Brain Tumor Classification Using Multiclass Machine Learning Algorithm

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Abstract— Most of the present predictable diagnosis techniques are based on human experience in interpreting the MRI-scan for decision; certainly this increases the possibility to false detection and identification of the brain tumor. On the other hand, applying digital image processing ensures the quick and precise detection of the tumor. classification of MR brain images is extremely important for medical analysis and interpretation. In the previous decade several methods have already been proposed. This research obtainable a novel method to classify a given MR brain image as normal or abnormal using hybrid SVM. The proposed method shared with wavelet transform and PCA. The preprocessed image is segmented using K mean algorithm. Then this images concerned wavelet conversion to extract features from images, followed by applying principle component analysis (PCA) to reduce the magnitude of features. These reduced features submitted to Hybrid Support vector machine (SVM) for classification. The proposed system used to classify the disease is in normal stage or abnormal stage such as Benign or Malignant.

Key words: Brain Tumor, Machine Learning Algorithm

I. INTRODUCTION

Magnetic Resonance Imaging (MRI) is the state-of the-art medical imaging technology which allows cross-sectional view of the body with unprecedented tissue contrast. MRI is an effective tool that provides detailed information about the targeted brain tumor anatomy, which in turn enables effective diagnosis, treatment and monitoring of the disease. Its techniques have been optimized to provide measures of change within and around primary and metastatic brain tumors, including edema, deformation of volume and anatomic features within tumors.

Most of the current conventional diagnosis techniques are based on human experience in interpreting the MRI-scan for judgment; certainly this increases the possibility to false detection and identification of the brain tumor. On the other hand, applying digital image processing ensures the quick and precise detection of the tumor. The proposed method first employed wavelet transform to extract features from images, followed by applying principle component analysis (PCA) to reduce the dimensions of features. The reduced features were submitted to neural network to classification. The proposed system classify two types brain tumor: benign and Malignant. The proposed method is combination of DWT+PCA+Hybrid classification.

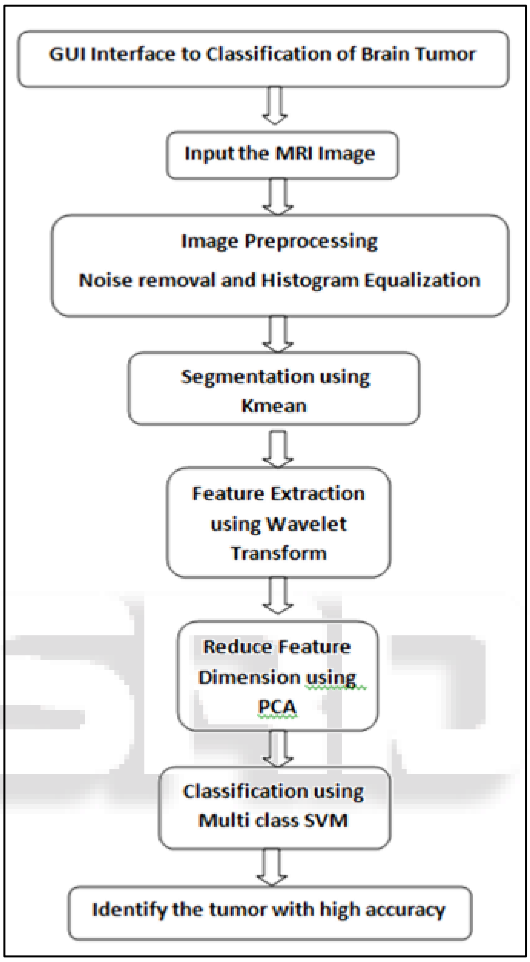

Fig. 1: Flow of Proposed work

II. INPUT THE BRAIN IMAGE

Image processing is a method to perform some operations on an image, in order to get an enhanced image or to extract some useful information from it. It is a type of signal processing in which input is an image and output may be image or characteristics/features associated with that image. Nowadays, image processing is among rapidly growing technologies. It forms core research area within engineering and computer science disciplines too. Digital image processing techniques help in manipulation of the digital images by using computers. The three general phases that all types of data have to undergo while using digital technique are pre-processing, enhancement, and display, information extraction.

The different types of MRI brain images collected and create a dataset. These images are used as a input. Figure 3.2 is sample image

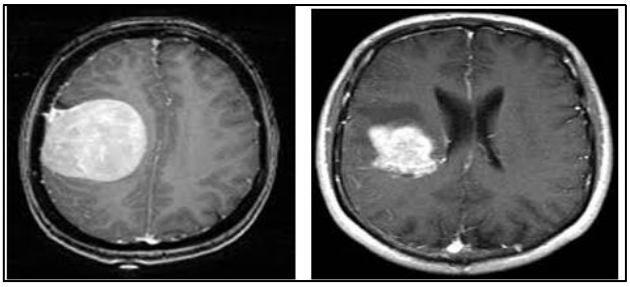

Fig. 1: Sample Image

A. Select the Image/Input Image

The images of both the effected and healthy brain images are used in the present work are collected and the database is created. These images are used as a input. Figure 4.2 is sample image.

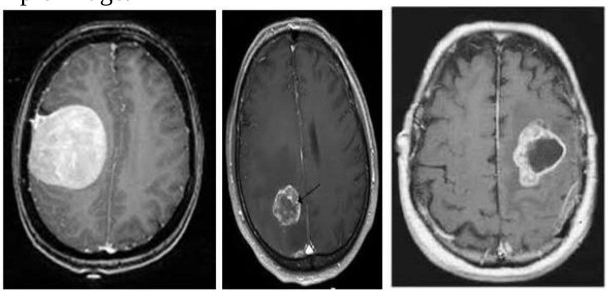

Fig. 2: Sample image-I.

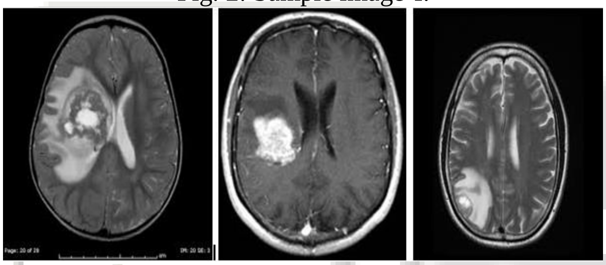

Fig. 3: Sample image-II.

III. IMAGE PRE-PROCESSING

Noise would disturb the segmentation and the feature extraction of disease spots. So they must be removed or weakened before any further image analysis by applying an appropriate image filtering operation. In the present work, considered Gaussian filter to filter out the input images.

Image Pre-processing Noise gets added during acquisition of leaf images. So different types of filtering techniques are used to remove noise .Create device independent color space transformation structure. Thus create the color transformation structure that defines the color space conversion. The next step is that we apply device-independent color space transformation, which converts the color values in the image to color space specified in the color transformation structure. The color transformation structure specifies various parameters of transformation.

IV. IMAGE SEGMENTATION

Image segmentation refers to the process of partitioning the digital image into its constituent regions or objects so as to change the representation of the image into something that is more meaningful and easier to analyze. The level to which the partitioning is carried depends on the problem being solved i.e. segmentation should stop when the objects of interest in an application have been isolated. In the current work, the very purpose of segmentation is to identify regions in the image that are likely to qualify as diseased regions. There are various techniques for image segmentation such as clustering methods, compression-based methods, histogram-based methods, region growing methods etc.

K-means clustering method has been used in the present work to carry out segmentation. K-Means Clustering is a method of cluster analysis which aims to partition n observations into k mutually exclusive clusters in which each observation belongs to the cluster with the nearest mean. Following are the steps in K-means clustering.

A simple two dimensional case for K-means clustering is shown The K-means algorithm set with *k*= 4 results in four clusters represented by *A*, *B*, *C*, and

A. The K-means algorithm operates as follows:

1) Assign document vectors,
2) Initialize cluster centroids
3) find the closest centroid *Cmin*.
   Move document *d* from current cluster.
4) Repeat step 3 until either the maximum epoch limit is reached or an epoch passes in which no changes in document assignments are made..

The initial seed clusters can be either assigned or generated by randomly assigning documents to clusters. K-means has been used in the clustering of images. hardware implementation of K-means to cluster hyper spectral images was created.

V. FEATURE EXTRACTION

This research work using wavelet transform to feature extraction. Wavelets are mathematical functions. It decomposes data into various frequency components and then study each component with a resolution matched to its scale. Wavelets is very powerful mathematical tool for analysis of complex datasets. The Fourier transform provides representation of an image based only on its frequency content [10].Hence this representation is not spatially localized while wavelet functions are localized in space as well as frequency. The Fourier transform decomposes a signal into a spectrum of frequencies where as the wavelet analysis decomposes a signal into a hierarchy of scales ranging from the coarset scale. Hence Wavelet transforms[5] which provide representation of an image at various resolutions is a better tool for feature extraction from images. This research work employ the Discrete wavelet transform for feature extraction.

A. Discrete Wavelet Transform

The Discrete wavelet transform is an implementation of the continuous wavelet transform using a discrete set of the wavelet scales and translation [2]. For practical computations, the wavelet transform is to be discredited. The scale parameter is discredited on algorithmic grid. The translation parameter (t) is discredited with respect to the scale parameter, i.e. sampling is done on the dyadic (as the base of the logarithm is usually chosen as two) sampling grid. The discredited scale and translation parameters are given by, $s = 2^{-m}$ and $t = n\, 2^{-m}$, where m, n ϵ Z , the set of all integers.

VI. PROPOSED METHOD

The graphical interface developed for the brain tumor identification has 3 segments. The first segment includes the provision for incorporating the image from the database. The second segment provides the option for the user to check the various features of the incorporated image from the preset database.

The third segment shows the output i.e the processed image of the input database. It also shows the accuracy of the various algorithms implied. Following are the steps involved in the GUI

Step: 1: Select the brain image
Step: 2: Incorporating the original image
Step: 3: Segmenting the Image
Step: 4: Save Image

VII. RESULT OF PROSED METHOD

The input image has to be preprocessed because images are corrupted by a type of multiplicative noise like light intensity and shadow on a cotton leaf images that may contain useful information about the brain tumor that can be used in the diagnosis.

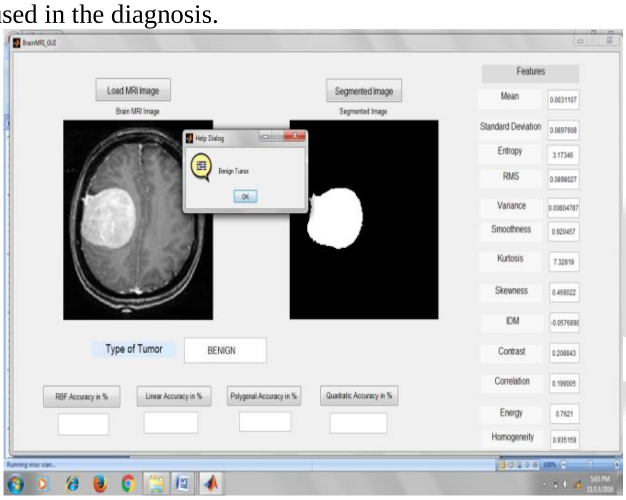

Fig. 4: Tumor Segmented Brain image

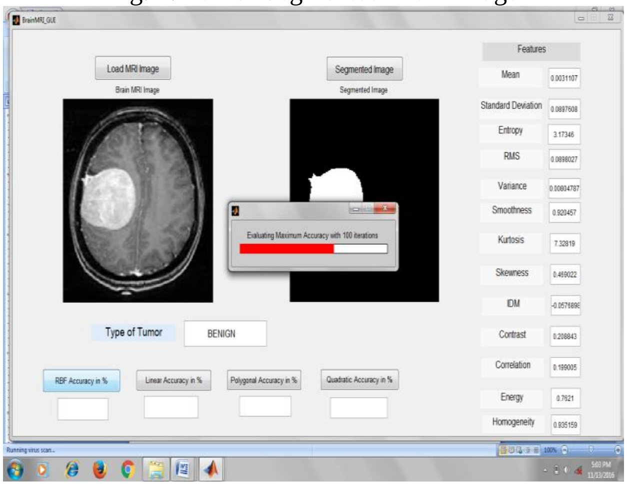

Fig. 5: Accuracy of the Segmented Image

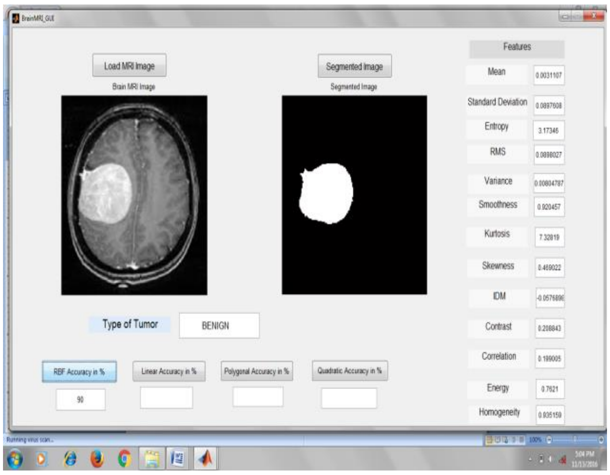

Fig. 6: RBF Accuracy of the Segmented Image

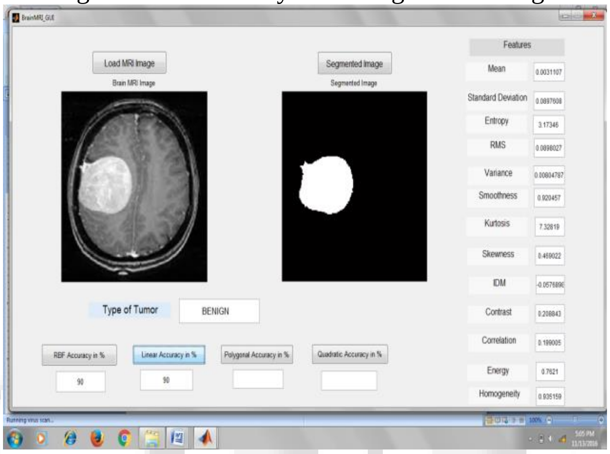

Fig. 7: LINEAR Accuracy of the Segmented Image

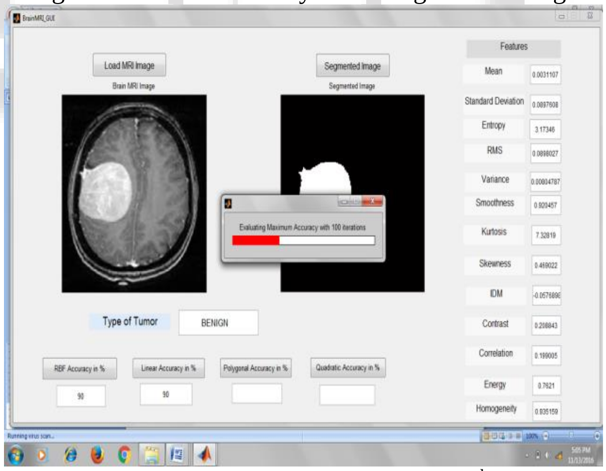

Fig. 8: Maximum Linear Accuracy on 100th Iteration

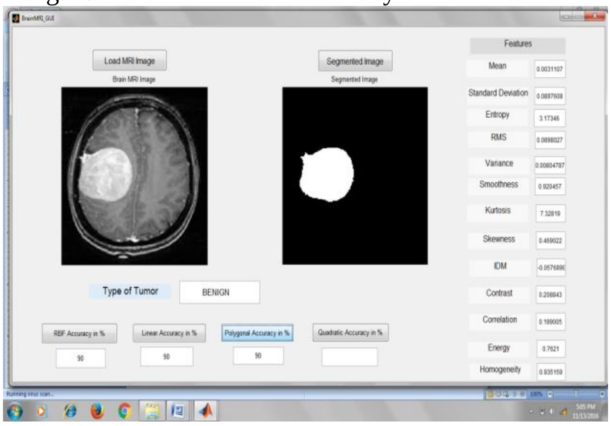

Fig. 9: Polygonal Accuracy of the Brain Image

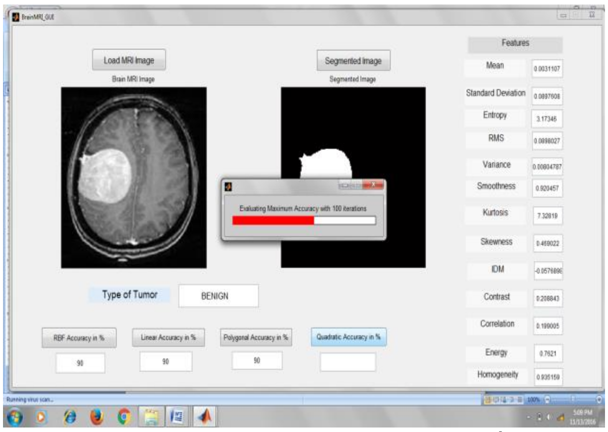

Fig. 10: Maximum Plygonal Accuracy on 100th Iteration

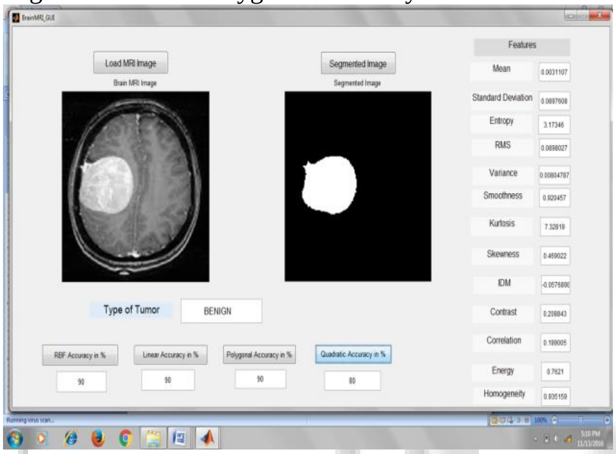

Fig. 11: Quadantic Accuracy of the Brain Image

VIII. Conclusion

As proposed method provides reliable and fast detection of different types of brain tumors. Therefore it can be used in fully automated systems for tumor detection. The designed system is an efficient system for Detection and Classification of Brain Cancer from a given MRI image of cancer affected patients. The proposed work consider only brain and its types in future it will consider all types of cancers.

References

[1] Abbosh, Y.M., Yahya, A.F. and Abbosh, A. "Neural networks for the detection and localization of breast cancer" International Conference on Communications and Information Technology, pp. 156-159, 2011.

[2] Abdaheer, M.S. and Khan, E. "An automatic and simple breast tumor classification using area matching", International Conference on Image Information Processing (ICIIP), pp. 1-5 , 2011.

[3] Abhi Gholap, Gauri Naik, Aparna Joshi and Rao, M.M. "Content-Based Tissue Image Mining", IEEE Computational Systems Bioinformatics Conference - (CSBW'05), pp.359-363, 2005.

[4] Alan Wee-Chung Liew. and Hong Yan. "Current Methods in the Automatic Tissue Segmentation of 3D Magnetic Resonance Brain Images", Current Medical Imaging Reviews, Vol. 2, No. 1, pp. 91-103, 2006.

[5] Alperin, N., Sivaramakrishnan, A. and Lichtor, T. "Magnetic resonance imaging-based measurements of cerebrospinal fluid and blood flow as indicators of intracranial compliance in patients with Chiari malformation", Journal of neurosurgery, Vol.103, pp.46-52, 2005.

[6] Anbeek, P., Vincken, M.J.P., Van Osch, R.H., Bisschops, C. and Van der Grond, J. "Automatic segmentation of different-sized white matter lesions by voxel probability estimation", Med. Image Anal., Vol. 8, pp. 205-215, 2004.

[7] Arabi, P.M., Muttan and Siji, R.J. "Image enhancement for detection of early breast carcinoma by external irradiation", International conference Computing communication and networking technologies, pp.1-9, 2010.

[8] Asad, M., Azeemi, N.Z., Zafar, M.F. and Naqvi, S.A. "Early Stage Breast Cancer Detection through Mammographic Feature Analysis", 5th International Conference on Bioinformatics and Biomedical Engineering, pp. 1-4 , 2011.

[9] Ashok N. Srivastava. and Nikunj Oza. "Knowledge Driven Image Mining With Mixture Density Mercer Kernels", Workshop on the Theory and Applications of Knowledge Driven Image Information Mining, with focus on Earth Observation, 2004.

