# Image Retrieval using Enhanced Feature Space

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*Abstract*— When the image is new, the world is new." Any image can be interpreted in different way by different human being; the interpretation also depends upon Computer Vision System. Retrieving an image can be based on colour features texture features. The Human Vision System based on Human nervous system which holds the information in the form of signals in brain. The sources of information for our brain are our body sensors and to record pictures, eyes capture image and send the information to our brain and so image is interpreted on the basis of previously stored information. Now the important task and also we can call it as demand of future development in image processing is to process image through machine like how human brain does. To reduce the semantic gap between real content and interpreted content. So we suppose that using a single way of processing will not be enough for complete set of operations in the area of image mining. This Paper examines the Image mining techniques which is based on the Color Histogram, texture of Image. We are trying to match the query image with images in database on the basis of Color Histogram and Texture, shape and results are given on that basis.

***Key words:*** Colour Coherence Vector (CCV), Image Retrieval

## I. INTRODUCTION

Content Based Image Retrieval systems are mean for finding visually similar images to a query image. There is a wide range of applications of CBIR systems found in many areas such as a web-based product search, surveillance, and visual place identification.[3] A common technique used to implement a CBIR system is using image features which describe an image instead of text.

Features of image are major part of CBIR systems which are used to find similarity in between images. The advantages of such systems are, systems can be customized as per the application. Also, the speed and efficiency, compact storage, etc.

### *A. Enhanced Feature Space*

Extraction of features of an image avails many ways to grab the information. However, there are some norms available which states that the features should have or characterize maximum data about query image or image under processing; also, the data extracted should be easy to manipulate even for larger database of an image. Moreover, they should match or link with human perceptions.[2] So we are presenting experimental analysis on different features are extracted to enhance performance of image retrieval system which will connect better with HVS.

*1) Colour feature*

Colour features are most commonly used features, as they have an important role human vision system [1, 2]. The colour histogram supply meaningful information in measuring the similarity between two images [2]. Exanimine colour histogram – colour corelogram, called a colour coherence vector (CCV), which divides the pixels on the basis of spatial coherence. A coherent pixel is part of some sizable continuous region, but an incoherent pixel is not a part of any continuous region. [2] In short, if we use the ratio of the coherent and incoherent pixels, we can measure chromatic benefactions to the complexity of any image. While searching for a matching image from a database, a person can provide a query image from which a colour histogram is calculated. The matching process then retrieves those images whose colour histograms matches most with the query image [6].

*2) Texture Feature*

Textures are important visual features for an image. The HVS analyses the surfaces i.e. textural information by visualising in and characterises it into different textures like smooth, hard, rough, fine, glossy, etc. [2]. Texture feature extraction is a big task in itself and quite tough to achieve the desired goal. By suing these two approaches for analysing we can give a fair chance to accomplish the extraction and they are- structural and statistical approaches.[2] Gray Level Co-occurrence Matrix (GLCM) is formulated in tabular form to show how frequently the combinations of pixels occur in a given image. A GLCM holds the data of pixel positions with similar gray levels. An input to GLCM calculation unit is gray level value. On comparing query image with the database image, on the basis of different available combinations, GLCM gives the deviation present in the image. The Gray-Level Co-occurrence Matrix (GLCM) is based on the relation between 2 neighbouring pixels. The two pixels are neighbouring pilxel and reference pixel.[17] GLCM matrix is a square matrix which is of dimensions equal to number of gray levels in an image. Every element in the matrix represents the numbers of occurrence of the pair of pixel.[16] Rows and columns of a co-occurrence matrix are set of possible image values.[16] Hence, it is necessary to add or integrate textural features in retrieval system to best match with human vision system.

| | Neighbour pixel | | | | |
|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 |
| Ref. pixel | 0 | 0, 0 | 0,1 | 0,2 | 0,3 |
| | 1 | 1,0 | 1,1 | 1,2 | 1,3 |
| | 2 | 2,0 | 2,1 | 2,2 | 2,3 |
| | 3 | 3,0 | 3,1 | 3,2 | 3,3 |

Table 1: GLCM Calculations.[17]

We are expecting to get enhanced space representation to represent effectively the capabilities of our system matching HVS by using colour and texture features.

Support vector machine (SVM) is a machine learning method that is widely used for data analyzing and pattern recognizing. Classification of data is one of the major and important part in machine learning. The SVM creates a hyper plane in between data sets to show to which class it belongs. To train the machine for extracting structure from data and map with correct class label is a challenge.

 

The best result can be obtained if the hyper plane has the largest distance to the nearest training data points of any class.

## II. IMPLEMENTATION AND SYSTEM DESCRIPTION

The following steps outline the procedure:

- Select the Image Features for Retrieval
- Index the Images(Extract features)
- Search Similar Images

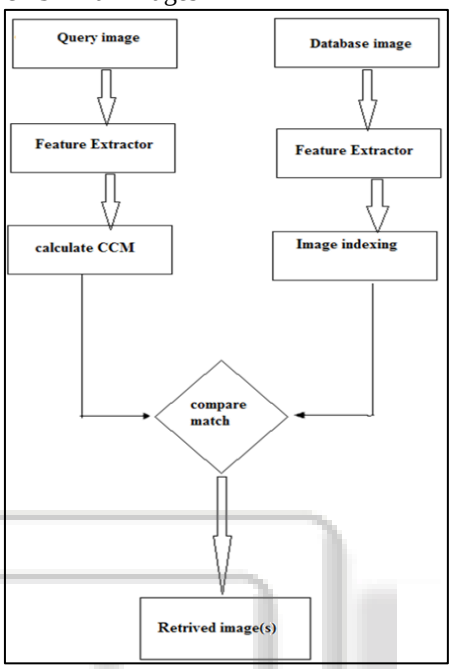


Fig. 1: Implementation of algorithm.[6]

### A. *Algorithm*

The algorithm for content based image retrieval system using multiple Feature given as below

*1) Step 1: Preprocessing*

Provide various object Images Creating Block Matrix. Calculate their Mean and concatenate all obtainede Block Matrices.

*2) Step 2: Feature Extraction*

Convert m×n Block matrices "r & s" from RGB to HSV where r and s are the average values of vector. Extract feature vector Vj from HSV space. The important data extracted are histogram mean, standard deviation, and median for each color channel. Extract texture feature such as entropy, energy, contrast, from the co-occurrence matrix. The conversion formulae are given as follows:[6]

$$H = \cos^{-1}\left\{\frac{\frac{1}{2}[(R-G)+(R-B)]}{\sqrt{(R-G)^2+(R-B)(G-B)}}\right\}$$

$$S = 1 - \frac{3}{R+G+B}[\min(R,G,B)]$$

$$V = \frac{1}{3}(R+G+B)$$

*3) Step 3: Similarity Measurement*

a) Calculation of shortest path distance:

Calculate Euclidean Distance and get Euclidean (D) Euclidean distance measures the similarity between the two different feature vectors. The formula for Euclidean distance is given as:

Euclidean Distance = $\sqrt{\sum_{i=1}^{n}[Qi - Di]^2}$

Where,

Q = Query image feature vector and

D = Database image feature vector.

Repeat the same steps for multiple images.

The svmclassify function uses results from svmtrain to classify vectors x according to the following equation:

$$c = \sum_i \alpha_i k(s_i, x) + b,$$

Where, $s_{i=}$ support vectors,

$\alpha_{i=}$ weights,

$b$= bias, and $k$ is a kernel function

In the case of a linear kernel, $k$ is the dot product. If $c \geq 0$, then $x$ is classified as a member of the first group, otherwise it is classified as a member of the second group

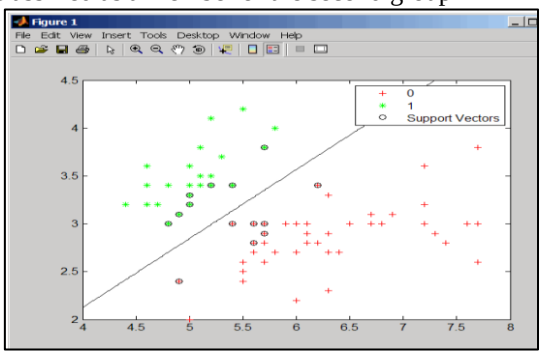


Fig. 2: Support Vector Machine

## III. RESULTS

The main objective of any visual complexity representation is to build a CVS which resembles the HVS system. To judge efficiency of our built system, we have created our own database with images from different categories. The obtained results from CVS are compared with HVS for verifying matching results.

The following figure shows the given query image for assessment and the obtained result in output window:

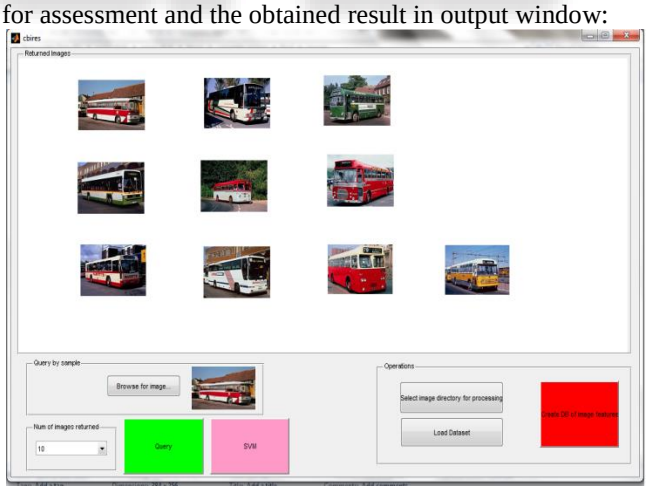

Fig. 3: Matching retrieved images

Further, on repeating the same procedure for multiple images, we may have different results obtained depending upon the image; whether it is present in our database or not. For testing purpose, we may use some standard database like coral 1000, medical images database etc. or we can create our own database. The experimental results are listed as shown in below table:

| Test image | Matched image | Unmatched image | % of image matching |
|---|---|---|---|
| Img1 | 8 | 2 | 80% |

| | | | |
|---|---|---|---|
| Img2 | 7 | 3 | 70% |
| Img3 | 5 | 5 | 50% |
| Img4 | 7 | 3 | 70% |
| Img5 | 6 | 4 | 60% |
| Img6 | 6 | 4 | 60% |
| Img7 | 6 | 4 | 60% |
| Img8 | 6 | 4 | 60% |
| Img9 | 6 | 4 | 60% |
| Img10 | 7 | 3 | 70% |

Table 2: Experimental Result

The experimental result shows that, for a query image, we have selected 10 result images. In first case in our trials, out of 10 resultant images, 8 images were matching to query images; detected by HVS the 3 images were misclassified by CVS. Similarly, we have different percentage of matched result depending on query image and available images in a database.

## IV. CONCLUSION

### *A. Conclusion*

Building a machine system- computer vision system, which can be effectively representing the HVS's estimation or evaluation and implementation of visual complexity would have keen impression in many areas in image processing and computer vision system. We are able to design a system of enhanced feature space to describe visual complexity of an image by extracting and manipulating features along with colour, texture attributes. As a result, we have seen that enhanced feature space can better classify visual complexity of an image and retrieve best matching results for a query image from database.

### *B. Future Scope*

There is a huge scope for research in a field of image processing and especially in image mining. The efforts can be done in future on selection of attributes of different features for improved result. Following that, the improved systems can be used to build a CVS (Computer visual system) system which will be closed to HVS (Human Visual System) by considering their visual complexity and to obtain a focused result for image retrieving system.

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