ISSN: 2321-5585 (Online)
ISSN: 2321-0338(Print)

Hybrid Feature Descriptor for Image Data Retrieval Using Hadoop Method

[1]V.Jagadish Kumar, [2]Ms Rajyalakshmi Matta
[1]Final M.Tech Student, [2]Associate Professor
[1,2]Dept of Computer Science and Engineering
[1,2]Chirala Engineering College, AndhraPradesh, India.

Abstract: In latest world huge quantity of data in the form of images is produced in digital cameras, mobile phones and photo modify software. In Existing Local Tetra pattern method the relationship between the referenced pixel and its neighbors is encoded using first order derivatives only in vertical and horizontal direction. The image retrieval data considering diagonal pixels for new computation and addition to vertical and horizontal direction. Content based image retrieval is a method to take the images in large database based on the image data. We propose new a novel image indexing algorithm for CBIR using local patterns. The main aim of the proposed method is to retrieve the best relevant images from the stored dataset that matches the query image. Recently, the research focuses in reducing the semantic gap, between the low level visual features and the high level image semantics. In this paper uses many techniques for image retrieval is studied. Further, Take content based image retrieval is take with new extraction methods based on texture, shape and color. Comparative study is take content based image retrieval techniques has been done. The main aim is distribution of image data over a large number of nodes over Hadoop using Map Reduce Technique. Hadoop defines a framework which allows processing on distributed large sets across clusters of computer.

Index Terms: Map-Reduce, HDFS, Content-Based Image Retrieval (CBIR), Local Binary Pattern, Local Derivative Pattern (LDP), Local Ternary Pattern (LTP).

I. Introduction

The term "Content Based Image Retrieval" is used for retrieving the corresponding images from the database based on their feature of images which derived the image itself like texture, color and shape and domain specific like human faces and fingerprints [1]. Traditionally, search of the images are using text, tags or keywords or annotation assigned to the image while storing into the databases. Whereas if the image which is stored in the database are not uniquely or specifically tagged or wrongly described then it insufficient, laborious and extremely time consuming job for search the particular image in the large set of databases [2]. for these purpose obtaining the most accurate result CBIR system are used which searches and retrieve the query images from the large databases based on their image content like color, texture and shape which derived from the image itself. The fast expansion of worldwide network and improvements in information technology leads to an explosive progress of multimedia databases and digital libraries used in application sectors such as scientific, educational, medical, and industrial and agriculture etc. The ultimate aim of content based image retrieval process is to extract the desired image data of the user more accurately. This demands an effective tool that allows users to search and browse efficiently through a large collection [3]. Content-based image retrieval (CBIR) is one of the most accepted solutions for above mentioned applications. The CBIR utilizes image's visual contents such as color, texture, shape, faces, spatial layout, etc., for the

ISSN: 2321-5585 (Online)
ISSN: 2321-0338 (Print)

representation and indexing of the image database [4]. It is difficult for an algorithm to choose the best image in various illumination changes from large collection. The survey of various image mining techniques is presented in [6]. The image retrieval performance is further optimized using an evolutionary approach [7]. In real time applications, intensity values of face images are severely affected due to various factors such as surrounding environment and imaging equipment. Illumination variation affects the low frequency component or global appearance of the image [8]. Compared to other real time challenges, lighting variation causes larger differences in the facial images. Lighting variation can sternly alter the appearance of a face in the image and to the extent that facial images with extreme illumination changes appear more different to their individual un-illuminated facial images. Hence pre-processing techniques are preferred to improve the illumination and lighting conditions in images[9] performed a comparative study of 12 well-known illumination preprocessing methods such as Histogram Equalization (HE), Logarithmic Transform (LT), Gamma Intensity Correction (GIC), Directional Grayscale Deviation (DGS), Laplacian Of Gaussian (LOG), Single Scale Retinex (SSR), Gaussian High Pass (GHP), Self-Quotient Image (SQI), Logarithmic Discrete Cosine Transform (LDCT), Logarithmic Total Variation (LTV), Local Normalization (LN) and Preprocessing chain (referred as TT) for face recognition. Chun [10] proposed Modified Homomorphism filtering (MHF) method for illumination normalization. The feature data also known as image signature for each of the visual attributes of each image is very much smaller in size compared to the image data, thus the feature database contains an abstraction of the images in the image database. The need for human intervention during image indexing and retrieval is to be reduced is the main goal of CBIR.

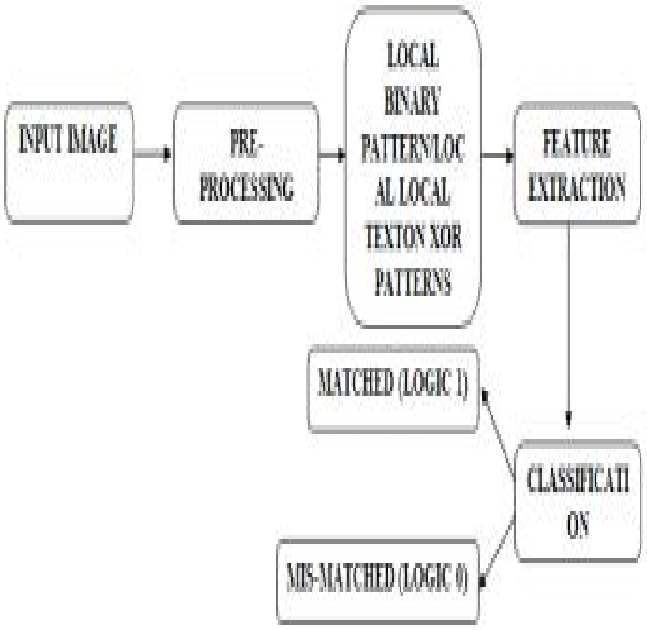

Figure 1 Content Based Image Retrieval System

II. Related Works

A keyword based approach is influenced by subjective decision on image content and is difficult to change a keyword based system. Therefore, new techniques are required to overcome such limitations [11], [12]. Color histograms are used in computer vision and have multiple number of computational advantages, and they are also sensitive to both illumination changes and quantization errors. The colors of similarity can be quantized into different number of bins, since conventional methods assign every pixel into a bin. Fuzzy approach can overcome this issue on assigning a pixel into a bin of each histogram with a degree of association through functions of fuzzyset membership described in [13]. Contour-based descriptions concentrate only on boundary lines; hence, they are not suitable for complex shapes consisting of several disjoint regions such as clipart, emblem, trademark etc., Region-based methods consider the whole area of the object and are most suitable for complex shapes [14], [15]. Commonly, region-based methods use moment for shape description. Regular moments store redundant

ISSN: 2321-5585 (Online)
ISSN: 2321-0338(Print)

information. Since low-order moments cannot describe the shape accurately the high-order moments are desirable [16]. The evaluation of the proposed method is done on benchmark image database [17]. Novel approaches referred as Local tetra pattern for content based image retrieval encoded the images based on the direction of pixels are calculated by horizontal and vertical derivatives [18]. A novel approach to compute rotation-invariant features from histograms of local no invariant patterns and this proposed approach to both static and dynamic local binary pattern (LBP) descriptors [19]. For static –texture description, we present LBP histogram Fourier (LBP-HF) features, and for dynamic-texture recognition we present two rotation-invariant descriptors computed from the LBPs from three orthogonal planes (LBP-TOP) features in the spatiotemporal domain. This approach also can be generalized; sign and magnitude components together can improve the description ability, reduces the computational complexity and improve the classification accuracy. A completed modeling of local binary pattern operator is proposed and an associated completed LBP scheme is developed for texture classification and analyzed LBP from a viewpoint of LDSMT [20].

III. System Design

The goal of the proposed system is to detect the most relevant images from the databases. In this paper, the LTrP includes LDP, LBP, LTP and Magnitude Pattern which are used to retrieve feature from the images. The feature extracted from the binary patterns and obtaining binary patterns from the magnitude patterns are combined to form a feature vector and stored this on database. The query image and images in the database are compared by using Euclidean distance for obtaining the similar measurement and the best matched images are retrieved from the database of images in response to query image [21],[22].

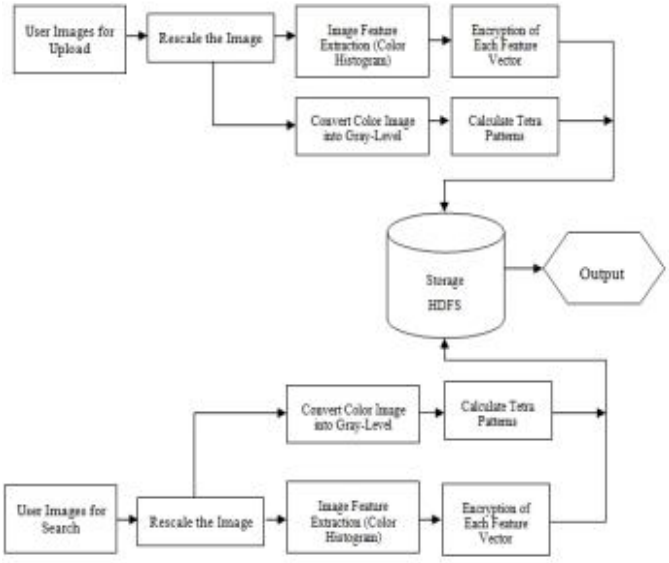

Figure 2 System Architecture

IV. HADOOP

Hadoop provides open source software framework which is used for storage and large scale processing of datasets on clusters. It has two subparts, Map-reduce and HDFS, Map reduce for computational capabilities and HDFS for storage. Map-reduce is distributed framework for data processing, especially big data. The Map-reduce process of hadoop complete with two phases Map and Reduce. In Map phase stored split data inputted to map function which will generate intermediate key pair .Wherever reduce phase accept these key value pair as its inputs which will merge all intermediate values associated with same intermediate key. Figure 1 shows architecture of HDFS.

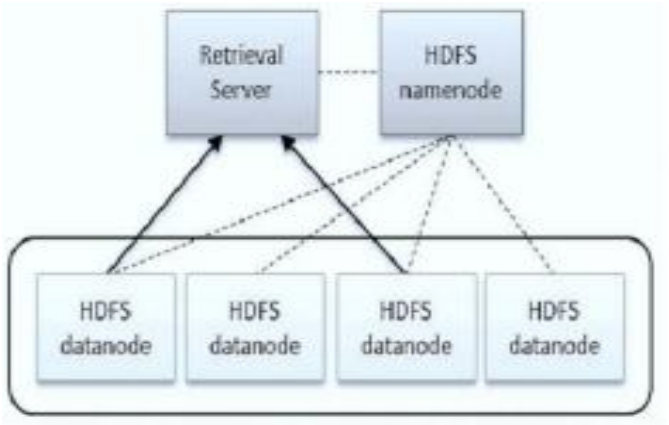

Figure 3 The Architecture of HDFS

ISSN: 2321-5585 (Online)
ISSN: 2321-0338 (Print)

Hadoop is a framework that allows for the distributed processing of large datasets, it is also capable of to process small datasets. However it also works on terabyte of data where RDBMS takes hours and fails whereas Hadoop does the same in couple of minutes. The Apache Hadoop is an open-source software project for scalable, reliable, flexible, distributed computing,failure handling [23]. HDFS - In HDFS Data is divided into chunks. Namenode is the Master of the File System and Datanode is the slave Component of the file system, only one Namenode and multiple Namenode are running on the Hadoop cluster. Data to be stored on node that is Datanode. Datanode should be replicated one each Datanode, if one data node goes down then the data is present on another Datanode also the Name node knows where the data is to be stored in which rack. Namenode contain all the data storage information which is stored in Datanode. There is another Namenode that also contain all the information like Namenode called secondary Namenode. If Namenode fails then it will recover the information from secondary Namenode [24].

Map Reduce: The parallel framework offered by Mapreduce is highly suitable for proposed CBIR structure with large amount of data. The Map reduce technique. We use the open source distributed cloud computing framework hadoop and their implementation of Map-reduce module. Map-Reduce decomposes work submitted by a client into a small parallelized map and reduce jobs. A Hadoop cluster includes multiple worker nodes and a single master. Master node consists of a Task Tracker, Name node, Job Tracker, and Data node. A worker node acts as both a Task Tracker and Data node, though it is possible to have compute-only worker nodes and data-only worker nodes. The list of output can then be saved into Distributed file system then the reducer run to merge the result in parallel. shows a multi-node Hadoop cluster. Hadoop provides location awareness compatible file system.

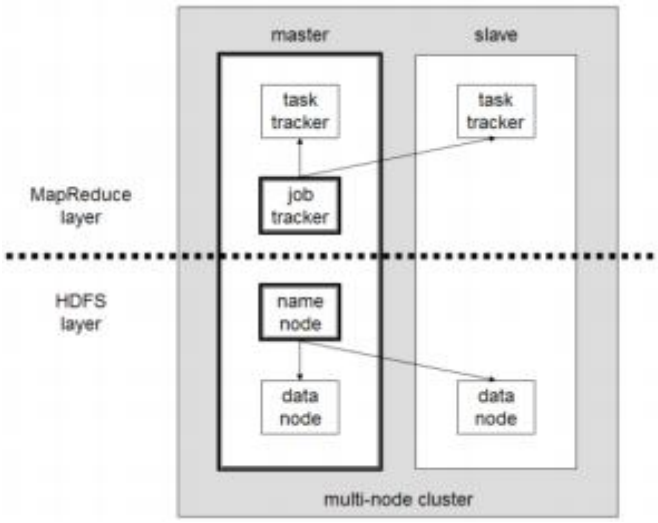

Figure 4 Multi Node Hadoop Structure

In HDFS Data is divided into chunks. Name node is the Master of the File System and Data node is the slave Component of the file system, only one Name node and multiple Name node are running on the Hadoop cluster.

V. Proposed System

The proposed system includes Preprocessing and direction of pixel which uses the preprocessing technique named resize and calculated the first order derivatives along with ° ° ° 90,0 45, . Extractions of pattern using LOP and LBP used to classify each pixel using octa direction and separate into binary patterns. Extraction of magnitude pattern is collected using magnitudes of derivatives. Finally, Hybrid method is established to extract the feature of an image by combining LOP, LBP and magnitude pattern which are used to improve the performance. The directions are calculated using first order derivatives in horizontal and vertical directions. The Ldp and Ltp encodes the relationship between center pixel and neighboring pixels by computing gray level difference. These methods extract the information from an image based on the distribution of edges in more than two directions. The combination of these different patterns will help in collecting more detailed information from an image.

ISSN: 2321-5585 (Online)
ISSN: 2321-0338(Print)

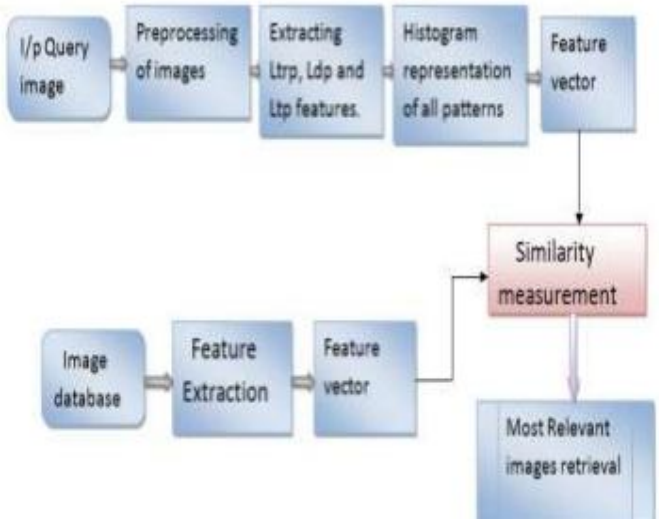

Fig 5 Block Diagram of the proposed framework

Initially, the query image is loaded and converted into grayscale image. As the dataset may be of different size, the image is resized. After resizing, the first-order derivative in both horizontal and vertical axis is applied and direction of every pixel is calculated. Based on the direction of the centre pixel the patterns are divided into four parts. The tetra patterns are calculated and separated into three binary patterns. Also the features are extracted from ternary and derivative patterns (ltp & ldp) and then all patterns are combined to form the feature vector. The query and database image then is compared using Euclidean distance technique for similarity measurement. Finally, the best matched images are retrieved from the image database in response to the query image.

The proposed system has the following structure.

1). Image Database: A database which contains number of mages with any one of the formats .bmp, .jpg, .tiff. is required.

2). Query: The user provides a sample image or sketched figure as the query for the system.

3). Preprocessing: this involves resizing and rgb to gray scale conversion of the input image for easy computations

4). Feature Extraction: The different features like local derivative pattern, local ternary pattern and local tetra patterns are to be collected from the database images and input query image based on the relationship between pixels value. There are various kinds of low-level visual features to represent an image, such as color, texture, shape, and spatial relationship. Since one type of features can only represent part the image properties, a lot of work done on the combination of these features.

5). Histogram Representation: The features extracted from different patterns are concatenated and represented through histogram to arrive at the feature vector for matching.

6). Similarity Matching: This involves matching these features to yield a result that is visually similar. The commonly used similarity measure method is the Distance method. There are different distances available such as Euclidean distance, City Block Distance, Canberra Distance.

VI. Face Recognition Algorithm

Face recognition algorithm consists of two phases namely training phase and testing phase.

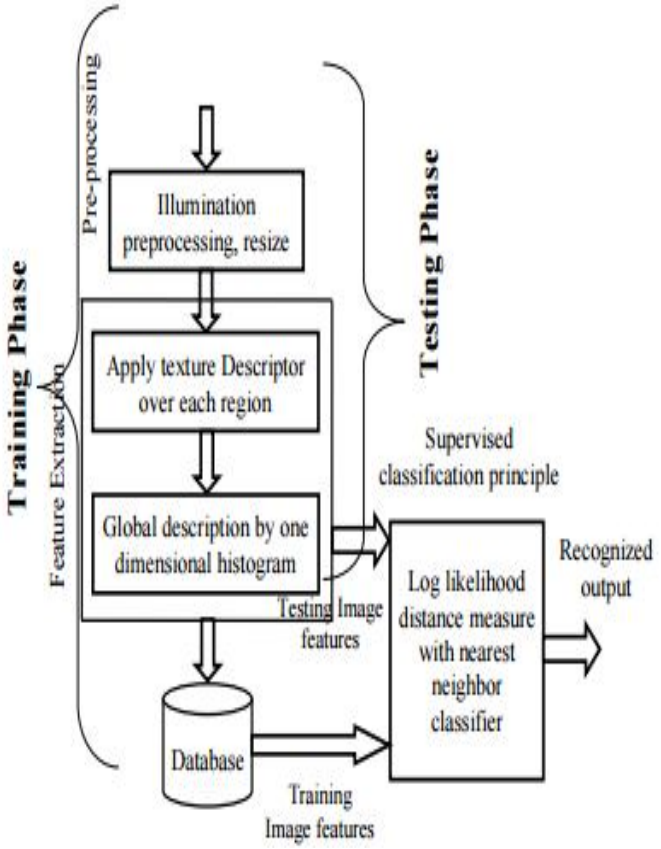

Figure6 Block Diagram of Face Recognition Algorithm

ISSN: 2321-5585 (Online)
ISSN: 2321-0338 (Print)

A. Training Phase:

1. Load the image

2. Apply any one of the illumination normalization techniques among HE, GIC, normalization chain and MHF over an image.

3. Divide the image into non overlapping region of size N × N.

4. Apply any one of the local texture descriptor such as LBP, LDP, LTP and LTrPs over the sub region.

5. Construct a one dimensional histogram for each sub region.

6. Concatenate the histogram over each sub regions to get global description.

7. Store this training feature in the database.

B. Testing PhaseP:

1. Steps 1 to 6 of training phase are repeated to extract the testing feature from an image.

2. Retrieve the training features from the database.

3. Find the similarity between training and testing features statistic distance.

4. Choose the nearest neighbor as correct match for the corresponding training image.

6.2 Histogram Equalization:

Histogram Equalization (HE) is still a de facto standard in preprocessing due to its computational simplicity and fidelity. This method is a straightforward and invertible. It increases the global contrast of an image which in turn enhances the discriminative information contained in the facial images. It remaps the histogram of the scene to the histogram of a near uniform probability density function (pdf). By taking a histogram, the image's pdf is first estimated. Then, cumulative density function (cdf) is calculated. The inverse cdf is then used as mapping function of original image. The histogram manipulation automatically minimizes the contrast in areas too light or too dark of an image. Hence it generates a resulting image whose histogram is approximately uniform.

VII. Results and Discussions

Performance Analysis:

Average Precision = Number of relevant images retrieved/Total number of images retrieved.

Average Recall = Number of relevant images retrieved /Total number of relevant images in the data base

Figure 7 Sample images from COREL Data Base

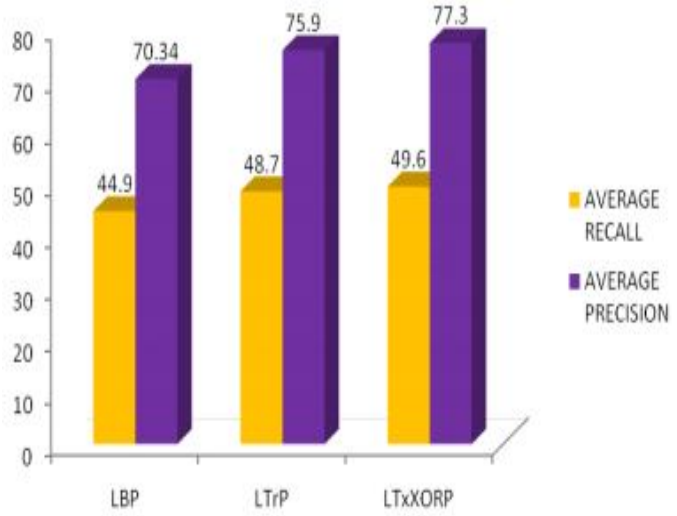

Figure 8 Performance comparisons between LBP, LTrP and LTxXORP Patterns Average Precision and Average Recall

From the average precision and average recall for the proposed method has increased compare with the existing systems.

ISSN: 2321-5585 (Online)
ISSN: 2321-0338(Print)

Conclusion:

After comparing various techniques of content-based image retrieval, it is concluded that Local Texton XOR patterns, technique has been achieved the highest average precision and highest average recall for image retrieval system. In this system the image stored on the HDFS database of Hadoop is in the text format which will not give any information the about the images on database even to the database admin. Thousands of images are growing through the various digital devices and these images are added to the image databases and internet for various applications which needs to store and retrieve the images in effective and efficient manner. Hadoop distributed File system (HDFS) is used to store and retrieve images. Application developed using the proposed approach is fast and efficient in retrieving images. The retrieval accuracy is also increased to greater extent as the images are retrieved on the basis of both pixel information and colour feature. Since this idea is implemented in high level language like Matlab. it can be used readily in many real time applications.

VIII. Future Enhancement

In this proposed system, only horizontal and vertical pixels have been used for 1st order derivative calculation in calculating direction pixels. Results can be further improved by considering the diagonal of pixels for derivative calculations in addition to horizontal and vertical directions. Due to the effectiveness of the proposed method, it can be also suitable for other pattern recognition applications such as face recognition, fingerprint recognition. It eliminates illumination effect and enhances the contrast by histogram equalization. In future the effect of directional illumination variation can also be experimented by the proposed approach to prove the efficiency of our method for face recognition.

References:

[1]. Y. Rui and T. S. Huang, “Image retrieval: Current techniques, promising directions and open issues,” J. Visual Commun. Image Represent., vol. 10, no. 1, pp. 39–62, Mar. 1999.

[2]. Venkatraman S.,and Kulkarni S. “MapReduce neural network framework for efficient content based image retrieval from large datasets in the cloud,” 12th International Conference on Hybrid.

[3]. L.Birgale, M.Kokare, D.Doye, "Color and Texture Features for Content Based Image Retrieval”, International Conference on Computer Grafics, Image and Visualisation, Washington, DC, USA, 2006,pp 146 – 149.

[4]. M. Subrahmanyam, A. B. Gonde, and R. P. Maheshwari, “Color and texture features for image indexing and retrieval,” IEEE International Advance Computing Conference (IACC 2009), Patiala 6-7 March 2009,pp 1411- 1416.

[5]. Mrs Monika Jain, Dr. S.K.Singh “A Survey On: Content Based Image Retrieval Systems Using Clustering Techniques For Large Data sets”, International Journal of Managing Information Technology (IJMIT) Vol.3, No.4, November 2011.

[6]. M. Saadatmand Tarzjan and H. A. Moghaddam, “A novel evolutionary approach for optimizing content based image retrieval,” IEEETrans. Syst., Man, Cybern. B, Cybern., vol. 37, no. 1, , Feb. 2007, pp139–153.

[7]. Yee Wan Wong, Kah Phooi Seng and Li-Minn Ang, “Dual optimal multiband features for face recognition”, Expert systems with Applications, Vol. 37, No. 4, pp. 2957-2962, 2010.

[8]. Hu Han, Shiguang Shan, Xilin Chen and Wen Gao, “A Comparative Study on illumination preprocessing in face recognition”, Pattern Recognition, Vol. 46, No. 6, pp. 1691-1699, 2013.

[9]. Chun-Nian Fan and Fu-Yan Zhang, “Homomorphic filtering based illumination

ISSN: 2321-5585 (Online)
ISSN: 2321-0338 (Print)

normalization method for face recognition", Pattern Recognition Letters, Vol. 32, No. 10, pp. 1468-1479, 2011.

[10]. Timo Ahonen, Adbenour Hadid and Matti Pietikainen., "Face description with Local Binary Pattern: Applications to Face Recognition", IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 28, No. 12, pp. 2037-2041, 2006.

[11]. Rui Y, and Huang T. S, "Image retrieval: Current techniques, promising directions and open issues", Journal of Vis. Commun. Image Represent. Vol.10, 1999, pp. 39–62.

[12]. P.V. N. Reddy, K. Satya Prasad, "Content Based Image Retrieval Using Local Derivative Patterns", Journal of Theoretical and Applied Information Technology, Vol 2, No.8, 2011,pp 95-103.

[13]. Baochang Zhang, Yongsheng Gao, Sanqiang Zhao, and Jianzhuang Liu, "Local derivative pattern versus local binary pattern: face recognition with high-order local pattern descriptor", IEEE Transactions on Image processing, Vol.19.No2, 2010,pp.533-544.

[14]. Kim, W.Y, Kim Y.S, "A region based shape descriptor using Zernike moments".J. Signal Process. Image Commun, Vol. 16, 2000, pp. 95–102.

[15]. Teh, C.H, Chin, R.T, "On image analysis by the methods of moments". In: IEEE Trans. Pattern Anal. Mach. Intell, Vol 10, No.4,1998, pp.496– 513

[16]. Ashish Oberoi1, Varun Bakshi, Rohini Sharma , Manpreet Singh, "A Framework for Medical Image Retrieval Using Local Tetra Patterns", International Journal of Engineering and Technology (IJET), Vol 5, No 1, Mar 2013, pp.27-36.

[17]. Anu Bala a , Tajinder Kaur b," Local Texton XOR patterns: A new feature descriptor for content based image retrieval", Department of Computer Science Engineering, Sant Baba Bhag Singh Institute of Engineering and Technology, Padhiana, Jalandhar, Punjab, India. Department of Information Technology, Sant Baba Bhag Singh Institute of Engineering and Technology, Padhiana, Jalandhar, Punjab, India

[18]. Subrahmanyam Murala, R. P. Maheshwari, Member, IEEE, and R. Balasubramanian "Local Tetra Patterns: A New Feature Descriptor for Content-Based Image Retrieval" Member, IEEE Guoying Zhao, Time Ahonen, Jiri Matas and Matti Pietikanien,

[19]. Zhenhua Guo, Lei Zhang and David Zhang, "A completed modeling of local binary pattern operator for texture classification" IEEE transaction on image processing, vol.19, no.6,page no.1657-1663, June2009

[20]. Eghtesad Doost. H. R.,. Amirani. M. C ," Texture Classification with Local Binary Pattern Based on Continues Wavelet Transformation" Department of Electrical Engineering, Majlesi branch, Islamic Azad University.

[21]. Subrahmanyam Murala, R. P. Maheshwari, Member, IEEE, and R. Balasubramanian, Member, IEEE," Local Tetra Patterns: A New Feature Descriptor for ContentBased Image Retrieval," IEEE Trans. on Image Processing, vol. 21, no. 5, May 2012.

[22]. Ashish Gupta, "Content Based Medical Image Retrieval Using Texture Descriptor, IJREAS" Volume 2, Issue 2 (February 2012), ISSN: 2249-3905.

[23]. Ryszard S. Choras "Image Feature Extraction Techniques and Their Applications for CBIR and Biometrics Systems" International Journal of Biology and Biomedical Engineering, Vol. 1, 2007.

[24]. Murala S., Maheshwari R.P., and Balasubramanian R., "LocalTetra Patterns: A New Feature Descriptor for Content-Based Image

ISSN: 2321-5585 (Online)
ISSN: 2321-0338(Print)

Retrievalsystem" IEEE Transactions on Image Processing, Vol. 21, pp.2874 – 2886, May 20 12.

V. Jagadish Kumar received his MCA degree

from **Andhra University, Vishakhapatnam** in 2008. At present he is pursuing M.Tech CSE in "**Chirala Engineering College**", Chirala., He is engaged in**"Hybrid Feature Descriptor for Image Data Retrieval Using Hadoop Method**" Project developing process**.**

Ms Rajyalakshmi Matta received B.Tech (CSE)

and M.Tech (C.S.E) from **Jawaharlal Nehru Technological University, Anantapur.** She is currently pursuing PhD in **Brain Computer Interface from KL University.** She has 10 years of Teaching Experience in various Engineering Colleges. At present she is working as **Associate Professor, Department of CSE, Chirala Engineering College**", Chirala. She received a gold medal in B.Tech. She has published articles and presenteded papers in various national and international journals and conferences.