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A Novel Approach for the Enhancement of Brain Tumour Pattern using Image processing Techniques

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ABSTRACT :

Brain tumour is an abnormal growth caused by cells reproducing themselves in an uncontrolled manner. Magnetic Resonance Imager (MRI) is the commonly used device for diagnosis. In MR images, the amount of data is too much for manual interpretation and analysis. During the past few years, brain tumour segmentation in Magnetic Resonance Imaging (MRI) has become an emergent research area in the field of medical imaging system. Accurate detection of size and location of brain tumour plays a vital role in the diagnosis of tumour. Image processing is an active research area in which medical image processing is a highly challenging field. Image segmentation plays a significant role in image processing as it helps in the extraction of suspicious regions from the medical image. In this paper we use discrete wavelet transform , principal component analysis and kernel SVM methods for the tumour segmentation or classification from the image.

Introduction:

Brain tumour is an abnormal growth of cells inside the skull. Normally the tumour will grow from the cells of the brain, blood vessels, nerves that emerge from the brain. There are two types of tumour which are- benign(non-cancerous) and malignant (cancerous) tumours. The former is described as slow growing tumours that will exert potentially damaging pressure but it will not spread into surrounding brain tissue. However, the latter is described as rapid growing tumour and it is able to spread into surrounding brain. Tumours can damage the normal brain cells by producing inflammation, exerting pressure on parts of brain and increasing pressure within the skull. Figure 1 shows the presence of tumour in the brain. Radiologists examine the patient physically by using Computed Tomography (CT scan) and Magnetic Resonance Imaging (MRI). MRI images showed the brain structures, tumour’s size and location. From the MRI images the information such as tumours location provided radiologists, an easy way to diagnose the tumour and plan the surgical approach for its removal.

MRI's use radiofrequency and magnetic field to result image's human body without ionised radiations. Imaging plays a central role in the diagnosis of brain tumours. On MRI, they appear either hypo (darker than brain tissue) or iso tense (same intensity as brain tissue) on T1-weighted scans, or hyper intense (brighter than brain tissue) on T2-weighted MRI. In medical, doctors don't have method that can be used for brain tumour detection standardization which leads to varying conclusions between one doctor to another. So in this paper we proposed the concepts which are helpful for the easy diagnosis.

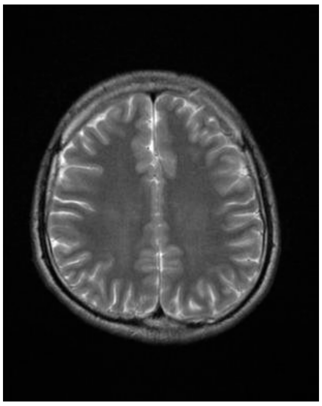

Figure 1:Normal Brain image

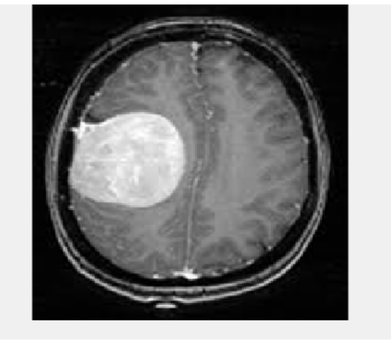

Figure 2: The presence of Brain tumour

Literature Survey:

Brain s are well known from the beginning of the 18th century. From then on being a period on researching on the various aspects of brain tumours. A lot of treatments are known to come and go from that period onwards. Later in the 19th century lot of societies and research institutes where set up in order to find imaging and treatment methods. Societies like The Brain Tumour Research Centre set up by Charles Wilson are doing various researches on tumour detection and treatments. Automatic segmentation algorithms are been developed recently to detect tumours within the brain. The images that are obtained through Magnetic Resonance Imaging or the Computed Tomography are taken to analyse the brain tumour. Some of the effects that are observed in these images which are taken either through MRI or CT may have arti facts, low contrast making the detection of brain tumour uneasy or noise present in those images. Hence it can be said that imaging here plays a central role in the segmentation or detection or classification of brain tumour. Many imaging techniques are

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been used to detect tumours within the image. Algorithms like thresholding and region growing are been used to segment brain tumours. The existing method is based on k means clustering. When these methods were applied there are few disadvantages such as the thresholding method ignored spatial characteristics which are important for malignant tumour detection. Whereas in the region based segmentation it needed more user interaction for the selection of seed. Due to these drawbacks these techniques are not been widely adopted. Future research in the segmentation of medical images will lead towards improving the accuracy, exactness, and computational speed of segmentation approaches, as well as minimizing the amount of manual interaction. These can be improved by incorporating discrete wavelet transform , principal component analysis and kernel SVM methods.

Computational effectiveness will be crucial in real-time processing applications. Segmentation methods have proved their utility in research areas and are now emphasizing increased use for automated diagnosis and radiotherapy. These will be particularly important in applications such as computer integrated surgery, where envision of the anatomy is a significant component.

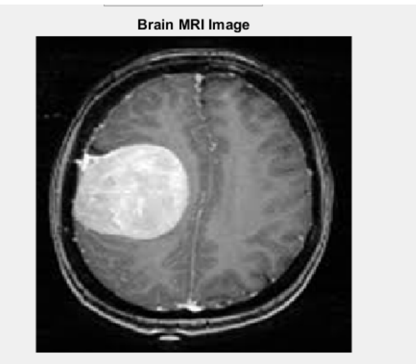

Figure 3: Original Image

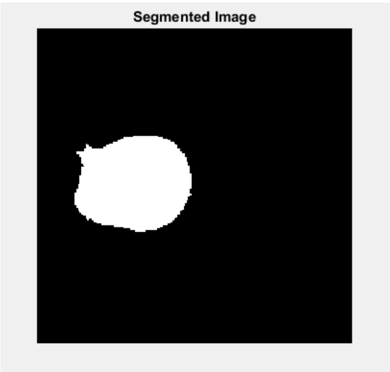

Figure 4: Segmented image

Pre-processing:

In total, our method consists of three stages:
Step 1. Pre-processing (including feature extraction and feature reduction);
Step 2. Training the kernel SVM;
Step 3. Submit new MRI brains to the trained kernel SVM, and output the prediction.
As shown in Fig.5, this flowchart is a canonical and standard classification method which has already been proven as the best classification method . We will explain the detailed procedures of the pre-processing in the following subsections.

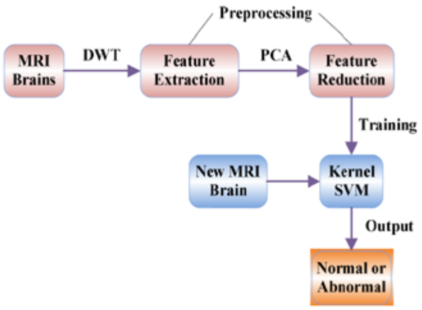

Figure.5 Methodology of our proposed algorithm.

Procedure:

First in the method of pre-processing we mainly concentrated on feature extraction and feature reduction .In feature extraction we extract the features like colour ,contrast ,size etc. information of brain MRI image . In that we use discrete wavelet transform for the extraction .wavelet transform can deal with both time and frequency related information of the image accurately so that we cannot lost any information.

Because of the excessive features and sometimes there may also require extra computations ,we have gone for feature reduction . In feature reduction we use PCA(principal component analysis) method. It mainly do the following

1. Orthogonalizes the components of the input vectors so that uncorrelated with each other.
2. It orders the resulting orthogonal components so that those with the largest variation come first.
3. eliminates those components contributing the least to the variation in the data set.

In this way we can reduce the computation times, storage memory and number of features.

Now we just know about features of the image only .The next task is to segment the tumour part from the image. Means we have to classify the image for the tumour detection. For this we use kernel SVM(support vector machine algorithm). Generally SVMs have higher accuracy among the classification methods like k-nearest neighbours. SVMs are generally linear in nature. To extend these linear to non-linear also we make use of the kernel function and that method we call it as kernel SVM.

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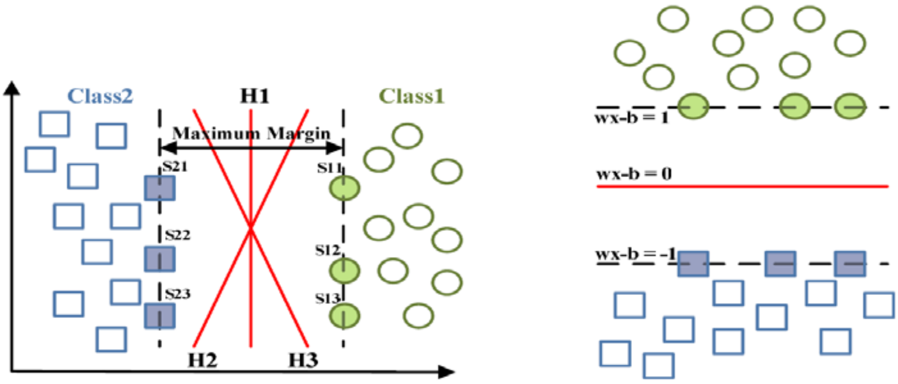


Figure 6 : kernel SVM

In this way we can classify the tumour from the image .

Results and Discussion:

We have mapped the resultant tumour image onto the original grayscale image for presentation purpose.

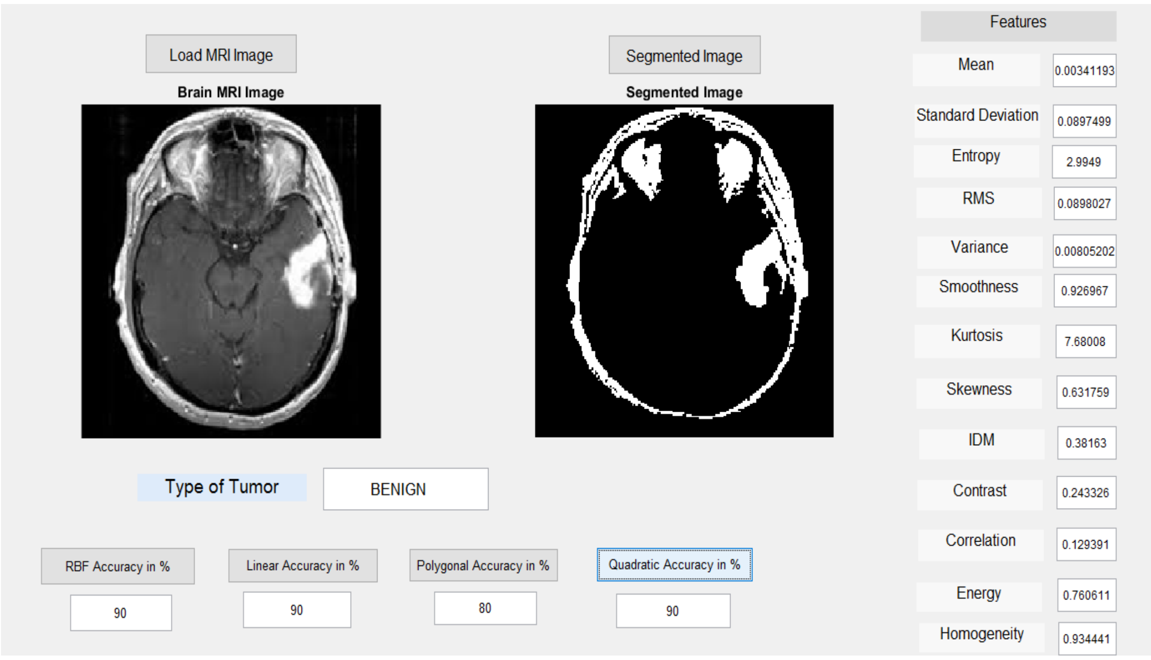


Figure 7: Detection of MALIGNANT tumour

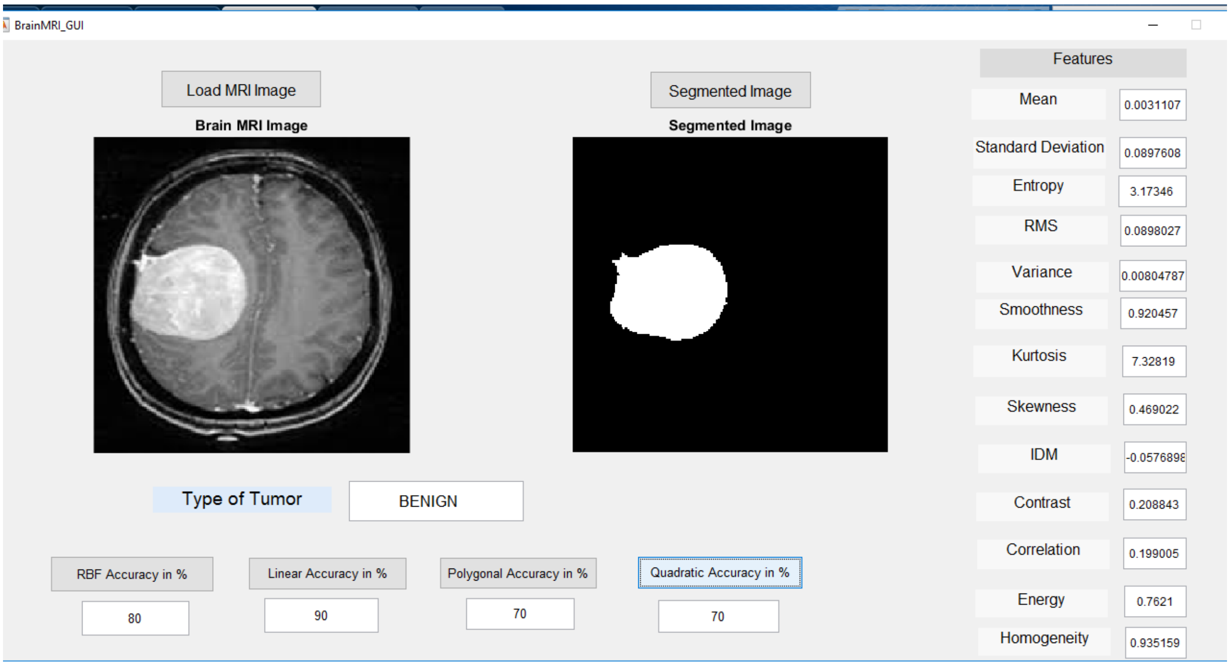
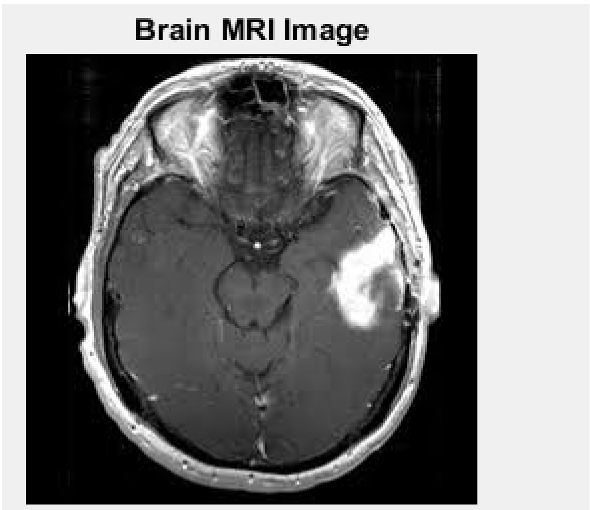


Figure 8 : Detection of BENIGN tumour



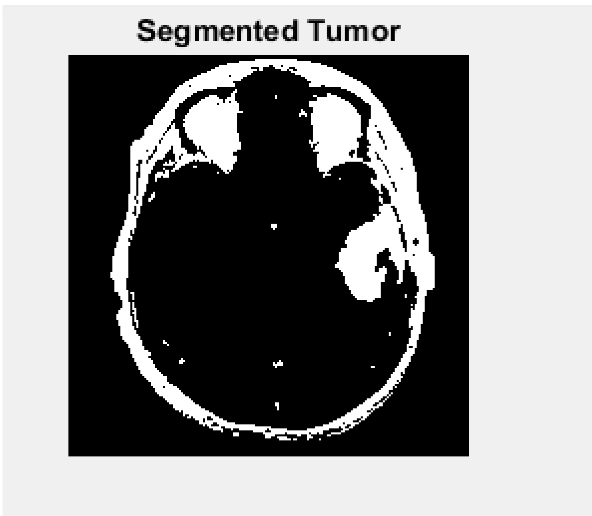


Figure 9 : Input Brain MRI image

Figure 10 : Output Segmented image

Figure 11 : Input Brain image

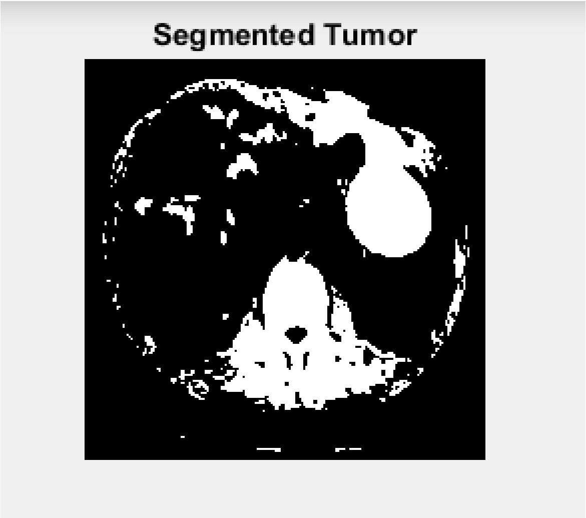


Figure 12 : Output Segmented image

FEATURES	BENIGN TYPE OF TUMOUR	MALIGNANT TYPE OF TUMOUR
MEAN	**0.00341193**	**0.00365066**
Standard deviation	**0.0897499**	**0.0897405**
Entropy	**2.9949**	**3.37095**
RMS	**0.0898027**	**0.0898027**
Variance	**0.00805202**	**0.00805956**
Smoothness	**0.926967**	**0.931415**
Skewness	**0.631759**	**0.635044**
Contrast	**0.243326**	**0.243326**
Correlation	**0.129391**	**0.0932787**
Kurtosis	**7.68008**	**7.35059**
Energy	**0.760611**	**0.761293**
Homogeneity	**0.934441**	**0.932884**
IDM	**0.38163**	**-0.137806**
Linear accuracy	**90%**	**90%**
Quadratic accuracy	**90%**	**90%**
Polygon accuracy	**80%**	**80%**
RBF accuracy	**90%**	**90%**

Table 1: Output parameters for brain tumour types

Conclusion:

In this proposed work we acquire an MRI image of the brain and perform a series of operations to enhance the quality of the image and then to segment the tumour within the brain. This algorithm is able to segment tumours clearly and able to outline the shape and location of the tumour. This in turn helps the physician or the doctor to analyze the tumour shape and size since the shape and size of the tumour plays a vital role in the treatment to the tumour.

References:

[1] M.S. Atkins and B.T. Mackiewich, "Fully Automatic segmentation of the brain in MRI", IEEE T. Med.Imag.,17:98–109.

[2] L.O. Hall and L.P. Clark, "Review of MR image segmentation techniques using pattern recognition",Med. Phys., 20:1033–1048, 1993.

[3] T.N. Pappas, "An adaptive clustering algorithm for image segmentation", IEEE T. Signal Process., 40:901 914,1992.

[4] Fan, J., Han, M. and Wang, "Single point iterative weighted fuzzy c-means clustering algorithm for remote sensing image segmentation Pattern Recognition", 42(11), pp.2527—2540., 2009.

[5] Chen, J., Pan, D. and Maz, "Image-object detectable in multi scale analysis on high-resolution remotely sensed imagery", International Journal of Remote sensing, 30(14), pp. 3585 – 3602, 2009.

[6] Chen, Z., Zhao, Z., Gong, P. and Zeng, "A new process for the segmentation of high resolution remote sensing imagery", International Journal of Remote Sensing, 27(22), pp. 4991-5001., (2006).

[7] Bieniek, A. & Moga. (2000) "An Efficient Watershed Algorithm Based on Connected Components. "Pattern Recog, 33(6), 907-916.

[8] Abdel-HalimElamy, Maidong Hu. Mining "Brain Tumors & Their Growth rates".872-875 IEEE Image Processing Society, 2007.

[9] Rajeev Ratan, Sanjay Sharma, S. K. Sharma, "Brain Tumor Detection based on Multi-parameter MRI Image Analysis". ICGST-GVIP Journal, ISSN 1687-398X, Volume (9), Issue (III), June 2009.

[10] Alka pandey, Saima beg,Archana Yadav ," Image Processing Technique for The Enhancement of Brain Tumour Pattern" . IJRDASE Journal , ISSN: 2454-6844, Volume 9, Issue 2, April 2016.