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# Development of Local Ternary Patterns for Content Based Image Retrieval

**G. Kiran Sowmya[1] and Dr. Y. Ramakrishna[2]**

*[1](Dept. of ECE, Gudlavalleru Engineering College, India-521356)*

*[2](Dept. of ECE, Gudlavalleru Engineering College, India-521356)*

**Abstract**

This paper presents a face identification based on Local Ternary Patterns (LTPs) for Content Based Image Retrieval (CBIR). In this project it extracts and compares some of features from query image and database image and it retrieves if it is in data base, else no image will be retrieved. Here, we are using CBIR technique. The problem identification of Local Binary Patterns (LBPs) is if a person is in front of camera he has 20% change in face the camera can't identified. In order to solve this problem this project proposes an efficient face image description with local ternary patterns to improve the efficiency of this concept. Image retrieval experiments are performed to observe the effectiveness of the proposed approach using MATLAB tool.

**Keywords** - Image retrieval**,** Content Based Image Retrieval (CBIR), Local Binary Patterns (LBPs), Local Ternary Patterns (LTPs).

## I. INTRODUCTION

Image retrieval system is a computer system for browsing, searching and retrieving images from a large database of digital images and input from the user image taken as query image. Image retrieval is demanding more and more consideration because of its fast development in numerous spots. Image retrieval has a few applications, for example, object recognition, biomedical, agriculture, and so on. In this project is used to identify the face and retrieving the image from the database folder based on some contents. Here, we are using content based image retrieval. [1] The aim of CBIR is to extract the similar images of a given image from huge database by matching a given query image with the images of the database. Matching of two images is encouraged by the coordinating of actually its feature descriptors (i.e. image signatures). It implies the execution of any image retrieval system is majorly depends on the image feature

descriptors being matched. CBIR has drawn a great attention in the past two decades [1]-[3]. Different from traditional keyword search systems, CBIR systems utilize the low-level features, including global features (e.g. color moment, edge histogram, LBP [4]), and local features (e.g. sift [5]), automatically extracted from images. In CBIR technique the features to be extracted are color, shape, texture. For color, a significant improvement over the RGB-color space use of opponent color representation uses the opponent color axes (R-G, 2B-R-G, R+G+B) [2] is one way to represent color of an image. There is also a method called Color Predominance Method Computing distance measures based on color similarity is achieved by computing a color histogram for each image that identifies the proportion of pixels within an image holding specific values (that humans express as colors). Texture measures look for visual patterns in images and how they are spatially defined. Textures are represented by texels which are then placed into a number of sets, depending on how many textures are detected in the image. which scans the image and replaces each pixel color with the new RGB color list [3, 4], gave an example indexing using texture where an image is indexed by a vector (w1, w2, w3, w4, w5, w6) representing the estimated proportion of texture where it is the proportion of pixels classified with texture they are introducing indexing using Intermediate Features [5]. Shape does not refer to the shape of an image but to the shape of a particular region that is being sought out. Shapes will often be determined first applying segmentation or edge detection to an image. Local pattern based descriptors have been used for the purpose of image feature description. The Local Binary Patterns (LBPs) [5], [6] are originally designed for texture description. Content Based Image Retrieval is any technology that in principle helps to organize digital image archives by their visual content. By this definition, anything ranging from an image similarity function to a robust image annotation engine falls under the purview of CBIR.

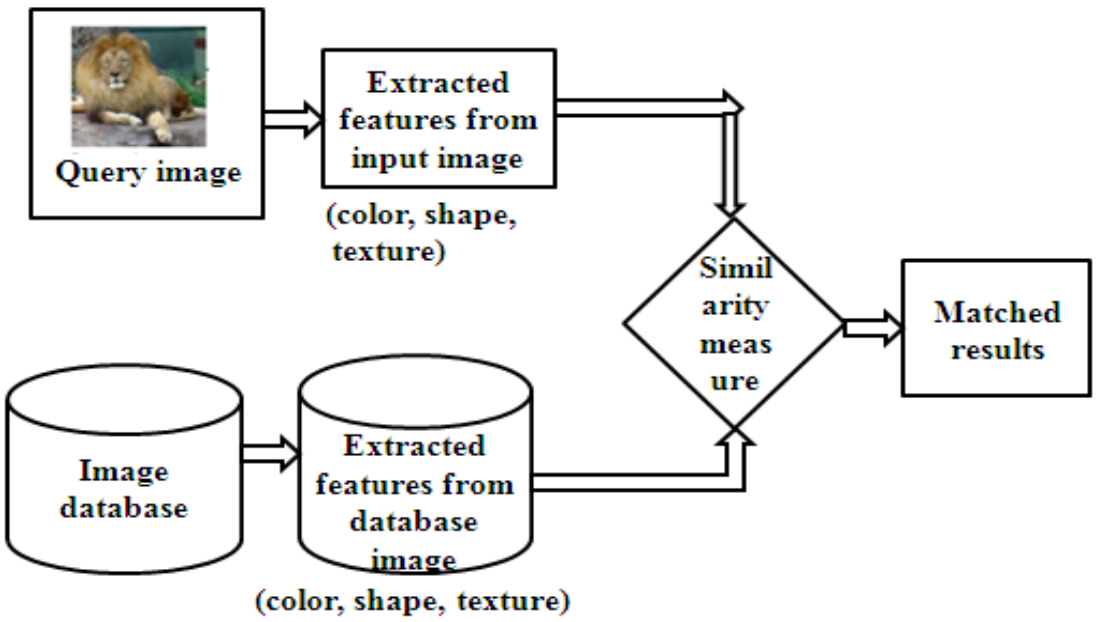



**Figure 1:** Block diagram of existing system

The most common form of CBIR is an image search based on visual [1]. The increasing amount of digitally produced images requires new methods to archive and access this data. Conventional databases allow for textual searches on Meta data only. The CBIR is a technique which uses visual contents, normally called as features, to search images from large scale image databases according to users' requests in the form of a query image. In this technique we use GABOR TEXTURE FEATURE EXTRACTION (GTEX). The GTEX technique is extracts the features of that image then it measure similarity between the two images and finally the image will be retrieved.

Whatever remains of this paper is composed in following way; Section II presents the proposed approach; Section III talks about the distance measures. Image retrieval experiments utilizing proposed strategies are performed in section IV with results; and finally section V finishes up the paper.

## II. PROPOSED TECHNIQUE

### Local Ternary Patterns (LTPs)

Local ternary patterns are an expansion of Local binary patterns. Unlike LBP, it does not threshold the pixels into 0 and 1; rather it uses a threshold constant to threshold pixels into three values. Considering k as the threshold constant, c as the value of the center pixel, a neighboring pixel p, the result of threshold is:

$$\begin{cases} \mathbf{1}, & \boldsymbol{if\ p > c + k} \\ \mathbf{0}, & \boldsymbol{if\ p > c - k\ and\ p < c + k} \\ \mathbf{-1}, & \boldsymbol{if\ p < c - k} \end{cases}$$

The local ternary patterns technique has to be implemented for correcting the facial deformations. In this way, each threshold pixel has one of the three values. Neighboring pixels are combined after thresholding into a ternary pattern. Computing a histogram of these ternary values will result in a large range, so the ternary pattern is split into two binary patterns. Histograms are concatenated to generate a descriptor double the size of LBP.

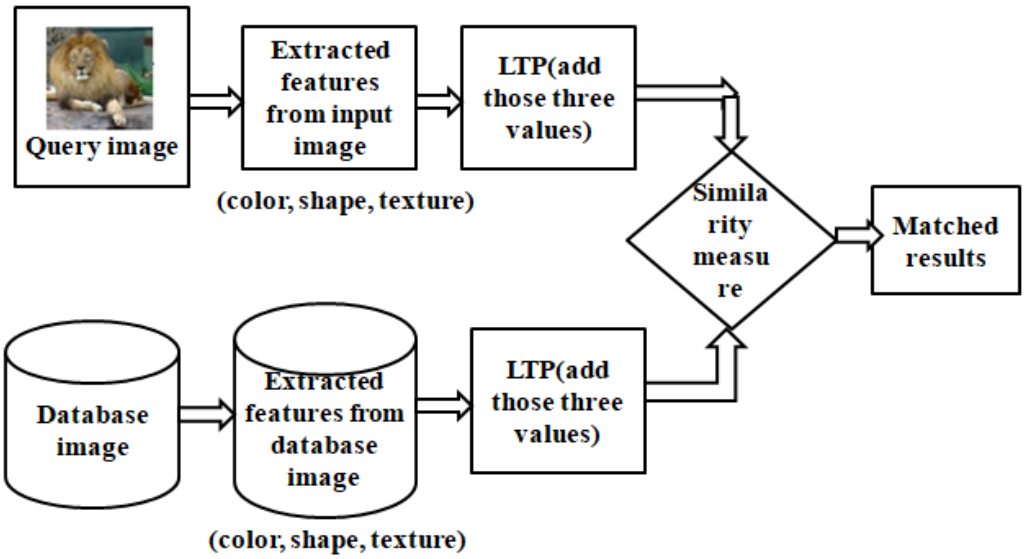



**Figure 2:** Block diagram of proposed system

In LTPs technique we use Gabor Texture Feature Extraction (GTEX). In practical if we pass image through the Gabor filter the output response of that filter is nothing but extraction of features of that image and the Gabor filters are used to reduce the noise in the input image. Gabor filters are band pass filters which are used in image processing for feature extraction, texture analysis, and stereo disparity estimation. The impulse response of these filters is created by multiplying a Gaussian envelope function with a complex oscillation. Gabor showed that these elementary functions minimize the space (time)-uncertainty product. By extending these functions to two dimensions it is possible to create filters which are selective for orientation under certain conditions the phase of the response of Gabor filters is approximately linear. This property is exploited by stereo approaches which use the phase-difference of the left and right filter responses to estimate the disparity in the stereo images.

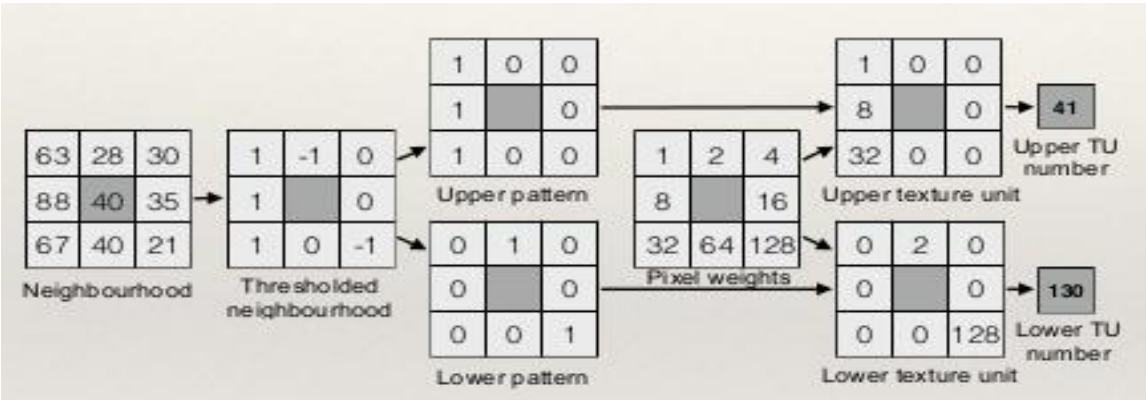



**Figure 3:** Local Ternary Patterns (LTPs)

It was shown by several researchers that the profile of simple-cell receptive fields in the mammalian cortex can by described by oriented two-dimensional Gabor functions. The extracted features are color, shape, texture. In the local ternary patterns technique add those three values (color, shape, texture), Divide the examined window into cells (e.g. 3*3 pixels for each cell). The LTP operator is shown in above figure3. For each pixel in a cell, compare the pixel to each of its 8 neighbors (on its left-top, left-middle, left-bottom, right-top, etc.). Follow the pixels along a circle, i.e. clockwise or counter-clockwise. Where the center pixel's value is greater than the neighbor pixel value, then it represents "0". Otherwise, write "1". And the neighbor pixel value is in between the higher center pixel value and lower center pixel value then it represents "-1". This gives an 8-digit binary number (which is usually converted to decimal for convenience).

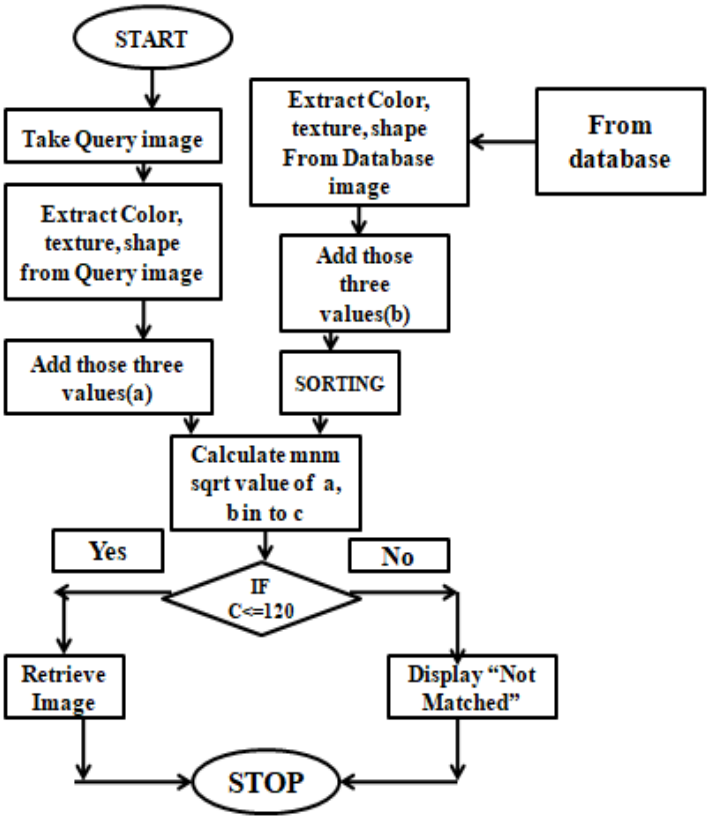



**Figure 4:** Flow chart of local ternary pattern for content based image retrieval

The flow chart of local ternary patterns for content based image retrieval is shown in the figure 4. In this way, each threshold pixel has one of the three values. Neighboring pixels are combined after thresholding into a ternary pattern. Computing a histogram of these ternary values will result in a large range, so the ternary pattern is split into two binary patterns. Histograms are concatenated to generate a descriptor double the size of LBP. The Gabor Texture Feature Extraction technique is to extract the features of query image and database images (color, shape, and texture) and after adding those

three values and then measure the similarity between the two images the difference is less than 120, the output image will be retrieved and the difference is greater than 120, there is no image will be retrieved and display the output is not matched.

## III. DISTANCE MEASURES

The fundamental point of distance measures is to find out the similarity between the feature vectors of two images. Euclidean distance is used in this paper. The Euclidean distance is the distance between two points in Euclidean space. The two points P and Q in two dimensional Euclidean spaces and P with the coordinates (p1, p2), Q with the coordinates (q1, q2). The line segment with the endpoints of P and Q will form the hypotenuse of a right angled triangle. The distance between two points' p and q is defined as the square root of the sum of the squares of the differences between the corresponding coordinates of the points. The two-dimensional Euclidean geometry, the Euclidean distance between two points a = (ax, ay) and b = (bx, by) is defined as:

$$d(a,b) = \sqrt{(bx - ax)^2 + (by - ay)^2}$$

The Euclidean distance is the straight line distance between two pixels.

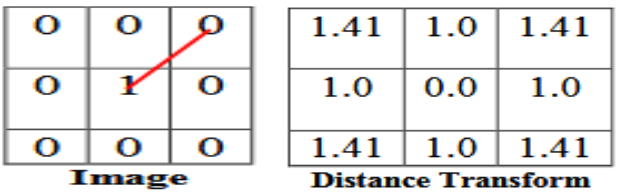
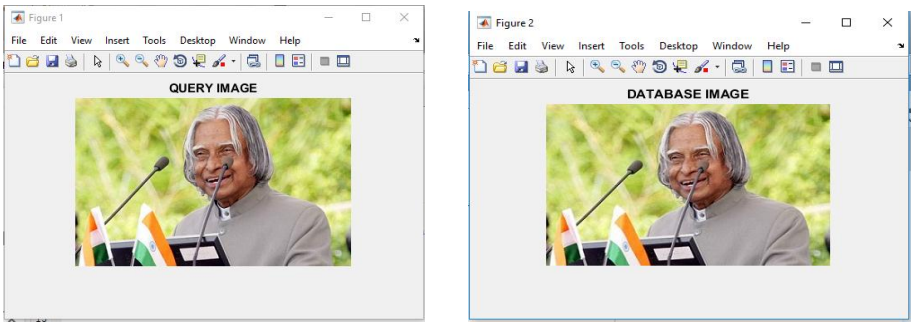



**Figure 5: Euclidean distance**

## IV. RESULTS AND DISSCUSSION

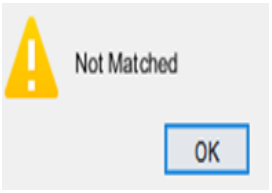
In this section, we performed the result analysis using Local Ternary Patterns feature vector from different aspects and discussed in detail. In this section, we compare the local binary patterns and local ternary patterns.




**(a) Input image** **(b) Database image**

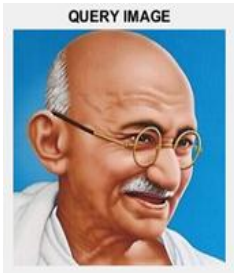
**Figure 6:** Input image and output images of Local Binary Patterns (a, b)

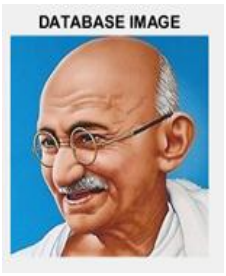
Implementation of local binary patterns in face identification using MATLAB R2016a tool and verify the results in figure5. In existing technique (LBP), the image retrieval time is **8.750956sec**. The local ternary patterns technique has to be implemented for correcting the facial deformations and improve the efficiency.


Input image Output

Fig: a). Output image (1)




Query image Database image

Fig: b). Output image (2)



Query image Database image

Fig: c). Output image

**Figure 7:** input image and output images of Local Ternary Patterns (LTPs)

The local ternary patterns technique has to be implemented in MATLAB tool and it improves the accuracy. The LTPs technique is implemented for efficient image feature description. In this project is used to identify the face and retrieving image from the database folder based on some contents. Like color, shape, texture. In this technique the image retrieval time is **6.709117sec**. In this proposed technique the image retrieval time is less when compared to the existing technique (LBP). So, LTP is better than the LBP and this technique is improves the efficiency. The comparison table of existing (LBP) technique and proposed technique (LTP) is given below.

**Table 1:** comparison of LBP and LTP

| Methods | Elapsed Time (sec) | Accuracy |
|---|---|---|
| Local Binary Patterns | 8.750956 | Less |
| Local Ternary Patterns | 6.709117 | More |

## V. CONCLUSION

In this paper, we propose face identification based on local ternary patterns (LTPs) for Content Based Image Retrieval (CBIR). In this technique each threshold pixel has one of the three values. Neighboring pixels are combined after thresholding into a ternary pattern. In this technique is implemented in face identification and the image retrieval performance is improved. The image retrieval experiments are used in many applications such as MNC companies, biomedical, and so on. The drawback of existing technique (LBP) is if a person is in front of camera he has 20% change face the camera can't identified so in order to overcome this problem this paper proposes a local ternary patterns technique. Image retrieval experiments are performed to observe the effectiveness of the proposed approach using MATLAB tool. Further, this project is enhanced by using Local Ternary Patterns to improve efficiency of this concept.

## REFERENCES

[1] S. R. Dubey, S. K. Singh, R. K. Singh, "Multichannel Decoded Local Binary Patterns for Content-Based Image Retrieval " IEEE Trans. Image Process., vol. 23, no. 12, pp. 5323–5333, Dec. 2016.

[2] A. W. M. Smeulders, M. Worring, S. Santini, A. Gupta, and R. Jain, "Content-based image retrieval at the end of the early years," IEEE Trans. Pattern Anal. Mach. Intell., vol. 22, no. 12, pp. 1349–1380, Dec. 2000.

[3] Y. Liu, D. Zhang, G. Lu, and W. Y. Ma, "A survey of content-based image retrieval with high-level semantics," Pattern Recognit., vol. 40, no. 1, pp. 262–282, 2007.

[4] T. Ojala, M. Pietikäinen, and D. Harwood, "A comparative study of texture measures with classification based on featured distributions," Pattern Recognit., vol. 29, no. 1, pp. 51–59, 1996.

[5] A. Hadid and G. Zhao, Computer Vision Using Local Binary Patterns, vol. 40. New York, NY, USA: Springer, 2011.

[6] T. Ahonen, A. Hadid, and M. Pietikäinen, "Face description with local binary patterns: Application to face recognition," IEEE Trans. Pattern Anal. Mach. Intell., vol. 28, no. 12, pp. 2037–2041, Dec. 2006.

[7] Distance Measures MATLAB Code, accessed on Aug. 2014. [Online]. Available: http://www.cs.columbia.edu/~mmerler/project/code/ pdist2.m

[8] C. Shan, S. Gong, and P. W. McOwan, "Facial expression recognition based on local binary patterns: A comprehensive study," Image Vis. Comput., vol. 27, no. 6, pp. 803–816, 2009.

[9] S. R. Dubey, S. K. Singh, and R. K. Singh, "Local wavelet pattern: A new feature descriptor for image retrieval in medical CT databases," IEEE Trans. Image Process., vol. 24, no. 12, pp. 5892–5903, Dec. 2015.

[10] Z. Guo and D. Zhang, "A completed modeling of local binary pattern operator for texture classification," IEEE Trans. Image Process., vol. 19, no. 6, pp. 1657–1663, Jan. 2010.