JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

BRAIN TUMOR SEGMENTATION AND STAGE CLASSIFICATION USING SVM CLASSIFIER

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Abstract : Brain tumor detection is very challenging problem due to complex structure of brain .Magnetic Resonance Imaging is a standard modality used in medicine for brain diagnosis and treatment. Due to the increasing of medical data flow, the accurate detection of tumors in the MRI slices becomes a fastidious task to perform. Furthermore the tumor detection in an image is useful not only for medical experts, but also for other purposes like segmentation and 3D reconstruction. The manual delineation and visual inspection will be limited in order to avoid time consumption by medical doctors. The brain tumor tissue detection allows localizing a mass of abnormal cells in a slice of Magnetic Resonance (MR). A SVM Classifier is used to segment the cancer detected portion. To segment the portion, first have to filter out the acquired image based upon the masking methodology. The Morphological function including dilation and erosion method will be applied extracted throughout the filtered image. By the method of morphological bounding box will be drawn over the affected portion. Then, the region enclosed by bounding box will be splitted out separately with the SVM Classifier.

IndexTerms **– Automation, Magnetic Resonance, Delineation SVM Classifier**

I. INTRODUCTION

Information is conveyed through images. Image processing is a process where input image is processed to get output also as an image. Main aim of all image processing techniques is to recognize the image or object under consideration easier visually. All the images used in today's world are in the digital format. Medical images are images that show the physical attributes distribution. Medical imaging modalities as in MRI, CT scan mostly depend on computer technology to generate or display digital images of the internal organs of the human body which helps the doctors to visualize the inner portions of the body. CT scanner, Ultrasound and Magnetic Resonance Imaging took over conventional x-ray imaging, by allowing the doctors see the body's third dimension. Human body is made up of several types of cells. Brain is a highly specialized and sensitive organ of human body. Brain tumor is a very harmful disease for human being. The brain tumor is intracranial mass made up by abnormal growth of tissue in the brain or around the brain. Brain tumor can be detected by benign or malignant type. The benign being non-cancerous and malignant is cancerous. Malignant tumor is classified into two types; primary and secondary tumor benign tumor is less harmful than malignant. The malignant tumor it spread rapidly entering other tissues of the brain therefore, worsening condition patients are loosed. Brain tumor detection is very challenging problem due to complex structure of brain. Brain tumor diagnosis is quite difficult because of diverse shape, size, location and appearance of tumor in brain. Brain Tumor detection is very hard in beginning stage because it can't find the accurate measurement of tumor. But once it gets identified the brain tumor it give to start the proper treatment and it may be curable. Therefore, the treatments depend on tumor like; chemotherapy, radiotherapy and surgery. Medical imaging is useful to diagnose the noninvasive possibilities. The various types of medical imaging technologies based on noninvasive approach like; MRI, CT scan, Ultrasound, SPECT, PET and X-ray. In the field of medical diagnosis systems (MDS), Magnetic resonance Imaging (MRI), gives the better results rather than Computed Tomography (CT), because Magnetic resonance Imaging provides greater contrast between different soft tissues of human body. In MRI-scan is a powerful magnetic fields component to determine the radio frequency pulses and to produces the detailed pictures of organs, soft tissues, bone and other internal structures of human body.

I. LITERATURE REVIEW

[1] **Huang Meiyan, Wei Yang, Wu Yao, Jiang Jun, Chen Wufan, and Qianjin Feng, "Brain Tumor Segmentation Based on Local Independent Projection-based Classification", IEEE Transactions on Biomedical Engineering, 2019** . Brain tumor is a group of cell that grows abnormally in the cell, nerves and other parts of the brain. Methods such as X-Ray, CT-Scan, MRI is available to detect the brain tumor. It is necessary to find the accurate part of the affected area of the brain tumor. Bio-medical image processing is the most challenging and upcoming field in the present world. By using MATLAB, the tumor present in the MRI brain image is segmented and the type of tumor is

specified using SVM classifier (Support Vector Machine). MRI of the brain for the image segmentation using MATLAB used and specified the type of the tumor. To segment tumor regions from MRI image, here an efficient algorithm called threshold segmentation algorithm is used. This algorithm is mainly used for segmentation process.

[2]**Ines NJEH, Lamia Sallemi, Mohammed Ben Slima, Stephane Lehericy. "A Computer Aided Diagnosis 'CAD' for Brain Glioma Exploration". International Conference on Advanced Technologies Signal and Image Processing.2018**. A method for segmentation of brain tumor has been developed on 2D-MRI data which allows the identification of tumor tissue with high accuracy and reproducibility compared to manual techniques. This method incorporates with some noise removal functions, segmentation which are the basic concepts of image processing. Detection and extraction of tumor from MRI scan images of the brain is done by using MATLAB software. The aim of this work is to design an automated tool for brain tumor quantification using MRI image data sets.

[3]Eman Abdel-Maksoud, Mohammad Elmogy, Rashid AlAwadi."Brain Tumor Segmentation Based on a Hybrid Clustering Technique".Egyptian Informatics Journal, 2018 a medical picture segmentation system that uses hybrid clustering algorithms to deliver accurate brain tumour identification in a short amount of time. In our suggested medical picture segmentation system, we present two hybrid approaches. The first uses k-means and fuzzy c-means (KFCM), while the second uses k-means with particle swarm optimization (KPSO). We used three separate benchmark brain data sets to evaluate the two proposed methodologies with k-means: fuzzy c-means, expectation maximisation, mean shift, and particle swarm optimization. The findings support the efficacy of our second proposed approach.

III. RELATED WORKS

3.1 IMAGE PROCESSING TECHNIQUES FOR BRAIN TUMOR DETECTION

MRI Imaging plays an important role in brain tumor for analysis, diagnosis and treatment planning. It's helpful to doctor for determine the previous steps of brain tumor. Brain tumor detections are using MRI images is a challenging task, because the complex structure of the brain. Brain tumor is an abnormal growth of cell of brain. MRI images offer better difference concern of various soft tissues of human body. MRI Image provides better results than CT, Ultrasound, and X-ray. In this the various preprocessing, post processing and methods like; (Filtering, contrast enhancement, Edge detection) and post processing techniques like; (Histogram, Threshold, Segmentation operation) through image processing (IP) tool is available in MATLAB for detection of brain tumor images (MRI-Images).

3.2 BRAIN TUMOR MRI IMAGE SEGMENTATION AND DETECTION IN IMAGE PROCESSINNG

Image segmentation plays a significant role in image processing as it helps in the extraction of suspicious regions from the medicalimages. In this paper we have proposed segmentation of brain MRI image using K-means clustering algorithm followed by orphological filtering which avoids the misclustered regions that can inevitably be formed after segmentation of the brain MRI image for detection of tumor location.Brain tumors are created by abnormal and uncontrolled cell division in brain itself. If the growth becomes more than 50%, then the patient is not able to recover. So the detection of brain tumor needs to be fast and accurate. The objective of this paper is to provide an efficient algorithm for detecting the edges of brain tumor. The first step starts with the acquisition of MRI scan of brain and then digital imaging techniques are applied for getting the exact location and size of tumor. MRI images consist of gray and white matter and the region containing tumor has more intensity. So, first noise filters are used for noise removal and then enhancement techniques are applied to the given MRI scan of brain. After that the basic morphological operations are applied for extracting the region suffering from tumor and then verification of region detected is done by using watershed segmentation.

IV. TESTING OBJECTIVES

There are two type of testing according their behaviors : Unconventional Testing Conventional Testing.

4.1 UNCONVENTIONAL TESTING:

Unconventional testing is a process of verification which is doing by SQA (Software Quality Assurance) team. It is a prevention technique which is performing from begging to ending of the project development. In this process SQA team verifies project development activities and insuring that developing project is fulfilling the requirement of the client or not.In this testing the SQA team follows these methods.

4.2 CONVENTIONAL TESTING:

Conventional Testing is a process of finding the bugs and validating the project. Testing team involves in this testing process and validating that developed project is according to client requirement or not. This process is a correction technique where testing team find bugs and reporting to the development team for correction on developed project built.

V. EXISTING METHODOLOGY

Image fusion is a process of combining complementary information from multi-modality images of the same patient in to an image. Hence the resultant image consists of more informative than the individual images alone. In feature level fusion, source images are segmented into regions and features like pixel intensities, edges or texture are used for fusion. The feature level image fusion with region based would be more meaningful than the pixel based fusion methods. The proposed fusion method contains the multi modal images are segmented into regions using automatic segmentation process and the images are fused according to region based fusion rule.

VI. PROPOSED METHODOLOGY

In Proposed, SVM Classifier used to segment the cancer detected portion. To segment the portion, first have to filter out the acquired image based upon the masking methodology. The Morphological function including dilation and erosion method will be applied extracted throughout the filtered image. By the method of morphological bounding box will be drawn over the affected portion. Then, the region enclosed by bounding box will be splitted out separately with the SVM Classifier.

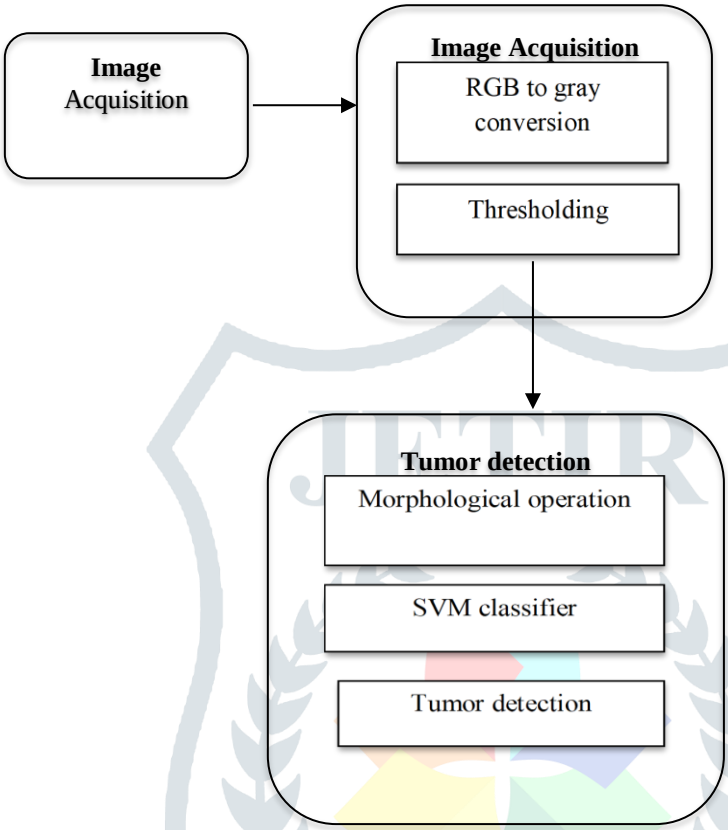


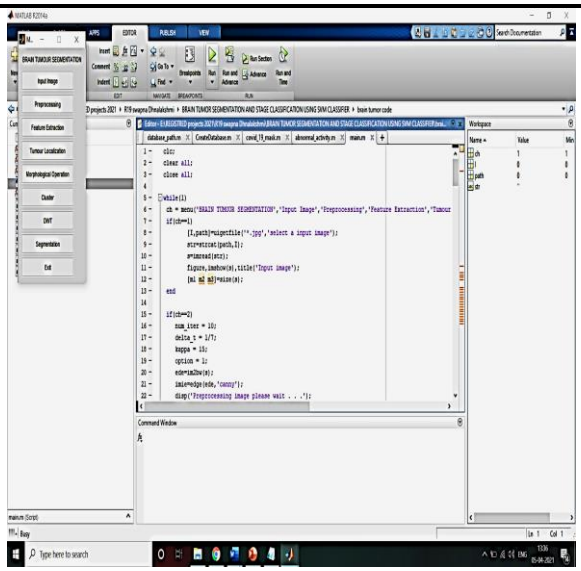
Fig 1:Shows the block diagram of image processing using MATLAB

6.1 Acquiring Image Data

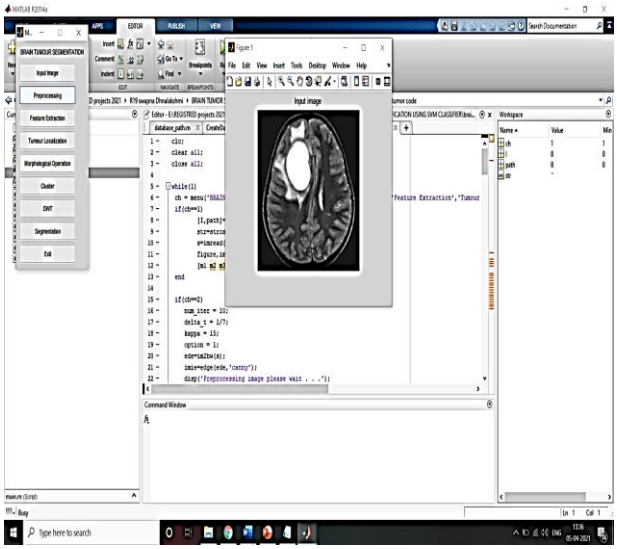
Image Acquisition Toolbox supports several modes, including background acquisition and continuous acquisition, while processing the acquired data. The toolbox automatically buffers data into memory, handles memory and buffer management, and enables acquisition from an ROI. The image acquisition engine is designed to acquire imagery as fast as your camera and computer can support, enabling analysis and processing of high-speed imaging applications. Data can be acquired in a wide range of data types, including signed or unsigned 8-, 16-, and 32-bit integers and single- or double-precision floating point. The toolbox supports any colour space provided by the image acquisition device including RGB, YUV, or grayscale. Raw sensor data in a Bayer pattern can be automatically converted into RGB data.

VII . SIMULATION RESULTS

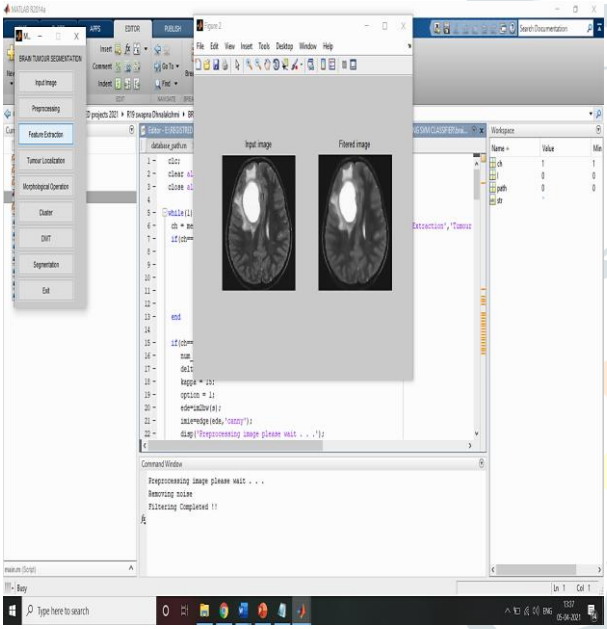
The following images represents the results of our proposed image segmentation technique,which are obtained by using real brain MR images. The proposed algorithm was carried out using MATLAB 7.12.0. In the simulation, the input signal is an image of brain MRI having 256×256 pixels with bit depth of 8 and in JPEG format as shown in the Fig 2 (b). First input image is filtered using anisotropic diffusion technique which smooth the image without changing the edges as shown in Fig 2 (c). The initial output of the DWT algorithm is shown in Fig 2(g), And finally the tumor portion is segmented as shown in Fig 2(h).



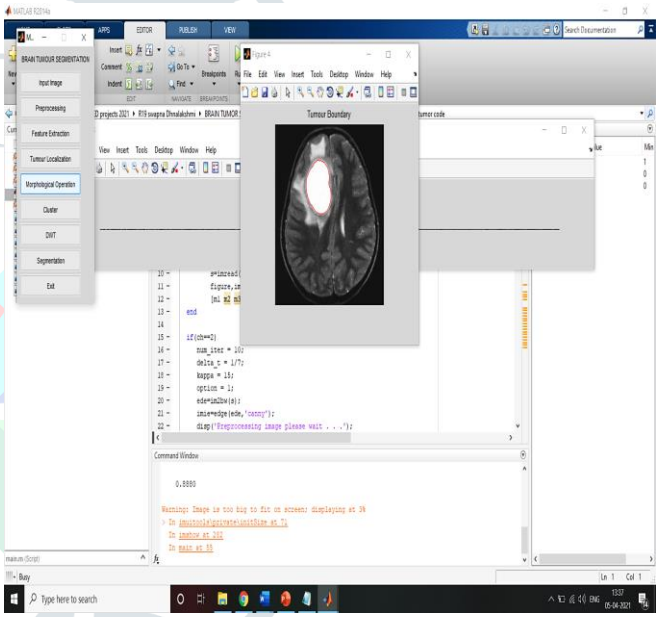
(a) Segmentation coding



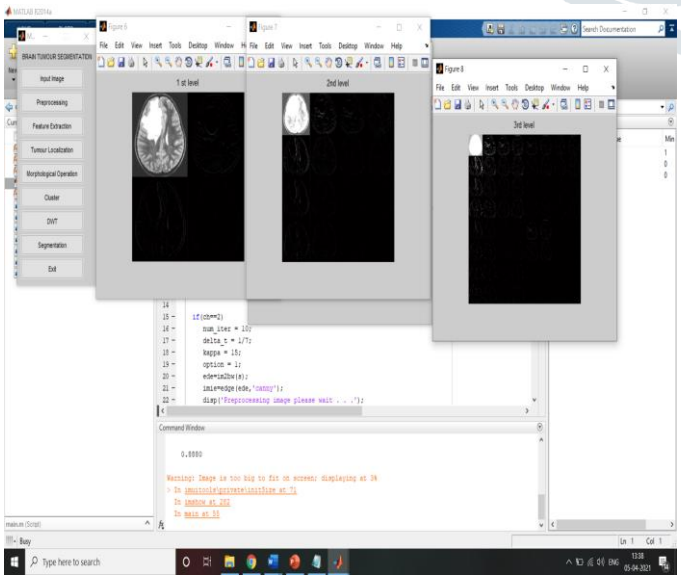
(b) Input image of brain tumor



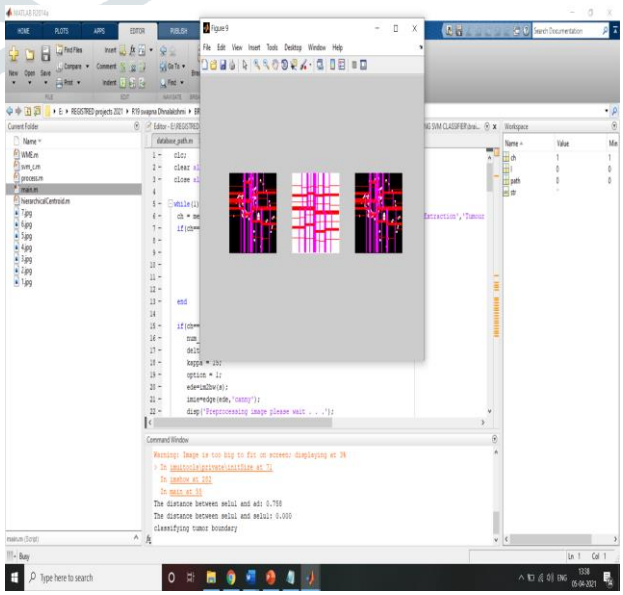
(C)Preprocessing image



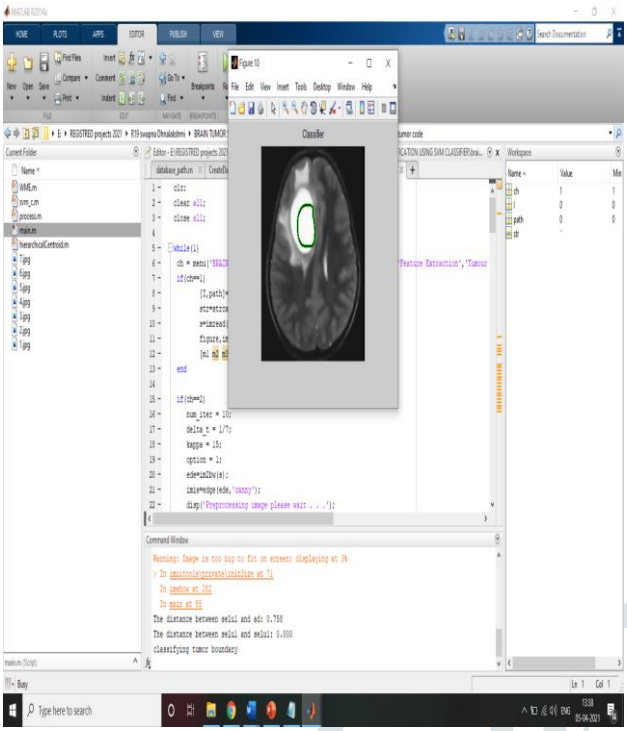
(d)Feature extraction



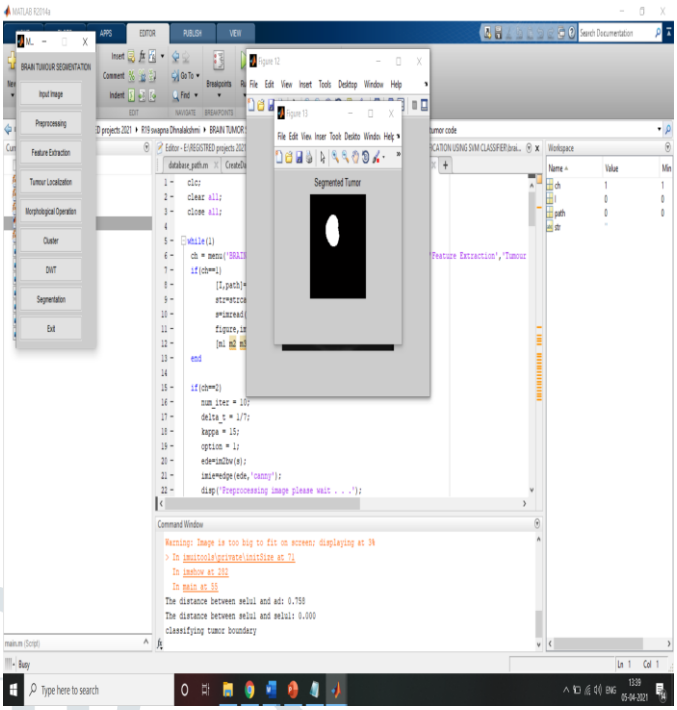
(e) Morphological operation



(f) Clustering of brain tumors



(g) Discrete wavelet transform(DWT)



(h) Segmentation of tumor indentified in brain

Fig 2 (a),(b),(c),(d),(e),(f),(g),(h) shows the simulation results brain tumor segmentation and stage classification using svm classifier.

X . CONCLUSION AND FUTURE SCOPE

MRI images are best suitable for brain tumor detection. In this project, Digital Image Processing Techniques are important for brain tumor detection by MRI images. The preprocessing techniques include different methods like Filtering, Contrast enhancement, are used for image smoothing. The preprocessed images are used for post processing operations like; threshold, histogram, segmentation and morphological operation, which is used to enhance the images and the type of brain tumor is specified using SVM classifier**.**The ROC characteristics accuracy,sensitivity and specificity of SVM in classifying tumors and non-tumors can be improved further for low glioma images.To extract the features of image instead of the histogram of oriented gradients,one can use local binary pattern and log gobar algorithm.To test the performance of SVM on other database for an improvement in accuracy,sensitivity and specify values.

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