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Brain Tumor Detection

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Abstract: *Brain tumor is the growth of abnormal cells in brain some of which may leads to cancer. The usual method to detect brain tumor is Magnetic Resonance Imaging (MRI) scans. From the MRI images information about the abnormal tissue growth in the brain is identified. In various research papers, the detection of brain tumor is done by applying Machine Learning and Deep Learning algorithms. When these algorithms are applied on the MRI images the prediction of brain tumor is done very fast and a higher accuracy helps in providing the treatment to the patients. These prediction also helps the radiologist in making quick decisions. In the proposed work, a self-defined Artificial Neural Network (ANN) and Convolution Neural Network (CNN) is applied in detecting the presence of brain tumor and their performance is analyzed.*

Keywords: Image Segmentation; Support Vector Machine; Self-Organized Mapping; MRI

I. INTRODUCTION

Brain tumor detection and classification is that the most troublesome and tedious task within the space of medicative image getting ready. Magnetic resonance imaging (Magnetic Resonance Imaging) may be a medicative procedure, typically adopted by the medical specialist for illustration of inner structure of the build with no surgery. Magnetic resonance imaging provides long information concerning the human delicate tissue that helps within the conclusion of brain tumour. Precise segmentation of magnetic resonance imaging image is basic for the conclusion of brain tumour by laptop supported clinical device. This paper is concentrated towards the look of Associate in Nursing best and additional correct approach for the detection of neoplasm from brain magnetic resonance imaging scans and if it confirms the presence of tumor then it's focused on evaluating its stage, i.e., benign or malignant. We've through an experiment shown that our projected methodology features a larger accuracy than different existent strategies for classifying tumor kind to be either as Malignant or Benign. This project proposes two different methodologies to segment a tumor from an MRI image and determine the type of tumor. For this one segmentation and one clustering techniques have been implemented. Each MRI image is passed through an imaging chain where the image is preprocessed to remove noise and is further enhanced to improve the contrast of the image. This paper proposes two different techniques which are then applied on the image to extract the tumor. These segmentation techniques include SOM Clustering and SVM Classification. Applying each of the segmentation techniques allows us to determine the most appropriate method to segment the tumor from each of the images. The tumor region represents the pixel values for the foreground points extracted using the ginput() command from a texture image. The texture image is generated by applying the rangefilt() method. In order to enhance the texture characteristics of the image, smoothing filter is applied to the texture image. In this project, the major challenge faced was to locate and extract the proper tumor region from the image. Due to several lighting issues, unnecessary white portions were present in the image which could wrongly be segmented as a tumor. Also the unwanted noise and reduced contrast displays several regions from the image that are falsely claimed as a tumor. Another challenge faced was degraded quality of the MRI image due to several problems that would have occurred during the acquisition stage.

II. DESCRIPTION OF THE PROBLEM

2.1 Problem Statement

Now days we have seen most of the tumors are life threating where brain tumor being one of them. As we know that brain tumor can be of ant shape , size ,location and intensity. Therefore it is very difficult to detect tumor and diagnose it. The manual identification of tumor from MRI images is subjective in nature and may very from expert to expert

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depending on their expertise and other factors which include lack of specific and accurate quantitative measures to classify the MRI images as it is brain tumor or not . so automated identification of brain tumor from MRI images help in alleviating the major issues and provide better result . Detection of brain tumor from the various symptoms of the patients has always been a major issue for the medical practitioner and pathologist for diagnosis and treatment planning.it is also a fact that some tests may be time consuming, and it gives workloads and difficulty for the pathologists to obtain the accuracy of the presence of the tumor.

2.2 Drawbacks of the present working system

1. It requires a large training data.
2. It requires appropriate model.
3. It is time consuming.
4. It is a tedious and exhaustive procedure.
5. While convolutional networks have already existed for a long time, their success was limited due to the size of the considered network.

III. METHODOLOGY

- Frontal lobe - The frontal lobes are the largest lobes in the human brain and they are also the most common region of injury in traumatic brain injury. The frontal lobes are important for voluntary movement, expressive language and for managing higher level executive functions. Tumors may contribute to poor reasoning, inappropriate social behavior, personality changes, poor planning, lower inhibition, and decreased production of speech.
- Temporal lobe - The temporal lobes sit behind the ears and are the second largest lobe. They are most commonly associated with processing auditory information and with the encoding of memory. Tumors in this lobe may contribute to poor memory, loss of hearing, and difficulty in language comprehension.
- Parietal lobe - The parietal lobe is one of the major lobes in the brain, roughly located at the upper back area in the skull. It processes sensory information it receives from the outside world, mainly relating to touch, taste, and temperature. Damage to the parietal lobe may lead to dysfunction in the senses. Tumors here may result in poor interpretation of languages, difficulty with speaking, writing, drawing, naming, and recognizing, and poor spatial and visual perception.
- Occipital lobe - The occipital lobe is the visual processing area of the brain. It is associated with visuospatial processing, distance and depth perception, color determination, object and face recognition, and memory formation. Damage to this lobe may result in poor vision or loss of vision.[21]
- Cerebellum -he cerebellum (“little brain”) is a structure that is located at the back of the brain, underlying the occipital and temporal lobes of the cerebral cortex. Tumors in this area may cause poor balance, muscle movement, and posture.
- Brainstem - Brainstem is the bottom, stalk like portion of your brain. It connects your brain to your spinal cord. Your brainstem sends messages to the rest of your body to regulate balance, breathing, heart rate and more. Sudden injuries, and brain or heart conditions may affect how your brainstem works. Tumors on the brainstem can cause seizures, endocrine problems, respiratory changes, visual changes, headaches and partial paralysis.

In this project, we have described our objective in two parts, the first half deals with detection of brain tumor that is the presence of the tumor in the provided MRI. The other part that is the second part contains the classification of the tumor. Here, we will analyze the MRI images which will conclude the stage of the tumor as benign or malignant. In general the diagram for our process. The input images will undergo various stages which can be summarized as follows.

1) MRI of Brain Images
2) Pre-Processing
3) Feature Extraction
4) Segmentation Technique
5) Image Analysis

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III. LITERATURE REVIEW

Swapnil R.Telrandhe, et.al [11] Proposed tumor detection inside which Segmentation separates an image into parts of regions or objects. In this it has to segment the item from the background to browse the image properly and classify the content of the image strictly. During this framework, edge detection is a vital tool for image segmentation. In this paper their effort was made to study the performance of most commonly used edge detection techniques for image segmentation and additionally the comparison of these techniques was carried out with an experiment. //Malathi Hong-Long et.al [12] , proposed approach by desegregation wave entropy based mostly spider net plots and probabilistic neural network for the classification of Brain MRI. Proposed technique uses two steps for classification one is wavelet entropy based mostly spider net plot for feature withdrawal and probabilistic neural network for classification. The obtained brain magnetic resonance image, the feature extraction was done by wavelet remodel and its entropy worth was calculated and spider net plot space calculation was done. With the assistance of entropy worth classification of probabilistic neural network was calculated. Probabilistic neural network provides a general resolution for pattern classification. //Rajeshwari G tayade et.al [13], in their paper they gave a mixture of wavelet statistical features and co-occurrence wavelet texture feature obtained from two level distinct riffle remodel was used for the organization of abnormal brain matters in to benign and malignant. The planned system was consists of four stages: segmentation of region of interest, separate ripple disintegration, feature abstraction, feature choice, organization and analysis. The support vector machine was used for tumor segmentation. A grouping of WST and WCT was used for feature extraction of neoplasm region extracted from second level separate ripple remodel. Genetic algorithm was used to choose the best texture options from the set of well-mined options. The probabilistic neural network was used to classify abnormal brain tissue in to benign and malignant and also the performance analysis was done by scrutening the classification results of PNN with alternative neural network classifier Lukas Let.al [14], proposed the work on information among the medical image and thereby vastly improve upon the machine speed for growth segmentation results. Significant feature points primarily based approach for primary brain tumour segmentation was planned. Axial slices of weighted Brain pictures with distinction improvement are analyzed. So as to extract vital feature points within the image, applied a feature purpose extraction rule based on a fusion of edge maps exploitation morphological and wave ways. Analysis of feature points so obtained has been done by geometric transformations and image scaling. A region growing algorithmic program was then utilized to isolate the tumor region. Preliminary results show that our approach has achieved good segmentation results. Also this approach was reduces a large quantity of calculation. Future work can involve associate investigation of the strategy in automatic 3D neoplasm segmentation, segmentation of ROI's in alternative medical pictures, still because the importance of enforced technique in medical image retrieval.

IV. SYSTEM DESIGN AND FLOW

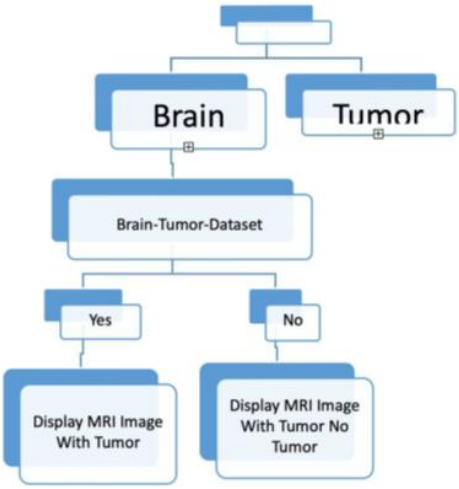

Fig. System Architecture

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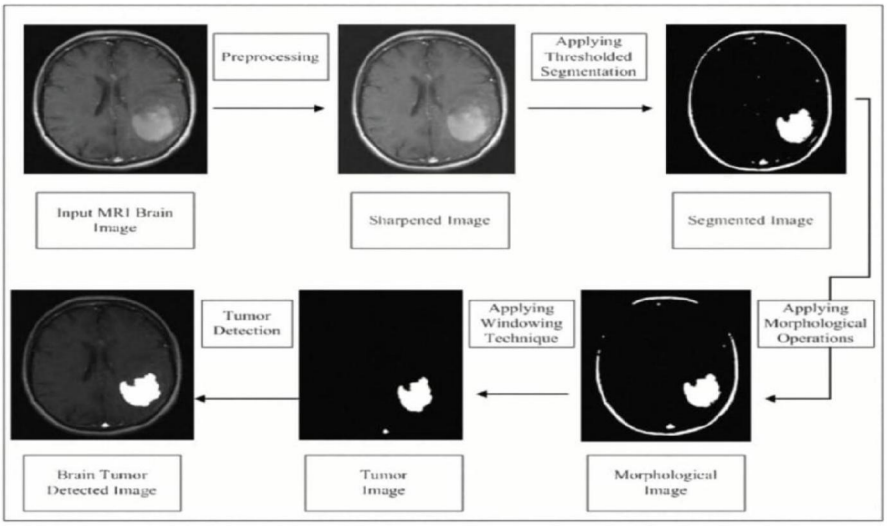

Fig. System Flow

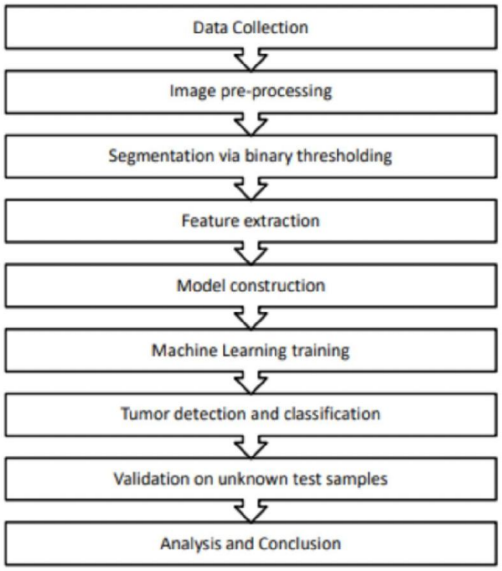

Fig. Program Flowchart

A brain tumor occupies space within the skull and can interfere with normal brain activity. It can increase pressure in the brain, shift the brain or push it against the skull and damage nerves and healthy brain tissue. Brain tumors are abnormal masses in or on the brain. When most normal cells grow old or get damaged, they die, and new cells take their place. Sometimes, this process goes wrong. New cells form when the body doesn't need them, and old or damaged cells don't die as they should. The formation of extra cells creates a mass of tissue called tumor. Tumor growth may appear as a result of failure of the normal pattern of cell death [8].Brain tumors may have a variety of symptoms ranging from headache to stroke. Different parts of the brain control different functions, so symptoms vary depending on the tumor's location [9]. The function of clustering is to identify the image areas that can have maximum chances of tumor. In this paper, fuzzy C means clustering is used. The genetic algorithm (GA) is a search heuristic that mimics the process of natural evolution. This heuristic is routinely used to generate useful solutions to optimization and search problems. Genetic algorithms belong to the larger class of evolutionary algorithms (EA), which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection and crossover.

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VI. PROJECT IMPLEMENTATION

Image Acquisition

- Brain images are acquired
- Creation of photographic images, such as of a
- Physical scene or of the interior
- Structure of an object.
- Compression, storage, printing, and display of image.

Data Pre-Processing

- Improve the quality of the MR images and make it in a form suited for processing by human or machine vision system.
- It helps to improve certain parameters of MR images such as improving the single to noise ratio.
- Removing the irrelevant noise and undesired parts in the background, smoothing the inner part of the region and presevating its edges.
- Improve the signal to noise ratio, and thus the clarity of the raw MR images

Segmentation

- Segmentation is the process of dividing an image into multiple segments.
- The aim of segmentation is to change the representation of a image into something which is easier to analyse.
- Segmentation is the process of separating the tumor from normal brain tissues.
- Watershed segmentation is performed for finding the location of the tumor in the MRI image.

Feature Extraction

- The segmented brain MRI image is used and texture feature are extracted from the segmented image which show the texture property of the image
- Transformation of this input data into a set of feature extraction. In this step , the important features required for image classification are extracted.
- Extracted using Gray Level Co-occurrence Matrix(GLCM) as it is robust method with high performance.

Classification

- Classification pf MR brain image either as normal or abnormal.
- With the help of above module, we can detect weather the Tumor is present or not.
- This process helps in identifying the size, shape, and position of the tumor.

Fig. Implementation Screenshot 1

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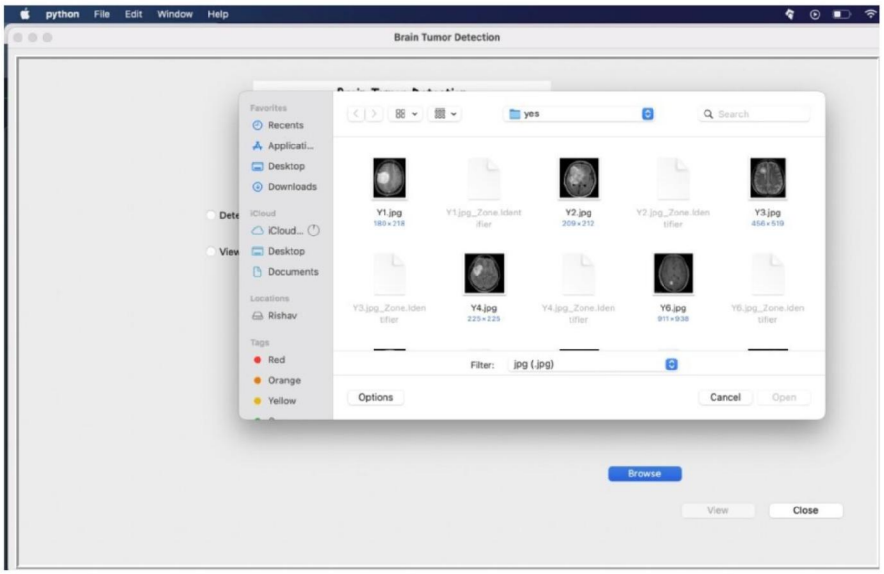

Fig. Implementation Screenshot 2

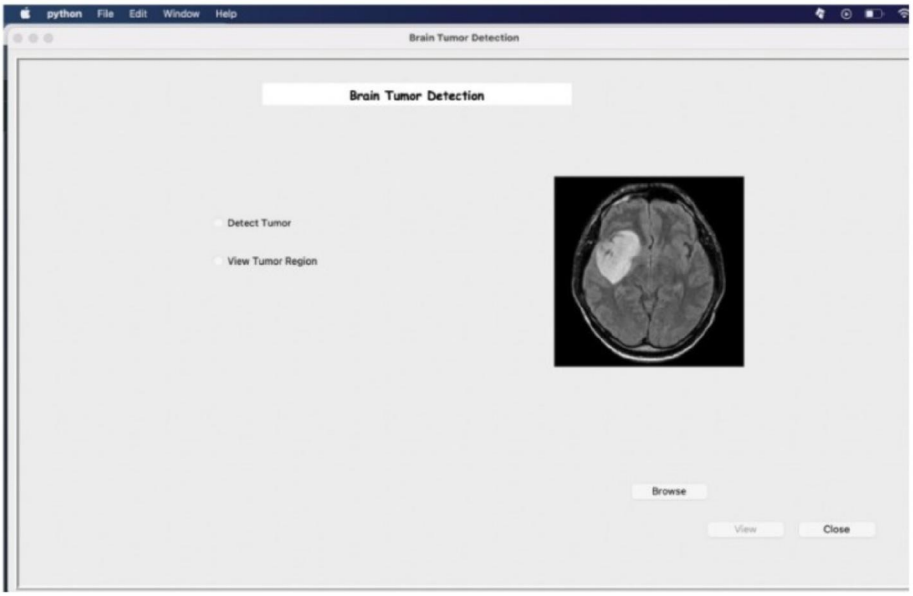

Fig. Implementation Screenshot 3

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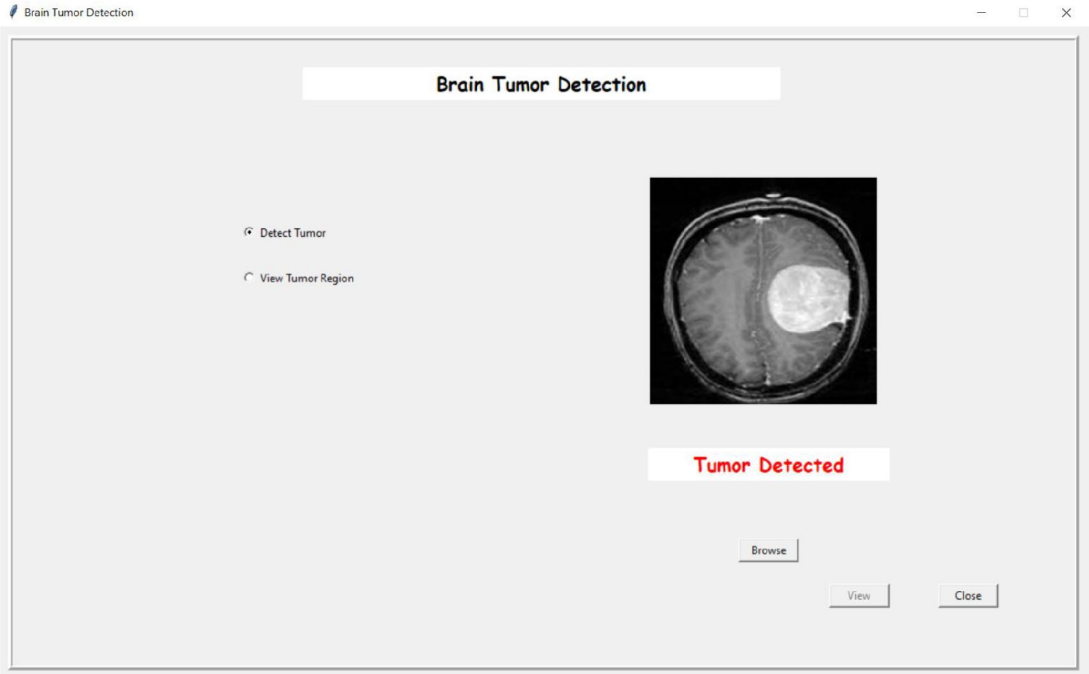

Fig. Implementation Screenshot 4

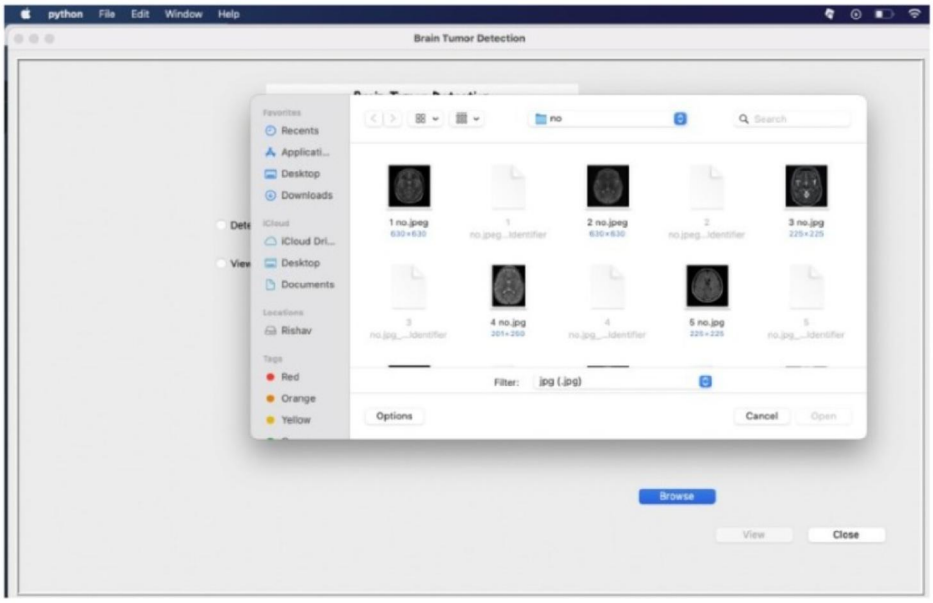

Fig. Implementation Screenshot 5

VII. DISCUSSION AND RESULTS

It identifies the tumor from the MRI of brain image and reconstructs the tumor area which has affected based on the threshold value. It also include K-mean clustering algorithm which consists of segmentation and reconstruction and identifies whether the image is affected by the tumor or not. Our main objective is as medical image segmentation plays a very important role in the field if image guided surgeries. By creating Three dimensional anatomical models from individual patients, training, planning and computer guidance during surgery is improved.

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VIII. ADVANTAGES & DISADVANTAGES

Advantages:

- Combination of various function in one application
- User friendly interface.
- Accuracy
- Time consumption
- It is considered as the best ml technique for image classification due to high accuracy.
- Image pre-processing required is much less compared to other algorithms.
- It is used over feed forward neural networks as it can be trained better in case of complex images to have higher accuracies.
- It reduces images to a form which is easier to process without losing features which are critical for a good prediction by applying relevant filters and reusability of weights
- It can automatically learn to perform any task just by going through the training data i.e., there no need for prior knowledge There is no need for specialised hand-crafted image features like that in case of SVM, Random Forest etc.

Disadvantages

- Knowledge of full system is require to work
- This project will run only in 32bit or 64bit windows operating system.
- Does not Provide Prebuilt statistical Models and Tests

IX. CONCLUSION & FUTURE WORK

We have automated the diagnosis procedure for the brain tumor detection by the use of image processing. Apart from several existing brain tumor segmentation and detection methodology are present for MRI of brain image our project has proved to provide an aver all accuracy by upto 97 percent. All the steps for detecting brain tumor that have been discussed startimg from mri image acquisition ,pre-processing steps to successfully classification of the tumor using the two segmentation techniques is been done. Pre-processing involves operations like wavelet based methods has been discussed. Quality enhancement and filtering are important because edge sharpening, enhancement, noise removal and undesirable background removal are improved the image quality as well as the detection procedure. Among the different filtering technique, Gaussian filter suppressed the noise without blurring the edges and it is better outlier without reducing sharpness of the images. reduces the noise; enhance the image quality and computationally more efficient than other filtering methodology. After the image quality improvement and noise reduction discussed here, segmentation methodology for a brain tumor from MRI of brain image is been used. Classification based segmentation segment tumor accurately and manufacture sensible results for big information set however undesirable behaviours can occur in case wherever a category is unrepresented in training data. Clustered based segmentation performs is straight forward, quick and manufacture sensible results for non-noise image except for noise pictures it leads to serious inaccuracy within the segmentation . In neural network based segmentation perform better on noise field and no need of assumption of any fundamental data allocation but learning process is one of the great disadvantages of it. In spite of several dealing of problems, an automization of brain tumor segmentation using combination of threshold based and classification with SVM and SOM overcame the problems and gives effective and accurate results for brain tumor detection. These classification methods are able to firstly detect weather there is tumor or not and if it is there then they are able to determine weather the tumor is benign or malignant type.

As medical image segmentation plays a very important role in the field of image guided surgeries. By creating three dimensional [3D] anatomical models from individual patients, training, planning, and computer guidance during surgery is improved. Build an app-based user interface in hospitals which allows doctor to easily determine the impact of tumor and suggest treatment accordingly Improve testing accuracy and computation time by using classifier boosting techniques like using more number images with more data augmentation, fine tuning hyper parameters. A much higher accuracy can be achieved by gaining a better dataset with high-resolution images taken directly from the MRI scanner.

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REFERENCES

[1]. L. Juo, L. zao, "Tumor detection in MR images using one-class immune feature weighted SVMs," IEEE Transactions on Magnetics, vol. 47, no. 10, pp. 3849–3852, 2011. View at: Publisher Site — Google Scholar.

[2]. R.Kumari, "SVM classification an approach on detecting abnormality in brain MRI images,"International Journal of Engineering Research and Applications, vol. 3, pp. 1686–1690, 2013. View at: Google Scholar.

[3]. N. Gordillo, E. Montseny, and P. Sobrevilla, "State of the art survey on MRI brain tumor segmentation," Magnetic Resonance Imaging, vol. 31, no. 8, pp. 1426–1438, 2013. View at: Publisher Site — Google Scholar

[4]. A. Demirhan, M. Toru, and I. Guler, "Segmentation of tumor and edema along with healthy tissues of brain using wavelets and neural networks," IEEE Journal of Biomedical and Health Informatics, vol. 19, no. 4, pp. 1451–1458, 2015. View at: Publisher Site — Google Scholar

[5]. S. Madhukumar and N. Santhiyakumari, "Evaluation of k-Means and fuzzy C-means segmentation on MR images of brain," Egyptian Journal of Radiology and Nuclear Medicine, vol. 46, no. 2, pp. 475–479, 2015. View at: Publisher Site — Google Scholar.

[6]. Y. Kong, Y. Deng, and Q. Dai, "Discriminative clustering and feature selection for brain MRI segmentation," IEEE Signal Processing Letters, vol. 22, no. 5, pp. 573–577, 2015. View at: Publisher Site — Google Scholar.

[7]. M. T. El-Melegy and H. M. Mokhtar, "Tumor segmentation in brain MRI using a fuzzy approach with class center priors," EURASIP Journal on Image and Video Processing, vol. 2014, article no. 21, 2014. View at: Publisher Site — Google Scholar.

[8]. S. Damodharan and D. Raghavan, "Combining tissue segmentation and neural network for brain tumor detection," International Arab Journal of Information Technology, vol. 12, no. 1, pp. 42–52, 2015. View at: Google Scholar.

[9]. M. Alfonse and A.-B. M. Salem, "An automatic classification of brain tumors through MRI using support vector machine," Egyptian Computer Science Journal, vol. 40, pp. 11–21, 2016.

[10]. E. A. Zanaty, "Determination of gray matter (GM) and white matter (WM) volume in brain magnetic resonance images (MRI)," International Journal of Computer Applications, vol. 45, pp. 16–22, 2012.

[11]. T. Torheim, E. Malinen, K. Kvaal et al., "Classification of dynamic contrast enhanced MR images of cervical cancers using texture analysis and support vector machines," IEEE Transactions on Medical Imaging, vol. 33, no. 8, pp. 1648–1656, 2014.

[12]. J. Yao, J. Chen, and C. Chow, "Breast tumor analysis in dynamic contrast enhanced MRI using texture features and wavelet transform," IEEE Journal on Selected Topics in Signal Processing, vol. 3, no. 1, pp. 94–100, 2009.