Recognition and Extraction of RS images from Remote Sensing Archives using Content Based Texture Features

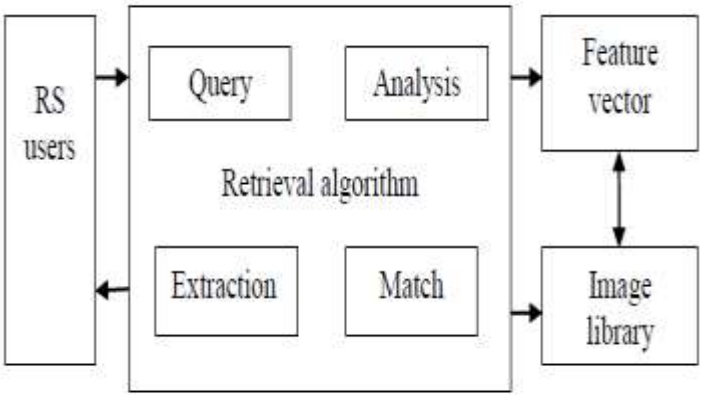
*S.Suganya, ** J.Rethna Virgil Jeny, M.E, (Ph D), **R.Raja Sekar, M.E.,
*PG Scholar, **Asst. Prof
Department of Computer Science Engineering
Sardar Raja College of Engineering, India
E-mail: suganyasellamuthu@gmail.com

Abstract:- Retrieval of remote sensing image from the large database is the difficult task. To solve this problem in this paper we are presenting the multiscale descriptors like circular covariance histogram, rotation invariant point triplets are used which are the effective texture descriptors. To overcome some of the limitations of the circular covariance histogram and rotation invariant point triplet, we introduce new descriptors Fourier power spectrum and quasi flat zone which consider the important texture properties like coarseness and directionality in the image which is the important property of the remote sensing images. The proposed system achieves best retrieval performance and also reduces the length of the feature vector. UC Merced land use land cover data set is used to evaluate the effectiveness of the descriptors which is the recently introduced dataset.

Key terms: Remote sensing, Texture descriptors, Morphological operators, content based image retrieval (CBIR).

1. INTRODUCTION

In [1] Remote sensing images and their information are used for large number of application because of the recent development in the research like earth monitoring, weather forecasting, disaster forecasting and so on. Hence it increases the size of the remote sensing database by acquiring large number images day by day. To manage the large database and getting the needed information from such large database is the difficult task. The problem of retrieving image from large remote sensing database is handled by the technique content based image retrieval. In [3] the framework for content based image retrieval shown in the Figure (1) Content based image retrieval research is the live discipline which solves numerous problems. CBIR is the application of computer vision technique. It is also called as query by image content and content based visual information retrieval. In [5] CBIR does not merely compare the metadata of the image like keywords, tags or the description of the image instead it analyzes the content of the image which includes the color, shape and



texture. In the early method of image retrieval is done similar to text retrieval and realized by remarks, for which all the images in the database should be remarked

and the retrieval of image is done by matching the remark, this method has lot of disadvantages. Whereas content based image retrieval

Figure (1) Framework for Content Based Image Retrieval

image retrieval has overcome those disadvantages and it also the effective technique for retrieving the remote sensing image form the large database. In this paper circular covariance histogram and the rotation invariant point triplets are used, these are the multiscale texture descriptors which concentrate only on the regular patterns to overcome this limitation, New texture descriptors Fourier power spectrum and quasi flat zone is used which consider important texture properties like coarseness and directionality which is important for remote sensing images. UC Merced land use land cover data set is used to evaluate the effectiveness of the descriptors.

2. Texture descriptor

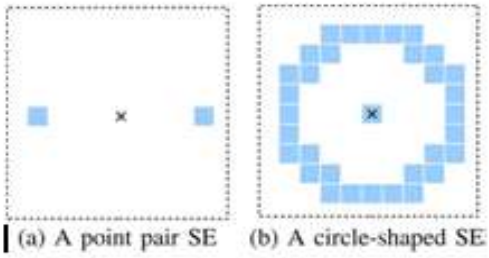


Figure (3) Calculating structuring element

In [11] The morphological operator includes the opening, closing, dilation and erosion. From which various intermediate images are formed. Figure (3) shows the calculation of SEs using CCH. These intermediate images are combined to form the single labeled image L which is of same dimension as that of the grey scale image. The normalized histogram of L is the 'n' dimensional feature vector and also best output is obtained by computing isotropic morphological covariance.

In this section we describe the principle of multiscale descriptors CCH and RITs and also described about the new texture descriptor FPS and QFZ representations. Figure (2) shows the block diagram of CBIR using texture descriptor.

2.1 CCH

In [1] Circular covariance histogram detects the periodic patterns from the given input. CCH calculate the structuring element SEs for the grey scale image in the circular form.

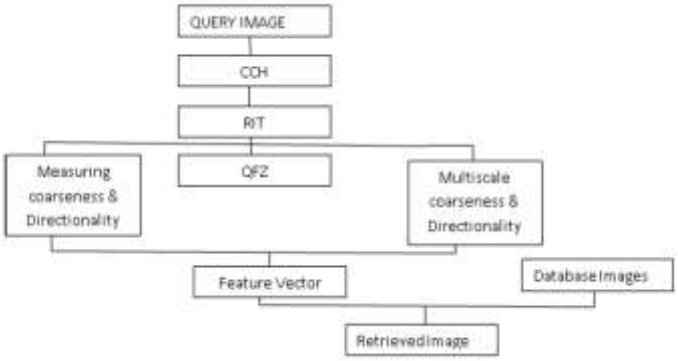


Figure 2 Block diagram CBIR using Texture descriptors

2.2. RITs

In [1] RITs almost similar to CCH but in RITs structuring element is not calculated in the circular form instead the circle is decomposed into the anti-diametrical point triplets which has the perimeter of 8*i pixels. In [9] We will obtain 4*i point triplets which lead to calculate the eight different intermediate points that are formed for the same radius, different intermediate image is obtained which is combined to form the single labeled image 'N'. The normalized image is constructed from all the input images F_i by taking the maximum argument across the different radii. Figure (4) shows the calculation of SEs using RITS with radius 2.

2.3 FPS

In [1] CCH and RITs are powerful texture descriptors both have the limitation it consider only the periodic patterns in their given inputs. To overcome this limitation FPS is introduced which measures the

important texture properties needed for the remote sensing image retrieval. In [6] the coarseness is also called the fineness of the image, color and shape can be differentiated using the human perception but texture cannot be identified. Coarseness is one of the important texture properties which are robust against the brightness, contrast, noise and size of the image. Figure (5) shows sample of different levels of frequency distribution for coarseness.

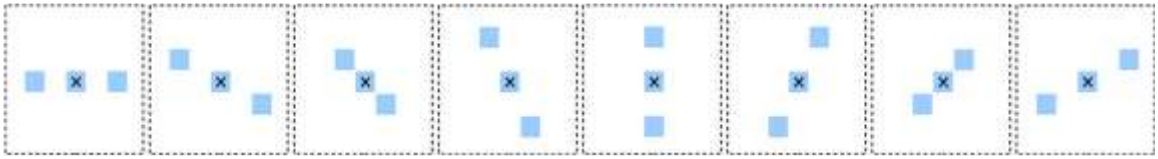
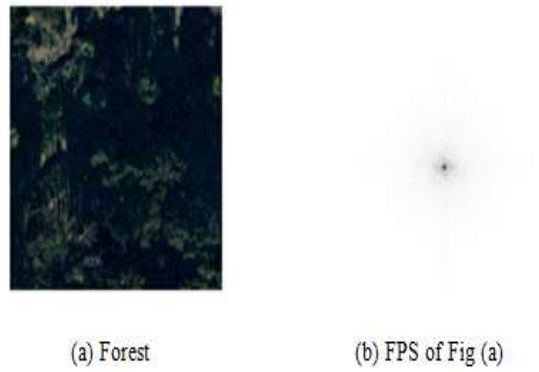


Figure (4) Eight Point Triplets of Radius=2



(a) Forest (b) FPS of Fig (a)

(c) Harbor (d) FPS of Fig (d)

Figure (5) Example for distinct level of coarseness

In figure (5) frequency distribution of the forest is uniformly distributed whereas for harbor it is denser distribution.

In [10] Directionality is also one of the important texture properties which measure the low and high level of directionality. In figure (6) chaparral are low directionality and agricultural are high directionality. In [12] Even though directionality and coarseness are important texture property they are still scale dependent and input images are rotational invariant, hence QFZ is implemented.

2.4 QFZ

In [2] Quasi flat zone has the high interest on segmentation but it also represents the connected components with each flat zone with few pixels. QFZ computes the homogeneous image region with respect to random criteria such as pixel intensity. In [4] QFZ is introduced to reduce over segmentation which in turn reduce the computational cost.

(a) Chaparral (b) FPS of Fig (a)

(c) Agricultural (d) FPS of Fig (c)

Figure (6) Example for distinct level of directionality

It relay on α-connected paths. The image is α connected if there exists a path between any pair of its pixels which is denoted by α-cc. if α is too high it results in under segmentation, to overcome this limitation new framework called logical predicate connectivity is introduced, it checks the difference between minimal and maximal pixel value, if it is below the threshold it is said to be ω-connected which is called global range. If it is higher than the threshold then it is called β-connectivity index. It is applied for directionality and coarseness by applying $QFZ_{\alpha,\omega}(f)$ to the grey scale input image with different scale value which leads to rotation-invariant description and capture information about coarseness and directionality.

3 RESULTS

CCH and RITs are effective texture descriptor they are scale depended, hence QFZ is implement to render multiscale which improves the retrieval score.

3. CONCLUSION

Recent development in the research has increased the size of the remote sensing database which paid way for the development of content based image retrieval. In the content based image retrieval, the contents include color, shape and texture in which texture is the important property to be considered. So in this paper effective texture descriptors like CCH and RITs are implemented to overcome their limitations, new texture descriptors FPS and QFZ is implemented which consider the coarseness and directionality are consider since it is important for the remote sensing image retrieval. By using QFZ multiscale is rendered. In future color component of the image is considered and wavelet is implemented for considering time factor of the image.

REFERENCES

[1] E. Aptoula and S. Lefèvre, "Morphological description of color images for content-based retrieval," IEEE Trans. Image Process., vol. 18, no. 11, pp. 2505–2517, Nov. 2009.

[2] E. Aptoula, J. Weber, and S. Lefèvre, "Vectorial quasi-flat zones for color image simplification," in Proc. Int. Symp. Math. Morphol., Uppsala, Sweden, Apr. 2013, pp. 231–242.

[3] Q. Bao and P. Guo, "Comparative studies on similarity measures for remote sensing image retrieval," in Proc. IEEE Int. Conf. Syst., Man Cybern., The Hague, The Netherlands, Oct. 2004, pp. 1112–1116.

[4] J. Crespo, R. Schafer, J. Serra, C. Gratin, and F. Meyer, "The flat zone approach: A general low-level region merging segmentation method," Signal Process., vol. 62, no. 1, pp. 37–60, Oct. 1997.

[5] P. Du , Y. Chen, T. Hong, and F. Tao, "Study on content-based remote sensing image retrieval," in Proc. IEEE Int. Geosci. Remote Sens. Symp., Seoul, Korea, Jul. 2005, pp. 707–710.

[6] G. M. Farinella, S. Battiato, G. Gallo, and R. Cipolla, "Natural versus artificial scene classification by ordering discrete Fourier power spectra," in Proc. Int. Workshop Struct. Synt. Pattern Recognit., Orlando, FL, USA, Dec. 2008, vol. 5342, pp. 137–146.

[7] K. Mikolajczyk and C. Schmid, "A performance evaluation of local descriptors," IEEE Trans. Pattern Anal. Mach. Intell., vol. 27, no. 10, pp. 1615–1630, Oct. 2005.

[8] M.D Mura , J. A. Benediktsson, B. Waske, and L. Bruzzone, "Morphological attribute profiles for the analysis of very high resolution images," IEEE Trans. Geosci. Remote Sens., vol. 48, no. 10, pp. 3747–3762, Oct. 2010.

[9] A. Oliva, A. Torralba, A. G. Dugue, and J. Herault, "Global semantic classification of scenes using power

spectrum templates," in Proc. Int. Conf. Challenge Image Retrieval, Newcastle, U.K., Feb. 1999, pp. 1–12.

[10] M. Pesaresi and J. Benediktsson, "A new approach for the morphological segmentation of high resolution satellite imagery," IEEE Trans. Geosci. Remote Sens., vol. 39, no. 2, pp. 309–320, Feb. 2001.

[11] A. R. Rao, A Taxonomy for Texture Description and Identification.Berlin, Germany: Springer-Verlag, 1990.

.

S.Suganya received her B.E degree in Information Technology from Avinashilingam University, Coimbatore in 2008 and MBA degree in Finance and Marketing from Bharathiar University, Coimbatore in 2010. She is currently doing M.E in Computer science and Engineering at Anna University, chennai. Her Area of interest includes CBIR in image processing.

J.Rethna Virgil Jeny received her B.E and M.E degrees in Computer Science and Engineering from Bharathidasan University, Trichy in 1997 and Annamalai University in 2005 ctively. She is respectively. She is currently doing Ph.D in wireless sensor Networks at MS University. She has received Lady Engineer Award by IEI. She is a member of IEEE, ACM, ISTE, IEI, IAENG and a senior member of IACSIT. Her research interests include Energy aware routing and Cross layer routing in Wireless Sensor Networks.

R.Raja Sekar received the B.E Degree in Computer Science and Engineering from Anna University, Chennai in 2010 and received M.E Degree in Computer Science and Engineering from Anna University, received M.E Degree in Computer Science and Engineering from Anna University Chennai in 2013. His area of interest is Digital image processing and Biometrics.