Brain Abnormality Identification using SVM classification and GLCM

MR. SWAPNIL PATIL, M.E. (EXTC)
Department of Electronics & Telecommunication,
Shri. L.R.Tiwari college of Engineering and Technology
Technology
Mumbai University
Email Id- swpnlptl57@gmail.com

PROF. SHRUTI PATIL.
Department of Electronics & Telecommunication
Shri. L.R.Tiwari college of Engineering and
Mumbai University
Email Id- shrutirp12@gmail.com

***Abstract*—** The purpose of this paper is classification of brain MRI image abnormality using SVM. We can classify normal patients from the abnormal one with the help of this method. Our aim is to classification and segmentation of images by using SVM classification and GLCM. Classification plays an important role in neuroscience. In proposed method 1st features are extracted using grey level co-occurrence matrix and support level matrix classifier is used for classification purpose. This can be achieved by feeding extracted input to SVM classifier

Keywords— *SVM, GLCM, Equilization, Entropy, MRI*

*****

I. INTRODUCTION

Brain abnormality detection using support vector machine and grey level co-occurrence matrix can be very helpful in the field of medicine. Diagnosis can become very easier and specific in order to operate patient with suitable remedies. Using image processing classification of hazardous and malignant tumour can be used as a diagnostic tool. Doctors can easily predict the abnormalities with the help of classified internal MRI image structure. By using techniques like MRI(magnetic resonance imaging), we can obtain important factors which will help doctors to make decisions. Magnetic fields are used to obtain image using MRI. Using this technique 3D image can be obtained on the film. In MRI scanning method signals reflected from internal brain tissues are analysed with the help of the device. CT scan (computed tomography) is another method for diagnosis of abnormal tissues. Brain is controller of human body. It controls various body functions such as blood pressure, cardiovascular activities, physical voluntary and involuntary movements etc. These abnormality identification methods make radiologist and doctor easy to diagnose the exact scenario with patient's abnormalities. SVM and GLCM are useful parameters used for identification and extraction.

II. PROCESS

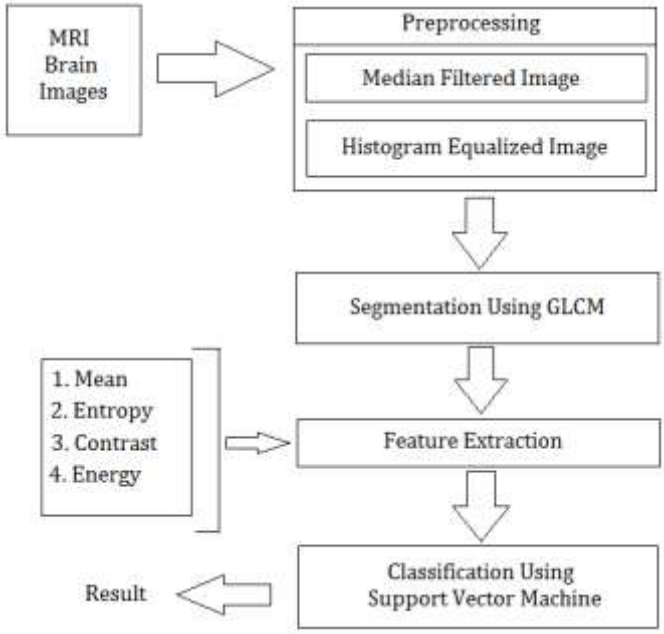

FIG.1 -Block Diagram of Detection of Abnormality in Brain MRI images using SVM classification and GLCM

A.PRE-PROCESSING

Pre-processing is nothing but purification of image before post processing of an image. It's done by removal of noise and redistribution of intensities. Before the computation process begins the image should be enhanced up to optimum level in order to extract features. This enhancement is done by Pre-processing; enhancement of an image is done by the removal of noise, correction of degraded areas and distortion. Also grey level overlapping which can cause problem during

segmentation and feature extraction are removed here. Pre-processing involves median filtering and histogram equalization

B. MEDIAN FILTERING

Median filtering becomes part of pre-processing in order to remove typical noise involved in digital filtering. In digital signal processing median filtering is widely used for edge preservation purpose. X_1, X_2,.....,X_N are set of random variables, where N=2K+1.Before calculating median value, pixels are sorted out from window W. So median filtering is nonlinear type of filter.

$$\text{median}(\mathcal{X}) = \begin{cases} X_{(K+1)} = X_{(m)}\,, & \text{for } N = 2K+1 \\ 1/2\left(X_{(K)} + X_{(K+1)}\right)\,, & \text{for } N = 2K, \end{cases}$$

C.GRAY LEVEL CO-OCCURRENCE MATRIX (GLCM)

The Gray-Level Co-Occurrence Matrix (GLCM) uses grey levels in image for co-occurrence matrix generation. It uses 2nd order special function. Pairs of pixels having nearby values are chosen to create grey level co-occurrence matrix. For example for input image consisting of repeating elements for example (1,1) and element (1,2). We can see in adjacent pixels have repeated values produced at output a shown in figure. For the elements having non repeating values there is zero in the output matrix. This process scans for repeated adjacent pair of pixels.

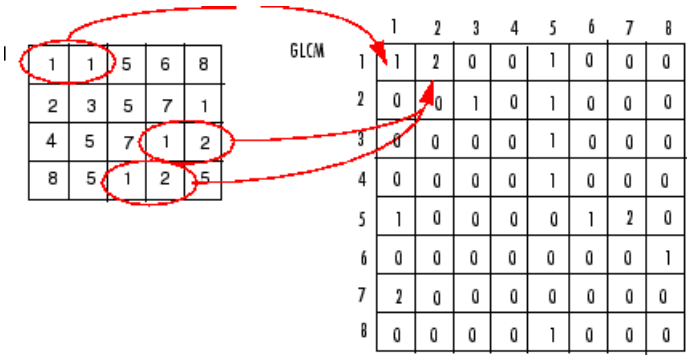

FIG. 2-CALCULATION OF GLCM MATRIX

D. HISTOGRAM EQUILIZATION

Histogram method is generally known for contrast management. Nearby contrast values are managed on the histogram. So areas having lower contrast can gain equilized contrast with respect to higher contrast region. So most repeated intensities values are used for histogram equilization.
As shown in graph when p(x) have high slope then p(y) tries to become equal to p(x) and vice versa.

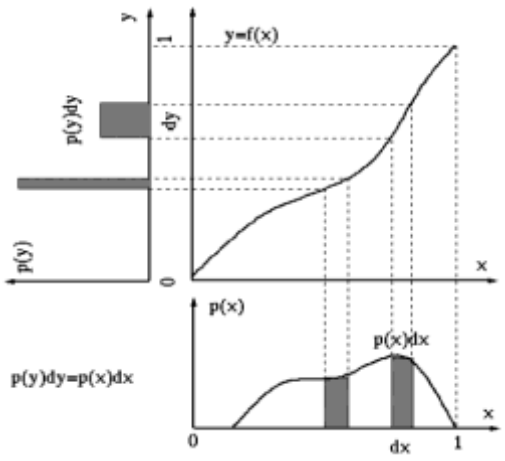

FIG.3- HISTOGRAM EQUILIZATION

E. CO-OCCURRENCE MATRIX-

Based on the co-occurrence matrix generated we can extract many features like mean , contrast, entropy, energy. These features are extracted based on the pixel orientation, pixel repetition and also pixel distance. Depending on special distribution and grey levels co-occurrence matrix is generated. The statistical measures from matrix are called as vectors and that's why this methods is called as support vector machine. On the basis of this matrix abnormalities can be differentiated from the normal ones.

	0	1	2	3	4	5	6	7
0	0	0	0	0	0	0	0	0
1	0	1	2	0	0	0	0	0
2	0	1	0	2	0	0	0	0
3	0	0	1	1	0	0	0	0
4	0	1	0	0	1	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0

FIG.4- CLASSICAL CO-OCCURENCE MATRIX

III. CONCLUSION

This method can detect abnormality in brain with the help of supervised vector machine classifier And segmentation approach for unsupervised area. Co-Occurrence matrices were used to characterize the image textures to differentiate between normal Image and abnormal Image. In order for training also classification, SVM classifier gives proper classification efficiency. SVM algorithm was utilized efficiently for correct image abnormality identification to detect it in the input original sample. The efficiency of this classification is developed with metrics Of sensitivity and accuracy. As a result it can be shown that classifier Provided proper differentiation, accuracy and congenial.

REFERENCES

[1] B. Scholkopf, S. Kah-Kay, C. J. Burges, F. Girosi, P. Niyogi, T. Poggio, and V.Vapnik, "Comparing support vector machines with Gaussian kernels to radial basis function classifiers," IEEE trans Signal Processing, vol. 45, pp. 2758-2765, 1997.

[2] N. B. Karayiannis and Pin-I Pai, "Segmentation of Magnetic Resonance Images Using Fuzzy Algorithms for Learning Vector Quantization", IEEE Transactions On Medical Imaging, Vol. 18,No. 2, pp. 172-180, 1999.

[3] Evangelia I. Zacharaki and Sumei Wang (2009), "MRI-Based Classification of Brain Tumor Type and Grade using SVMRFE," IEEE Transactions on Medical Imaging, Vol.6 No.10.

[4] E.A. El-Dahshan, T. Hosny, A. B. M.Salem "Hybrid intelligent techniques for MRI brain images classification", Digital Signal Processing, vol.20(2), pp. 433 – 441, 2010

[5] K. Kasiri, K. Kazemi, M. J. Dehghani, M.S. Helfroush, "Atlas - based segmentation of brain MR images using least square support vector machines", Image Processing Theory, Tools and Applications, pp. 306-310, 2010

[6] Komal Sharma, Akwinder Kaur, Shruti Gujral, "A review on various brain tumor detection techniques in brain MRI images", IOSR Journal of Engineering (IOSRJEN), vol. 04, PP 06-12, 2014

[7] A.E. Lashkari, A Neural Network based Method for Brain Abnormality Detection in MR Images Using Gabor Wavelets, International Journal of Computer Applications, Vol.4, No.7, July 2010, pp. 9-15.

[8] P. Lin, Y. Yang, C.X. Zheng, J.W. Gu, An Efficient Automatic Framework for Segmentation of MRI Brain Image, Proceedings of the Fourth International Conference on Computer and Information Technology(CIT'04), IEEE, 2004.

[9] H.B. Kekre, S. Gharge, Direct Variance on MRI Images for Tumor Detection, Journal of Sci., Engg. & Tech. Mgt., Vo1.2, No.1, January 2010, pp.3-11.

[10] M. Shenton, R. Kikinis, F. Jolesz, et al., Abnormalities of the Left Temporal Lobe and Thought Disorder in Schizophrenia, N. Engl. J. Med., Vol. 327, No.9, 1992, pp. 604-612.