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DSS for Detection and Comparison of Brain Tumor on T2-Weighted MRI Images

Vijay Subhash Gaikwad[1]
Department of Computer Engineering
SVIT, Chincholi
Nashik,India

Prof. S. M. Rokade[2]
Department of Computer Engineering
SVIT, Chincholi
Nashik,India

Abstract— **this work is extension of our previous work [1]. Previous work [1] introduced the method for the detection of tumors in human brain on the basis of T2-weighted MRI images. The author developed method which detect tumor area in human brain on the basis of bitmapped digital MRI Images. This paper showing the results of developed system. Using different brain disease MRI dataset the experiments were performed. The experiment results shows that the conceptually simple proposed method is effectively detect tumor blocks. The system also compares the tumor between two MRI images taken over different time period of a patient and shows percent rise or fall in tumor.**

Keywords— Image Analysis, Operation and Decision Support Systems, detection, Tumors, MRI.

I. INTRODUCTION

The magnetic resonance imaging is the technique used by creating strong magnetic field by passing an electric current through wire loops. At the same time other coils in the magnet send & receive radio waves. The protons are triggered in the body to align themselves. The radio waves are observed by the protons once it aligned which simulate spinning. After exciting molecules energy is released, this in turn emits energy signals that picked up by the coil. Finally this information is then sending to a computer for generating image after processing all the signals. This process not involves ionizing radiations unlike CT scanning or general x-ray studies. As per the survey conducted in the United States this year 12,820 men and 10,560 women (23,380 adults) will be diagnosed with primary cancerous tumors of the brain & spinal cord. Estimations give the statistics that 8,090 men & 6,230 women (14,320 adults) will be die from this disease this year. In recent years the development in medical science & imaging techniques given facility to use these techniques in various domains of medicine like surgical planning, time series and statistical analysis, computer aided pathologies, surgical guidance diagnosis..

II. LITERATURE SURVEY

Ishita Maiti et al [19] introduced a new method for brain tumor detection using watershed method which is color based brain tumor detection algorithm which uses color MRI images of brain in HSV color space. By considering different approaches we studied, M.Karnan [8] demonstrate the method of tumor detection using segmentation by soft computing. J.Li,S.Ghanavati et al [10] introduced the brain tumor detection technique by extracting the features like deformation, intensity, symmetry & texture features. M.Monica Subashini et al [11] represents the model Pulse coupled neural network by giving segmented MRI as input which detects the presence of tumor in the brain image. Shraiya Nancy et al [12] et al represents the technique with three steps that is preprocessing, histogram equalization & segmentation S.Chandra et al [6] represent a clustering based algorithm on Particle Swarm Optimization (PSO). A.Azamimi Abdullah, T.Logeswari et al [13] represent the detection method based on cellular neural networks (CNNs).

A.Islam et al [14] proposed a stochastic model by using Magnetic Resonance Imaging for characterizing tumor texture in brain. T.Rajesh, R. Suja Mani Malar [15] represents the paper that shows that MRI image given as input & features are extracted from that image based on Rough Set Theory. Eyup Emre Ulku et al [17] represents the brain tumor detection using Computer-aided detection system. The brain tumor detection technique using K-means clustering is introduced by J.Vijay, J.Subhashini [18]. Pavel Dvorak et al [16] proposed the technique that determines whether the input MRI image of brain contains a tumor or not by checking the symmetry of the brain which is assumption for healthy brain.

III. MATERIALS

The computational analysis is developed on Dell Latitude Intel Core2Due 2.00 GHz computer with 2GB RAM. The application is developed in JAVA using Eclipse tool. The T2-wieghted MRI image dataset is used for the testing of the application. The MRI images take with different cases including tumor & non-tumor brain images.

IV. EXPERIMENTAL RESULTS

1) Tumor Detection

The experimental results of the DSS are getting after giving the input to the system from the MRI Data set as shown in figure 5. After clicking on the load button the browsing window appear to select the MRI Image.

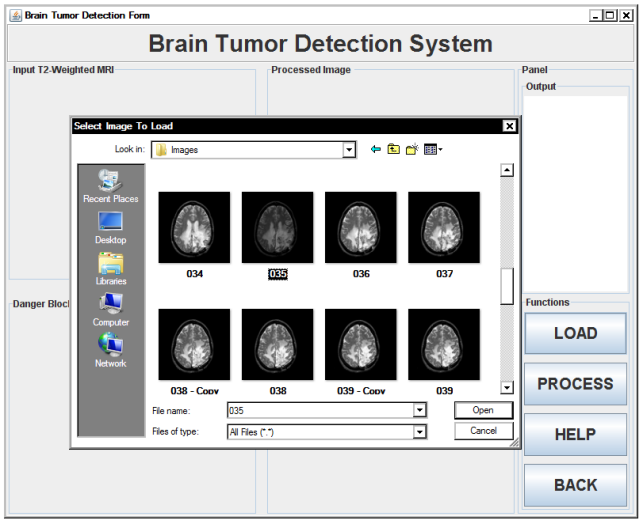

Fig 1: Loading MRI Image in the system

Once the MRI image loaded, after clicking on the process button the system give the three output images as shown in figure 6.

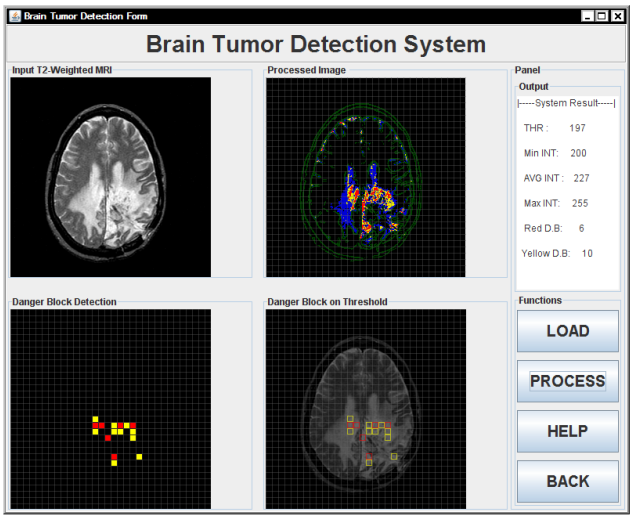

Fig 2: Output window of the system

The system reports panel at the right side of the window shows the different output values like threshold, minimum intensity & maximum intensity, red data block count & yellow data block count etc. which is calculated after processing the input MRI image.

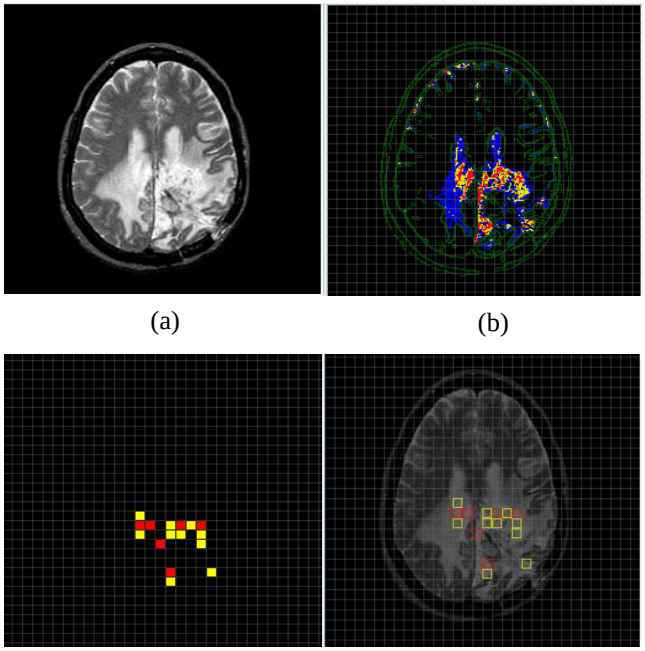

Fig 3: Detection Result (a) Input T2-weighted MRI (b) Processed Image (c) Danger block (d) Danger block on threshold Image Output of the system

As shown in figure 7 the system gives the three output images. The Processed image i.e. figure 7(b) showing the color allotted to pixels in the image after preprocessing. The danger blocks are getting in figure 7(c), which is depends on the calculations made during the processing of the system. The figure 7(d) gives the output of the danger blocks on threshold. The red danger blocks have shown the high density tumor area and Yellow danger blocks have shown medium or low density tumor area.

TABLE I

Image	Sample Output Readings For tumor & non-tumor image		
	Threshold	Red D.B	Yellow D.B
Tumor Image	201	9	4
Non-Tumor Image	190	0	0

[a.] Sample Output Readings of Detection System

The experiment is performed on the T2-wieghted MRI image dataset. The dataset consist of different cases of tumor & non-tumor brain images. The above table (TABLE I) shows the readings taken by randomly selecting one tumor image & one non-tumor image.

2) Tumor Comparison

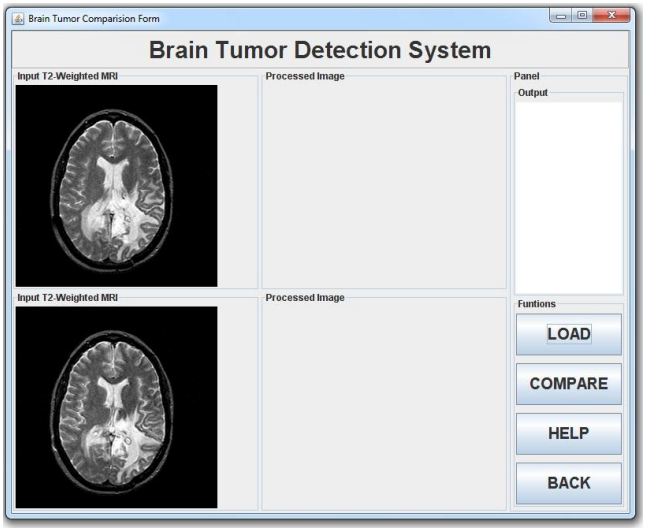

Fig 4: Loading MRI Images for Comparison

The system provides the facility to compare the two MRI images taken over period of time of the patient. System shows the results of percent fall or percent rise in tumor blocks.

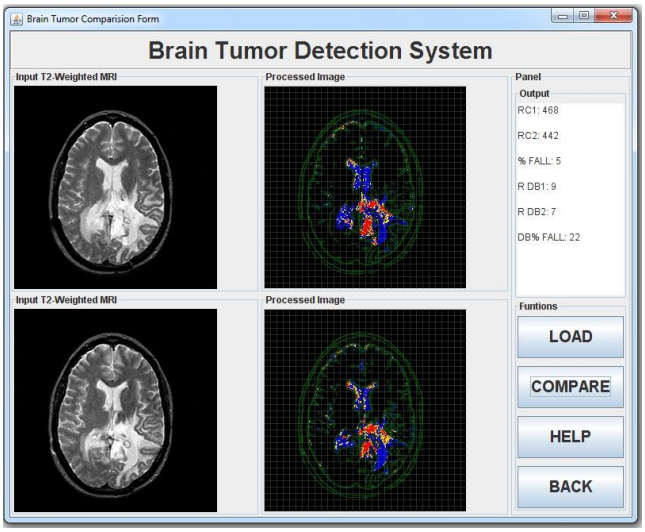

Fig 5: Comparison Results

The fig shows the comparison results of the two MRI images of a patient. In this example the patient tumor decreased & percent fall in tumor is shown by the system. If the tumor increased then the system can show the percent rise in tumor. The table II shows the reading given by the system of the red count, red data block, percent fall w.r.t to red count and percent red data block fall.

TABLE II

Image	Sample Output Readings For tumor & non-tumor image			
	RC1	*Red D.B*	*% Fall*	*DB % FALL*
1st MRI Image	468	9	5 %	22
2nd MRI Image	442	7		

b. Sample Output Readings of Comparison System

V. CONCLUSION

The proposed technique effectively capable to identify the tumor areas in the given T2-weighted brain image as input taken from the MRI dataset consisting of different cases. The technique is capable to help the doctors to analyze the tumor area in human brain.

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AUTHOR PROFILE

Mr.Vijay S. Gaikwad has completed his B.E in Information Technology from Pune University and currently pursuing Master of Engineering from SVIT Chincholi, Nashik.

Prof. S.M.Rokade has completed his B.E in Computer Engineering from Pune University and M.E in Computer Science & Engineering from MGM, Nanded. He is presently working as an Associate Professor in SVIT Chincholi, Nashik.