ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

AN INTEGRATED TECHNIQUE FOR TEXTURE AND SHAPE FEATURES

R.N.MUHAMMAD ILYAS[#1], Dr S.PANNIRSELVAM[*2]

[#1] *Ph.D Research Scholar,*
Department of Computer Science,
Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu
[*2] *Associate Professor & Head,*
Department of Computer Science,
Erode Arts & Science College, Erode, Tamilnadu
[#1]ilyas_rn@yahoo.com
[*2]pannirselvam08@gmail.com

***Abstract*— The Content Based Image Retrieval (CBIR) technique is retrieving the image from image database. The research work, introducing a novel approach for CBIR using combination of both texture and shape features. The K-means clustering and Fuzzy C-means clustering are used for clustering the images. The texture features and shape features are extracting from image query and database images. In our experiment, standard database is used and it contains 250 images and it classified into 5 classes. The results are compared with other existing methods and it is found that the proposed combined features are better in retrieval of images. Euclidean distance is used for similarity measurements in the proposed CBIR method.**

***Keywords*— CBIR, Euclidean distance, texture features and shape features.**

I. INTRODUCTION

In recent time, due to the growth of powerful processors and the cheapest nature of memories, the deployment of huge image databases supporting a wide range of applications have now become achievable. Databases possessing art works, satellite and medical images have a great potential in attracting more and more users in diverse fields like geographical, architecture, advertising, medicine, fashion design and publishing. Accessing the desired and relevant images from large image databases in an efficient manner is now a great necessity. Content Based Image Retrieval (CBIR) is a powerful tool which uses the visual indication to search images databases and retrieve the required images. It uses several approaches and techniques for this purpose.

II. RELATED WORK

A. Begam, K.Nazeer [1] in 2013, proposes CBIR system which exploits the texture and shape options of chosen the images. A combined shape and texture feature is computed for every region.

W. Xingyuan, W. Zongyu [2] in 2013, used structure elements descriptor to describe shape and texture features. The speed of shape based retrieval can be enhanced by considering approximate shape rather than the exact shape. In addition to this a combination of texture and shape based retrieval is also included to improve the accuracy of the result in R. Chaudhari, A. M. Patil [3] in 2012.

S. Sulochana, R.Vidya [4] in 2013, discusses a novel content based image retrieval system based gray level co-occurrence matrix (GLCM). Its growth is due to some causes such as in many large image databases, conventional methods of image indexing are used. These traditional methods of image indexing proceeds by storing an image in the databases and relating it with a keyword or number that associate with a categorized description, have become obsolete. They have been proven that these

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

methods are insufficient, laborious and extremely time consuming.

S. Mori Tamura and T. Yamawaki [5] in 1978, proposed texture representations that were based on psychological studies of human perception, and these representations consists of six statistical features, including coarseness, contrast, directionality, regularity, line-likeness, roughness to describe various texture properties. In context to texture features extraction tamura properties are very meaningful and this advantages makes tamura features in Texture Based Image Retrieval. In comparison with psychological measurements for human subjects, the computational measures gave good correspondence in correlation of rank of 16 patterns of typical texture type of patterns. These features were attempted by using similarity measurements.

H. Yao and B. Li [6] in 2003, proposed textural feature extraction based on coarseness .To improve the performance they used coarseness textural feature and compared its result with the Gray Level Co-occurrence Matrix textural coarseness, Fractual dimension textural coarseness and tamura textural model. And they proposed amongst the three, tamura textural model performance of describing coarseness is best followed by the other two methods.

J. Zhang, G.-L. Li and S.-Wun [7] in 2008, proposed image retrieval by texture characterization by GLCM texture properties and an edge detector by prewitt edge detection, since by considering the texture properties only coarseness, contrast, energy correlation there is much information left on the edges. Thus they proposed the composition of both the co-occurrence matrix and the edge detector approach, and they used composition of edge information and texture characterizations of GLCM properties and proposed the method which has high retrieval precision.

This pap N. Chaturvedi, S. Agrawal and P. Kumar Johari [8] in 2014, proposed CBIR based on texture features contrast, coarseness, directionality statistical features. They firstly proposed the feature vectors based on texture is extracted from the query image then the similarity measurement algorithm is applied to the extracted feature vector from which relevant images are retrieved from the database.

N. Puviarasan, Dr. R. Bhavani and A. Vasnthi [9] in 2004, proposed Retrieval of images from large databases from the image database using CBIR technique. The proposed a combination of texture and shape feature extraction methods like Haralick features and Hu-invariant moments. They first segment the image according to the Fuzzy C-means clustering and comparing with the k-means, and they extracted features according to the texture and shape and use the combination of both features. The corel images database were used for experimentation. And similarity measures Euclidian distance was applied for the retrieval of images.

P. Howarth and S. Ruger [10] in 2004, compared the three textures features GLCM, tamura and Gabor filter .based on query-by-example approach to image retrieval. The features calculated were evaluated and tested on retrieval tasks from the corel TREVID 2003 images collection. They found that tamura performs better than other two features but for large scale coarseness degraded performance and therefore they limited the range and used a logarithmic scale.

T. Deselaers, D. Keysers and H. Ney [11] in 2007, proposed an experimental comparison of large number of descriptor images for CBIR. The methods proposed earlier descriptors for CBIR describes their newly proposed methods as most appropriate methods. In this paper a large number of features for CBIR are done, and compared them quantitatively on different tasks. These comparisons of features were done on five different publicly freely available image databases, and the retrieval performance is used. This method allow to used a direct comparisons of all features considering and further in future will allow a comparisons of newly proposed features to these in future.

Therefore we use the shape moment given in Hu [12] which are invariant. And thus we extract texture features and shape and fused these feature

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

vectors of tamura and shape combinations for better result.

In CBIR, each image is stored in the database and its features are extracted and matched with query image features. It possesses two steps: feature extraction and matching. The first step involves the process of extraction of image features to a distinguishable extent. The second step proceeds by matching of extracted query image features with the features of images stored in the database to yield a result which is visually similar.

Problems in Earlier Works

- The recognition rate is very low due to issues in image enhancement methods.
- Feature extraction of images is not significant.
- Has more complexity in recognition and retrieval.
- One or two feature are been used
- Accuracy is poor due to the inefficiency of existing system.
- Processing an image takes more time.

III. Proposed Methodologies

In order to overcome the above problems, there is a need to create a new model. Hence I proposed a new integrated model for CBIR using the combination of texture and shape features. Before analyzing images based on their feature extraction from databases of images, pre-processing methods in images are performed in all types of images. Like, firstly, the images resize according to the region of interest for the faster retrieval of images. Deleting and removing complicated background will speed up further image processing.

The median filtering is applied in the proposed work for removing the noise, where the value of an output pixel is found by the median of the neighbourhood pixel. The sensitivity to outliers is much less for median than the mean. Thus, median filtering is most suited to remove the outliers while preserving the sharpness of the image. The schematic diagram of proposed work is shown in Fig. 1.

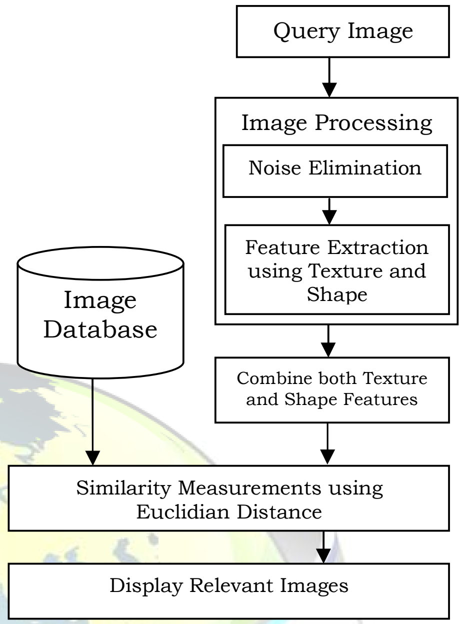

Fig 1. Proposed Methodology of CBIR

Texture Feature Extraction

According to quantitative analysis, one of the first descriptions given in S. Mori Tamura and T. Yamawaki [5] in 1978, proposed six textural properties of which we have taken four features and gave descriptions common over all texture images in photographic images. These are six different texture features given by tamura Coarseness, Contrast, Directionality, Line-Likeness, Regularity and Roughness.

Contrast - Contrast measures intensity between a pixel and its neighbor over the whole image and it is considered zero for constant image and it is also known as variance and moment of inertia.

$\text{Contrast}=\Sigma i,j(i-j)2p(i,j)$ .....(1)

Correlation - Correlation measures how pixel is correlated to its neighbor over the whole image.

$$\Sigma i,j \frac{(i-\mu i)(j-\mu j)p(i,j)}{\delta i\delta j} \quad ......(2)$$

Energy - Energy is the sum of squared elements in the GLCM (Gray-level co-occurrence matrix) and it is by default one for constant image.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com
International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 3, Special Issue 20, April 2016

$Energy=\Sigma i,j(i+j)^2$ ……(3)

Moment - Moment invariant is region-based object shape representation. R is the binary image, the p+q central moments of R form as,

μp,q= Σ(x,y)ЄR(x-xc)p(y-yc)q ….(4)

Where (xc , yc) is the center of the object. For scale-independent nature, central moments can be standardized as:

ηp.q= μp,q / μ02,0, γ=(p+q+2)/2 …(5)

Shape Feature Extraction

Shape can be defined as the feature surface configuration of an outline, object or contour. The shape feature is used to separate objects from the background and surrounding by its outline representation. Some of the feature sets we have used for our work are

Extent: It gives the proportion of pixels in the bounding box that are also in the region. It is computed as area divided by the area of the bounding box

Extent = Area / Bounding Area ……(6)

Circularity: It gives the extent to which the shape is a circle. This parameter is 1 for circle and 0 for long bar

Circularity = 4∏ (Area / Bounding Area)..(7)

Solidity: It gives the extent to which the shape is convex or concave. Solidity for convex contour is always 1.

Solidity = Area / Convex Area ……...(8)

Equivalence Diameter: It is defined as the diameter of a circle with the same area as the region.

Equivalence Diameter = √4*Area/∏ …(9)

IMAGE/ METHOD	EXISTING METHOD		PROPOSED METHOD	
	Precision	Recall	Precision	Recall
LION	78	76	82	79
FLOWER	75	74	85	78
BUILDING	78	77	83	80
HORSE	79	72	83	75
DINOSUR	74	70	87	74

Algorithm for Proposed Methodology

Step1: Read the query image

Step2:Calculate the extent feature using the equation (6)

Step3: Calculate the circularity value using the equation (7)

Step4:Calculate the solidity using the equation (8)

Step5:Calculate the Equivalence Diameter using the equation (9)

Step6: Extract all the features and stored into database

Shape FeatureSet(FS)={fte, ftc, fts, ftd}

Step7:Add all those features into texture features

Feature set (FTS) = { FT, FS }

Step8: Apply similarity measurement using the Euclidian distance with the feature extraction of query image and the feature sets of Database images

Step9: Retrieve the relevant images based on some similarity measures from Database images.

Similarity Measurement

Euclidian Distance matrix is mostly used for similarity measurement in context retrieval of image from database because of its higher accuracy and effectiveness. It measures the distance between the two feature vectors of images by calculating the square root of the sum of the squared absolute differences and is calculated and is denoted by ED.

$$D= \sqrt{\sum_{i=1}^{N} (Fq[i]-Fdb[i])^2} \quad \text{……..(2.6)}$$

Where Fq[i] is the ith query of the image feature and Fdb[i]is the corresponding feature in the vector database. Here N refers to the number of images in the database.

IV. EXPERIMENTAL RESULTS

Comparison for Existing and Proposed System

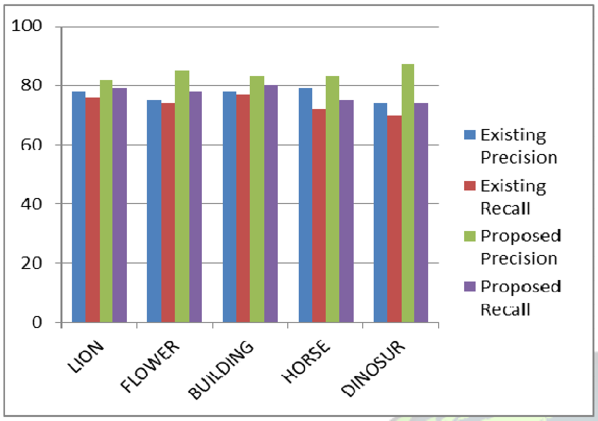

Fig 1. Comparison for Existing and Proposed System

V. CONCLUSION

In order to fulfill the objective of the proposed research work, the new hybrid model of CBIR using texture and shape feature are proposed. The preprocessed query image is retrieved from the image database using the texture and shape based features and encourage results are achieved from the proposed model.

REFERENCES

1] A. Begam, K.Nazeer, Content based image retrieval on image subblocks, International Journal of Advance Research 1 (2013) 1–10.

[2] W. Xingyuan, W. Zongyu, A novel method for image retrieval based on structure elements descriptor, Elsevier journal of Visual Commun. Image R. 24 (2013) 63–74.

[3] R. Chaudhari, A. M. Patil, Content based image retrieval using color and shape features, International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering 1 (2012) 386–392.

[4] S. Sulochana, R.Vidya, Texture based image retrieval using framelet transform gray level co-occurence matrix(glcm), International Journal of Advance Research in Artificial Intelligence 2 (2013) 68–73.

[5] S. Mori Tamura and T. Yamawaki, "Textural Features Corresponding to Visual Perception", IEEE Transactions on Systems, Man and Cybernetics, vol. smc-8, no. 6, (1978) June, pp. 460-473.

[6] H. Yao and B. Li, "An efficient approach for texture-based image retrieval", Neural Networks and Signal Processing, vol. 2, (2003), pp. 1039-1043.

[7] J. Zhang, G.-L. Li and S.-Wun, "Texture–Based Image Retrieval by Edge detection Matching GLCM", the 10th international Conference on High Performance computing and Communications, (2008), pp. 782-786.

[8] N. Chaturvedi, S. Agrawal and P. Kumar Johari, "A novel Approach of image retrieval based on texture", International Journal of Enhanced Research in Management & Computer Applications, ISSN: 2319-7471, vol. 3, no. 1, (2014) January, pp. 42-48.

[9] N. Puviarasan, Dr. R. Bhavani and A. Vasnthi, "Image Retrieval Using Combination of Texture and Shape Features", International Journal of Advanced Research in Computer and Communication Engineering, ISSN: 2319-5940, vol. 3, (2014) March, pp. 5873-5877.

[10] P. Howarth and S. Ruger, "Evaluation of Texture Features for Content Based Image Retrieval", Springer–Verlag Berlin Heidelbag LNCS 3115, (2004), pp. 326-334.

[11] T. Deselaers, D. Keysers and H. Ney, "Feature for Image Retrieval: An Experimental Comparision", Springer -, (2007) November, pp. 1-22.

[12] Hu, "Visual Pattern Recognition by Moment Invariants", IRE Transactions on Information Theory, (1962), pp. 179-187.