



## Content Based Image Retrieval using Line Edge Singular Value Pattern

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*Abstract-Content Based Image Retrieval Technique is highly used technique in this world of large image database. Content Based Image Retrieval is actively used in field of Data Mining, Education, Medical, Crime Prevention, Remote Sensing, Management of Earth Resource, Forecasting etc. It is very effective and efficient method for indexing and retrieving the images based on the content features like color, shape and texture. With increasing popular technologies content based image retrieval is very accurate and fast method to retrieve the image. In this paper we proposed an improved image retrieval technique Line Edge Singular Value Pattern (LESVP) by the integration of Line Edge and Singular Value Decomposition to retrieve images from a large database. The experimental results show our proposed method retrieve images with better accuracy as compared to other existing methods like LBP, LEBP.*

*Keywords - Content Based Image Retrieval(CBIR), Color Histogram, Singular Value Decomposition, Local binary Pattern, Texture.*

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### I. INTRODUCTION

Content Based Image Retrieval (CBIR) is the method which is commonly used to retrieve the images from huge image database. Research on CBIR started on early 1990's and originated by T.Kato . It is progressively used in the field of Digital Image Processing. Today many research institutes and companies are working and researching on the CBIR. There are two most common approaches used for image retrieval. (i) Text Based (ii) Content Based.

Text based method is based on textual description and categorization of images but it is time consuming when we deal with large image database. So the Content Based method is the solution to overcome this problem or limitation of Text Based method.

Content Based Image Retrieval is also called Query by Image Content (QBIC) and Content Based Visual Information Retrieval (CBVIR)[4]. The Visual Content denotes to the colors, shapes, textures [1, 2,3] and other information which can be used to retrieve the images from large database. It supports Query based on the images, colors and texture of images.

Texture is one of the important characteristics which is usually present in the image. In image processing, texture content shows the information about the spatial arrangement of the colors or intensities in an image. There are two basic methods which can be used to analysis the texture: (1) Structural approach (2) Statistical approach .

Histograms are used to show image statistics in a proper visual format. It mainly helpful to improve the visual appearance and shows frequency of the intensity value of an image. Color content of an image can be represent by color histogram. Color histogram is very important technique which can be used in CBIR. It is used mainly for color images to show statistical nature of color image. Color histogram is beneficial because of its effectiveness and accuracy.

Local Binary Pattern (LBP) are the descriptor which is used to describe the local structure of an image. LBP defines the local structure of an image by comparing each pixel of an image with its neighboring pixels of image. LBP is a powerful method which is used to classification of texture.

Singular Value Decomposition (SVD) generally applied in many restoration problems of images. It is very significant topic which is used in linear algebra by mathematicians and very reliable orthogonal matrix decomposition method. Some of the SVD properties are normally used in digital image processing.

In this paper new approach **LINE EDGE SINGULAR VALUE PATTERN (LESVP)** is proposed by the integration of Line Edge and Singular Value Decomposition which retrieve the image with higher accuracy compared to existing image retrieval techniques.

### II. LITERATURE SURVEY

CBIR is very highly used technique in Digital Image Processing. Query by pictorial example (QBPE) is very common process in CBIR [5].Color, Shape and Texture are important visual features which are used in image retrieval [8,9]. Shape and Texture using elastic energy based approach is used to measure image similarity [6] . Smith and Chang represented an automated extraction of color and texture information by using binary set representation [7].

Color is the powerful descriptor for identification and retrieval of object from an image [10]. Color histogram counts the number of color contents and occurrence of intensities of each color in an image [11]. Effectiveness and efficiency is very desire characteristics of color histogram [12].

LBP is a standard method to analysis the 2D images [13]. LBP is successfully applied in texture analysis [14],[15]. Pepton [16] used local binary pattern in face recognition. Ojala [???] introduced Rotation-invariant texture classification using feature distributions [17] which is based on pattern recognition with local binary pattern. Facial expression analysis and recognition is proposed by Ahonen et al. [18] and Zhao and Pietikainen [19] by using Local Binary Pattern Operator. Yao and Chen [20] have proposed two types of local edge patterns (LEP) histograms. The center-symmetric local binary pattern (CS-LBP) which is a modified version of the well-known LBP feature is combined with scale invariant feature transform (SIFT) [21]. Subrahmanyam et al. [27] have proposed the DLEP which collects the directional edge information for image retrieval.

Singular Value Decomposition is very important linear algebra method which is used in image compression [22][23]. Improved SVD techniques used in watermarking, image compression and quality measure in digital image processing[24][25][26]. Many watermarking schemes are there based on SVD decomposition[27][28].

### III. PROPOSED ALGORITHM

We proposed a method **Line Edge Singular Value Pattern (LESVP)** which integrate the concept of line Edge and Singular Value Decomposition to retrieve the image with better retrieval accuracy. The algorithm is as below.

#### ALGORITHM:

**Step 1:-** Load Original Image=I (Table -1),

PTN( $g_c$ )= the 3×3 pattern value of an image (I) with central pixel  $g_c$ .

The line edges (LE) (shown in Table -2) are calculated by multiple of window functions ( $W_\theta$ ) with the gray values pattern.

$$LE(\theta) = \text{sum} (PTN(g_c) * W_\theta); \quad \theta = 0^\circ, 45^\circ, \dots, 315^\circ \quad (1)$$

**Step 2:-** Take the absolute of Line Edge matrix (LE) and Centre pixel value will be mean of absolute of LE( $\theta$ ). That is shown in Table-3.

25	30	28	10	11	25	30
22	28	29	24	21	20	18
31	17	22	28	29	26	19
15	18	25	23	18	20	17
22	28	27	18	19	24	27
17	22	23	25	26	24	28
29	28	26	24	21	23	28

Table 1:- Gray Value of i/p Image (I)

-10	4	12				
3	×	4				
-5	-9	-19				

Table 2:- Line Edge (LE) Value

10	4	12				
3	8.25	4				
5	9	19				

Table 3:- Absolute(LE)=| LE | and centre pixel value is the mean of | LE |

	27.46					

Table 4:- Max Value of Singular Value Decomposition of |LE| that is LESVP

**Step 3:-** Find out the Singular Value Decomposition (SVD) of Table-3 :

$$[U \ S \ V] = SVD(|LE|) \quad (2)$$

Where, U=left singular Vectors, V= Right singular Vectors, S= Singular Value of the corresponding matrix (|LE|)

**Step 4:-** Centre pixel replaced by maximum value of Singular Value Matrix (S) (In Table-4) that is the LESVP of the 3×3 pattern- image .

**Step 5:-** After identifying the LESVP pattern of each pixel ( $j, k$ ), the whole image is represented by building a histogram:

$$H(l) = \sum_{j=1}^{N_1} \sum_{k=1}^{N_2} f_2(LESVP_{P,R}^{M_2}(j, k), l); l \in [0, 255] \quad (3)$$

$$f_2(x, y) = \begin{cases} 1 & x = y \\ 0 & else \end{cases}$$

where the size of input image is  $N1 \times N2$

#### IV. EXPERIMENT RESULT

We have implemented our proposed work using MATLAB. We have performed experiment using Coral1000 database which contains 10 groups of images and each group having 100 images, thus total number of images are 1000. Our results show when we give query image as input, our proposed method is successfully retrieve corresponding matching image as output image. For example, when we give flower as input, 12 flower images are retrieved out of 1000 images .

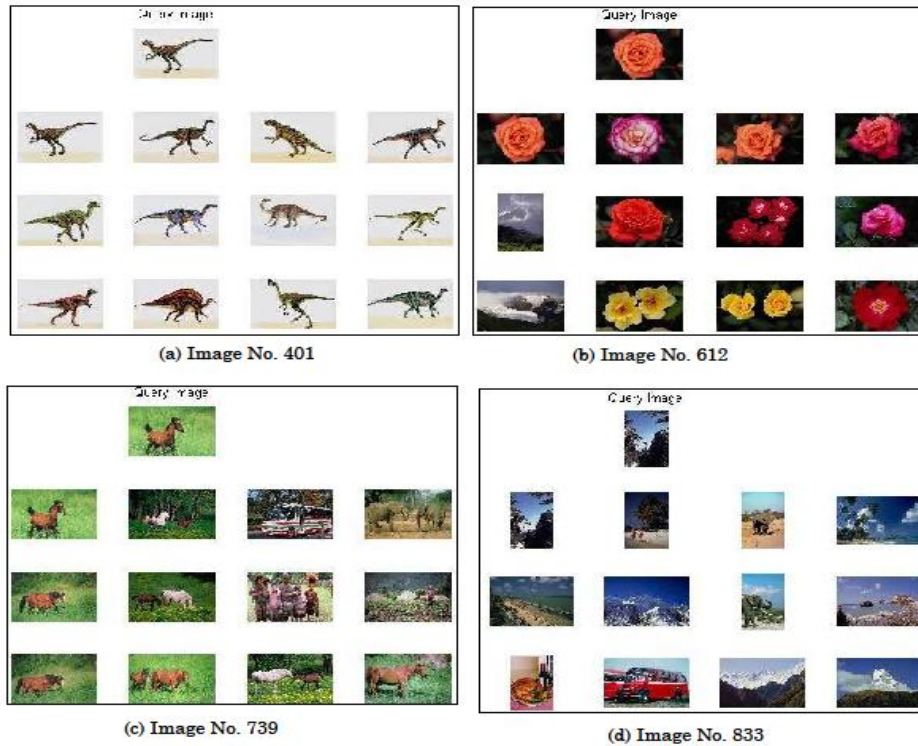


Fig 2. Query results of our proposed method on Coral Database

We have also calculated precision of result using our method (LESVP) against other method like LEBP, LBP. The graph shows our method gives better result.

No of Top Images	10	20	30	40	50	60	70	80	90	100
LESVP	79.43077	70.76923	66.06154	62.50769	59.94154	57.71026	55.67473	54.00577	52.28889	50.69231
LEBP	74.552	68.997	64.124	61.001	58.471	56.743	54.764	53.217	51.233	49.798
LBP	71.511	65.001	60.752	58.0124	55.213	53.184	51.129	49.326	47.816	45.721

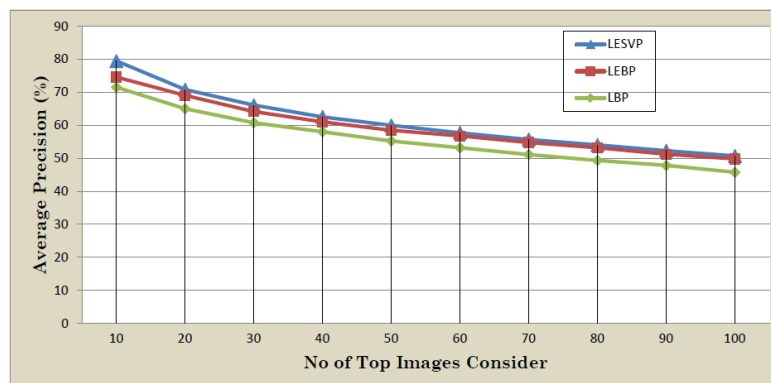


Fig 2. Average Precision Graph

#### V. CONCLUSION

In this paper, a new image retrieval techniques Line Edge Singular Value Pattern (LESVP) which integrate the concept of Line Edge and Singular Value Decomposition (SVD) to retrieve texture image is proposed. We performed our

experiments on Coral1000 database image. The result shows that proposed method gives efficient and accurate result in terms of precision against other existing methods like LBP , LEBP.

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