginary and real component of Walsh values are assigned to each quadrant. Once the feature vector is generated for all images in the database a feature database is created.

3. Similarity Measurement

The CBIR process is used for general applications like recognizing patterns and matching fingerprints or other biometric data. Basically we need to compare two images and check whether they are similar or they match or not. To compute this, it is required to have certain techniques by which one can statistically evaluate if two images are similar or not. It is for this reason that similarity measurement is done. Once we extract a good set of features, we compare the extracted feature for similarity for; it is believed that if good sets of features are extracted, the similarity between 2 images is given by how close the extracted features are of the two images. There are various kinds of similarity measurement techniques; the Euclidean Distance, Mean Square Error and Sum of Absolute Differences for common CBIR applications.

3.1 Euclidean Distance

In image processing, a distance transform is the derived representation of a digital image. A distance transform is also called a distance map. A distance map is such that it labels each pixel of the image with the distance of the nearest obstacle pixel. The distance measure depends on the type of metric chosen. In Euclidean distance, the metric that is chosen is obviously the Euclidean metric. For the distance measures either a low value or a high value indicates similarity. In the case of Euclidean distance, a low of value of distance measure indicates similarity.

3.2 Mean Square Error

Mean Square Error like Euclidean distance is a distance measuring technique. A minimum value of MSE indicates similarity. MSE in statistics is a way to quantify the difference between an implied value of an estimator to the true value of the quantity to be estimated. Mapping this definition to the application of image recognition, we could say that estimators would be the images in the database and the value to be estimated would be the query image to be compared. MSE measures the amount by which value of the image from the database implies differs by the actual value of the target image. This difference occurs because of randomness or because the image from the database could not account for information that would have produced a more accurate estimate.

3.3 Sum of Absolute Differences

Sum of absolute differences is a simple algorithm for finding the co-relation between two images. It takes the absolute difference between each pixel in the original image to the corresponding pixel in the image used for comparison. Like Euclidean Distance and Mean Square Error, a low value of the sum of absolute difference indicates similarity. The accuracy of this method is affected by factors such as lighting, color, viewing direction, shape or size.

3.4 Neural Network Classifiers

Classifiers by themselves are an example of an Artificial Intelligence application. Classifiers are basically used to determine a closest match in a set of statistical data. A neural network is literally a network of neurons in the brain which perform various activities [14]. In an artificial neural network, the actual neural network is simulated by interconnections called as nodes. An artificial neural network is used to match patterns depending on the sequence of traversal through the nodes.

3.5 K-Nearest Neighbor Algorithm

This algorithm [15] is used in pattern recognition as a method of classifying objects based on the closest training examples in a feature space. In this algorithm an object is classified by a majority vote of its neighbors. If k=1, the object under

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consideration is assigned the class of its nearest neighbor. The algorithm has a training phase and a classification phase. The training phase of the algorithm consists of storing feature vectors and class labels of the training samples. The drawback is that during the classification phase, the classes with the more frequent samples tend to dominate the prediction of the new vector, because they tend to come up in the k-nearest neighbor when the neighbors are computed due to their large samples. Euclidean or Mahalanobis distance are used as distance metrics. The best choice of k depends upon the data; generally, larger values of k reduce the effect of noise on the classification, but make boundaries between classes less distinct. The optimal value of K for most datasets is 10.

3.6 Mahalanobis Distance

Mahalanobis Distance [16] is a distance measuring metric in statistics. It is based on the correlations between variables and can be used to analyze various patterns. It is useful in determining the similarity between an unknown sample set and a known one. In our case the sample set is the query image and the known set is the image database. It differs from Euclidean Distance as it is a multivariate effect size. Meaning it deals with the observations of more than one variable and the strength in their respective relationships.

3.7 Bhattacharya Distance

In statistics, the Bhattacharya Distance [17] measures the similarity between two discrete or continuous probability distributions. It is very closely related to the Bhattacharya Coefficient, which is used to measure the relative closeness of the two samples taken into consideration. It can also be used to measure the separability of classes in classification. The Bhattacharya Coefficient cannot measure the distance between fully separated samples.

III. Issues in CBIR

An image retrieval system is a computer system for browsing, searching and retrieving images from a large database of digital images. Most traditional and common methods of image retrieval utilize some method of adding metadata such as captioning, keywords, or descriptions to the images so that retrieval can be performed over the annotation words. Interest in the potential of digital images has increased enormously over the last few years. Users in many professional fields like medical, engineering, architecture are exploiting the opportunities offered by the ability to access and manipulate remotely-stored images in all kinds of new and exciting ways. However, it is also discovered that the process of locating a desired image in a large and varied collection can be a source of considerable frustration. While it is perfectly feasible to identify a desired image from a small collection simply by browsing and more effective techniques are needed with collections containing thousands of items. The problems of image retrieval are becoming widely recognized, and the search for solutions an increasingly active area for research and development.

Image Retrieval Systems are broadly categorized into Text-based image retrieval and Content based image retrieval.

Text Based Image Retrieval System: In Text Based Image Retrieval system, image search is supported by augmenting images with keyword-based annotations and the search process always relies on keyword matching techniques. Text Based Image Retrieval system is lexically motivated rather than conceptually motivated, which leads to irrelevant search results in information retrieval. Limitations of Text based Image Retrieval:

- Manual annotations require too much of time and are expensive to implement.
- The contents of medical images are difficult to be concretely described in words. For example, irregular organic shapes cannot easily be expressed in textual form.
- Users should have complete domain knowledge in order to formulate appropriate keywords for a valid query.
- Additionally, the difficulty in dealing with non-visual objects like expressing feelings or emotions.

Thus to overcome these limitations of text based image retrieval, content based image retrieval methods are proposed.

Content-based Image Retrieval: Problems with traditional methods of image indexing have led to the rise of interest in techniques for retrieving images on the basis of automatically-derived features such as color, texture and shape – a technology now generally referred to as Content-Based Image Retrieval (CBIR). Content-based image retrieval is an alternative and complement to traditional text based image searching. Content based image retrieval means that the search will analyze actual contents of the image by using image analysis technique. The term content, in this context refers to properties of the image called low level features such as color, shape, texture, or any other information that can be derived from the image itself. These systems employ image processing technologies to extract visual features and then similarity measurements are applied to get the relevant images. Feature extraction algorithms extract features and store them in the form of multidimensional vectors. Afterwards, similarity or dissimilarity measurement between two feature vectors is defined for each feature. Limitations of Content based Image Retrieval:

- Semantic gap; the discrepancy between the low level features that are automatically extracted by machine and the high level concepts of human vision and image understanding.
- In CBIR we generally have large database which contains images with varying huge sizes, so, CBIR of extracting relevant images is a very time consuming process.
- Low retrieval precision together with the requirement of advanced image processing and pattern recognition techniques.

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The biggest issue for CBIR system is to incorporate versatile techniques so as to process images of diversified characteristics and categories. Many techniques for processing of low level cues are distinguished by the characteristics of domain-images. The performance of these techniques is challenged by various factors like image resolution, intra-image illumination variations, non-homogeneity of intra-region and inter-region textures, multiple and occluded objects etc. The other major difficulty, described as semantic-gap in the literature, is a gap between inferred understanding / semantics by pixel domain processing using low level cues and human perceptions of visual cues of given image. In other words, there exists a gap between mapping of extracted features and human perceived semantics. The dimensionality of the difficulty becomes adverse because of subjectivity in the visually perceived semantics, making image content description a subjective phenomenon of human perception, characterized by human psychology, emotions, and imaginations. The image retrieval system comprises of multiple inter-dependent tasks performed by various phases. Inter-tuning of all these phases of the retrieval system is inevitable for over all good results. The diversity in the images and semantic-gap generally enforce parameter tuning & threshold-value specification suiting to the requirements. For development of a real time CBIR system, feature processing time and query response time should be optimized. A better performance can be achieved if feature-dimensionality and space complexity of the algorithms are optimized. Specific issues, pertaining to application domains are to be addressed for meeting application-specific requirements. Choice of techniques, parameters and threshold-values are many a times application domain specific e.g. a set of techniques and parameters producing good results on an image database of natural images may not produce equally good results for medical or microbiological images.

IV. Related Work

Content based image mining approach is proposed in [18]. Image mining presents unique distinctiveness suitable to the richness of the data that an image can show. Successful assessment of the results of image mining by content requires that the user point of view is used on the performance parameters. Comparison among different mining by resemblance systems is particularly challenging owing to the great variety of methods implemented to represent resemblance and the dependence that the results present, of the used image set. Other obstacle's is the lack of parameters for comparing experimental performance. [18] describes about an evaluation framework for comparing the influence of the distance functions on image mining by color. Experiments with color similarity mining by quantization on color space and measures of likeness between a sample and the image results have been carried out to illustrate the proposed scheme. Important aspects of this type of mining are also described. A fast query point movement technique for large content based image retrieval systems is discussed in [19]. This system refers to finding a specific image such as a particular registered logo or a specific historical photograph. This approach is able to reach any given target image with fewer iterations in the worst and average cases. In this system, a new index structure and query processing technique to improve retrieval effectiveness and efficiency is proposed. Strategies to minimize the effects of users' inaccurate relevance feedback are also considered. Extensive experiments in simulated and realistic environments show that this approach significantly reduces the number of required iterations and improves overall retrieval performance. This approach can always retrieve intended targets even with poor selection of initial query points which is the main advantage of this approach.

Table 1 List of Major Work in CBIR

Efficient relevance feedback for content based image retrieval by mining user navigation pattern is proposed [20]. It gives a detailed study about image retrieval and also specifies that approach used in it can be divided into two major operations, namely offline knowledge discovery and online image retrieval. For online operation, once a query image is submitted to this system, the system first finds the most similar images without considering any search strategy, and then returns a set of the most similar images. Then, by using the navigation patterns, three search strategies, with respect to Query Point Movement (QPM), Query Reweighting (QR), and Query Expansion QEX, are hybridized to find the desired images. Overall, at each feedback, the results are presented to the user and the connected browsing information is stored in the log database. A structure which concentrates on color as characteristic using Color Moment and Block Truncation Coding (BTC) to obtain the features for image dataset is developed in [21]. Subsequently K-Means clustering algorithm is conducted to group the image dataset into various clusters. An image is considered as a spatial representation of an object and represented by a matrix of intensity value. It is sampled at points known as pixels and represented by color intensity in RGB color model. A basic color image could be described as three layered image with each layer as Red, Green and Blue.

Content based image retrieval using hierarchical and K-Means clustering technique is proposed in [22]. Image is given as input query and retrieves images based on image content. Content based image retrieval is an approach for retrieving semantically-relevant images from an image database based on automatically derived image features. The unique aspect of the system is the utilization of hierarchical and k-means clustering techniques. This technique consists of two clustering algorithms, the hierarchical and the K-means clustering algorithms to group the images into clusters based on the color content. Both these clustering algorithms have been frequently used in the pattern recognition literature. Most of the images are filtered in the hierarchical clustering and then clustered images are applied to K-Means, so as to obtain better favored image results[23], an improved image mining technique is discussed.

An image mining method, which is dependent on the Color Histogram and texture of that image, is presented in [24]. Table 1 presents the list of the major works conducted in the area of CBIR system highlighting its methodologies adopted.

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Author	Technique Adopted	Image database Used	Results	Observation
Ravishankar [25]	Dominant Color Region Based Indexing	Paul Wilson Image Database	Images from databases are segmented and retrieved properly	Share and texture properties of image are not considered.
Ren [26]	Multi-image query content	UPenn Natural Image Database	The weighted visual similarity measure gave improved retrieval performance	Better precision & recall rate is observed
Georgakis & Li [27]	Bootstrapped SOM Network	SUNET: Image database.	Not enough test data	Completely dependent on Bootstrapping
Hiremath, Pujari [28]	Color, Texture and Shape features	Wang's dataset comprising of 1000 Corel images with ground truth.	Sufficient data being tested and better comparative results explored	Extraction of shape of objects, invariant moments are satisfactorily done
Herraez, Domingo, Ferri [29]	Combining similarity measures	A database containing 1508 pictures, some of which were extracted from the web and others were taken by the members of the research group.	Single Instance representation (SI) of the pictures, vague benefits of Equalization and Combination	Optimal use of adhoc based strategies.
Khaparde, Deekshatulu, Madhavilatha, Farheen, [30]	Independent Component Analysis	Database designed with tulip, texture, satellite image, animal, airplane, flag, natural images	Not enough test data,	Distribution of pixels with gray scale or histogram are not completely addressed
Yao-Hong Tsai [31]	Salient Points Reduction	fish image database	Better results of the CBIR using salient points generated	Sufficient data tested, better performance than proposed method.
Gonde, Maheshwari, Balasubramanian [32]	Complex Wavelet Transform, Vocabulary Tree	Corel 1000 and texture image database	Highest level of transformation used is not precisely defined for higher precision rate.	good improvement in precision, recall and rank
Rao, Kumar, Mohan [33]	Support vector machines, Exact Legendre Moments	COIL-20 database	Better results accomplishment only with respect to moments	improved classification efficiency obtained by SVM
Mascio, Frigioni, Tarantino [34]	Vector Image Serach Tool, new Content-Based Image Retrieval (CBIR) system for vector images	database of 2000 images (name not specified)	There is a functional dependence between the discriminating power of metrics and the image category	guarantees effectiveness and the efficiency of retrieval.
Soman, Ghorpade, Sonone, Chavan [35]	Discrete Cosine Transforms	Corel database of 1000 images	Texture and Color feature extraction provides maximum efficiency	Only 60% efficiency explored in comparative analysis
Reddy & Prasad [36]	Magnitude of Local Derivative Patterns	Corel database and MIT VisTex database	Significant improvement in terms of their evaluation measures	Better precision and recall rate is observed.
Sudhir, Baboo [37]	YUV Color Space, Texture Features	webdocs.cs.ualberta.ca database	Better similarity match on retrieved images	YUV have higher performance and retrieves the most similar images.
Sharma, Rawat, & Singh [38]	Color Histogram Processing	Used real time images from digital camera	Not enough test data,	Better result using cross correlation function

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Ali, Adnan, Zahidullah [39]	Materialized Views	MM-Database	Materialized views will be created on the basis of image features.	Efficiency of the model is not discussed enough
Agarwal, Mostafa [40]	Used in medical analysis on Alzheimer's Disease	SPECT database	successfully leverage user feedback accomplished	Associated information seen to achieve better retrieval performance
Sharma & Dubey [41]	Color Averaging Technique	WANG database	Success depends upon source image pixels	precision is high and recall is low
Sravanthi & Reddy [42]	CBIR using sketches	Microsoft Research Cambridge Object Recognition Image Database.	Cannot be precisely used in medical field due to adoption of the free hand sketches.	Histogram of Oriented Gradients in more cases was much better than the Edge Histogram detector based retrieval.
Chowdhury, Das, & Kundu [43]	Ripplet Transform, Fuzzy Relevance Feedback	SIMPLIcity database	Not applicable for video retrieval.	Ripplet transform based image coding is suitable for representing low level features
Jaswal, Kaul [44]	Color space Approach	database of 500 JPEG images clicked by 3 mega pixel camera and for 120 JPEG images downloaded from the internet.	Cumulative Color Histogram and Color Coorelogram not considered	Better precision and recall rate observed

From the Table 1, it can be seen that majority of the work done in the area of CBIR process has used color, texture, transformation, and various new techniques considering different types of databases too. But what is unique point of the findings is that there is absolutely no work recorded till data considering visual art images. However, [45] is the only record of the work being done considering visual arts query image. Hence, a huge research gap can be identified when the analysis of CBIR techniques is attempted considering visual art images.

V. RESEARCH ISSUES

The concept of visual art in image processed highlights about various sets of procedures that can be perform on the fine arts or the paintings for retention of the digitized contents of the fine arts, or removal of noise from fine arts, or correcting the artifacts from the fine arts [46]. Since one of the most significant characteristics of paintings is that they are images, image processing seems to be a natural candidate to deal with them. As a matter of fact, there are several ways in which image processing may find meaningful applications in the art field. Roughly speaking, we can identify three main application areas: the achievement of a digital version of traditional photographic reproductions, the pursuit of image diagnostics, and the implementation of virtual restoration. The authentication and classification of Visual arts used to be dependent on the judgment of the artist himself according to experience and knowledge of the artwork and its artist. Recently, the development of computer and image processing technology has made the processing of digital visual artworks possible. More and more museums and libraries have their collections to be digitalized, which make the study of problems haunted the art historians based on these digital images available. In this paper, the research of understanding of visual arts based on computer and low-level information of paintings, which can be called scientific understanding of visual arts, has been brought out. Some features, including multi-scale amplitude, distribution of coefficients of Curvelets and non-stationary of artworks, are extracted to evaluate the style of different artist and some other respects of the artwork. The relations between the style of visual arts and these features are also stated. It is apparent that each feature reflects different characteristics of the painting technique.

This research area presents a number of interesting challenges of great relevance to the knowledge and dissemination of works of art and their related culture. Several issues, such as the ones regarding colorimetric recording of image data and accurate reproduction, are common to the general research area of digital color imaging. However, conservation issues are especially important for art objects. The digitizing process must not harm the artwork, and damage could easily occur by excessive handling and irradiation by high-intensity light sources. In general, it is not possible, or not desirable, to move art objects, even when their position is not ideal for scientific investigation. Clearly, it is also desirable to digitize the artwork once, in a manner that facilitates a variety of applications. This imposes highly demanding requirements on the acquisition devices and methods. However, the true peculiarity of this field lies in the fact that each work of art is, by its nature, unique. Dimensions, materials, and techniques may vary enormously between western and eastern production, for artworks produced in different periods and by different artists. The fields involved are optics, image processing, color science, computer science, art history, and painting conservation. Research and development issues in visual art

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images in CBIR cover a range of topics, many shared with mainstream image processing and information retrieval. Some of the most important ones are:

- understanding image users' needs and information-seeking behavior
- identification of suitable ways of describing image content
- extracting such features from raw images
- providing compact storage for large image databases
- matching query and stored images in a way that reflects human similarity judgments
- efficiently accessing stored images by content

Key research issues in video retrieval include:

- automatic shot and scene detection
- ways of combining video, text and sound for retrieval
- Effective presentation of search output for the user.

VI. Conclusion

CBIR at present is still very much a research topic. The technology is exciting but still is immature, and few operational image archives have yet shown any serious interest in adoption. The crucial question that this report attempts to answer is whether CBIR will turn out to be a flash in the pan, or the wave of the future. It is not as effective as some of its more ardent enthusiasts claim – but it is a lot better than many of its critics allow, and its capabilities are improving all the time. The application areas most likely to benefit from the adoption of CBIR are those where level 1 technique can be directly applied.

In this paper, various feature extraction methods, similarity measurement techniques and the various applications in which they are used have been analyzed. It has been found that variation in feature extraction methodologies can ensure the better and more accurate retrieval of relevant images from the large database. Similarity measuring parameters also play a major role, in not only the relevant retrieval of images but also in providing the faster mechanism for comparison such as Sum of Absolute Difference, which is computationally very less than the widely used Euclidean Distance. In many cases it has been found that Sum of Absolute Difference provide better retrieval comparing to other distances like Euclidean Distance, Bhattacharya Distance, Mahalanobis Distance. The choice of the CBIR process has to be application specific and it really is a matter of which process is the most optimum rather than better. The CBIR system also depends on the size of the database. The most interesting part of the current paper is that there are more than 48,758 papers published till date in ACM digital library and 16,439 papers being published in the area of image retrieval explored in IEEE itself. However, only one work of visual art map has been identified so far [45].

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