

ANALYSIS AND DETECTION USING MRI TO DETECT BRAIN TUMOR

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ABSTRACT

A mundane encephalon has many cells when the cells grow anomalously and become cancerous it is called an encephalon tumour in medical language. The tumour can spread from any component of the body and it becomes a cancer of that body part. It has many mundane symptoms like headache, loss of optical discernment, dizziness, and in some cases, it is described that there are no symptoms. We have our medical facilities to fight against these perilous diseases but sometimes it is too tardy to remedy the disease because of nascence and unavailability of medical facilities. To surmount this quandary we have introduced an Encephalon tumour Detection System utilizing python and machine learning. This system will avail to find the tumour region, analysis, detection, prediction, stage if present in the MRI report of the patient. With the avail of feature extraction, one can agonize the person has a tumour or not.

Keywords: Numpy, Open-CV, Pillow, Tensorflow, tumour Detection, Convolutional Neural Network, tkinter, analysis, MRI Images, Brain.

I. INTRODUCTION

Diseases are a component of human life. A customary person's body feels mundane when all their body components are working congruously. But when a body part commences reacting in the antithesis direction the person's noetic and physical health goes down day by day till he gets opportune treatment for that. As we all ken there is a list of diseases in this world amongst them we ken very little of them. And with the disease, their types and variants are additionally there. There are many types of cancer and tumor diseases that lead a person to die. In our project, we have discussed one of the hazardous diseases called brain tumors. The tumor is nothing but the magnification of eccentric tissues or cells in any component of our body and commences spreading rapidly. But not all encephalon tumors are defined as cancerous some tumors are noncancerous called as benign and some are cancerous called malignant. It is not sure that how expeditiously the tumor will spread depends upon the location of the tumor and it will rely on how the nervous system gets affected by the tumor.

In our project, we came up with the conception of detection, analysis of the encephalon tumor utilizing MRI of the person. In this whole process presage, detection, analysis, diameter, stage of an encephalon tumor are going to be implemented. All this will be shown directly on the screen utilizing python, machine learning, feature extraction, segmentation and the k-mean algorithm is utilized. This project will avail medicos to find the tumor facilely with congruous precision so that the person gets treatment accordingly.

[1] Encephalon tumour detection coalescing using method of 3 dimensional MRI multimodal info is proposed by M.Li and Xyan Malik at [1] to obtain multidimensional features like stages, boundaries, and feature extraction. He has worked on this using deep learning and unsupervised learning. Both training and testing of the module is done for the better results.

[2] MRI and a CT scan images are used in this to obtain segmentations of tumor using astronomical Encephalon proposed by Shishir at [2]. MRI is used as a key feature in his project and the prediction of the brain tumor with 90% of accuracy using cnn algorithm for analysis.

[3] A web predicted software was proposed by Hasann at [3] to detect tumor using Magnetic Resonance Images. This software allow user to find cancerous and noncancerous tumor by uploading the MRI in the system and the detection result is shown directly on the screen in human readable form so that a common person can see the result.

[4] To automatically segment the most mundane type of tumor in human encephalon CNN method is proposed by extracting features of the encephalon so that the genuine tumor is detected utilizing image

processing techniques and the most widely used algorithm that is CNN. Segmentation techniques have a mean-field phrase in the traditional fuzzy c-denotes objective function. This is proposed by Baljinder Singh et.al [4]

II. METHODOLOGY

In this project we have implemented a Brain Tumor Detection system that will help patient or doctor to easily recognize the tumor region depending upon the MRI given as an input. We have used SVM algorithm and K-means algorithm, Feature extraction, Segmentation, and image processing techniques to classify the input images. Steps are mentioned below to detect brain tumor in MRI:

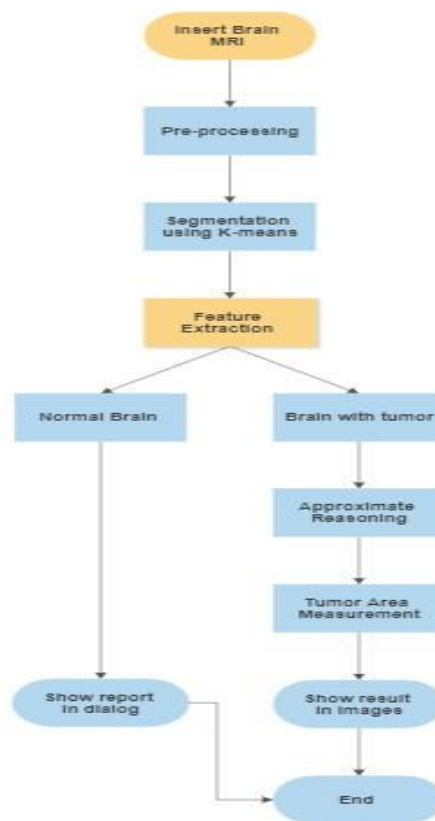


Fig.1 Flowchart

- 1) First upload MRI as input to the system.
- 2) Second the MRI is converted to grayscale.
- 3) The grayscale image will now converted to HSV image.
- 4) Now the HSV is converted to threshold segmentation.
- 5) Now detect the tumor area if available.
- 6) If tumor is found it will show the diameter of that.
- 7) After that the stage of the tumor can also be found.
- 8) The region area of the tumor is defined on the screen.
- 9) Finally output will confirm that is tumor present or not, and if yes the area will be deteted and shown, and if no it will show no tumor detected.
- 10) If tumor is found all the related operation like diameter, region, stage will also be found simultaneously.

III. MODELING AND ANALYSIS

Pre-processing:

Pre-processing is a first step of this project as this will help us to pre-process the input image to find result more accurately. This process is done before we handover the data for further processing to algorithms.

Segmentation:

In this step the given data gets divided into two parts, in common language we can say it gets separated into two groups which we call classified and unclassified according to their classification.

Feature Extraction:

This is the process where one can find all the required things from an image that is its colour, shape, size, and contrast. It extract all the features of the image and gives exact output with high level of accuracy. Hence it is very commonly used feature in python.

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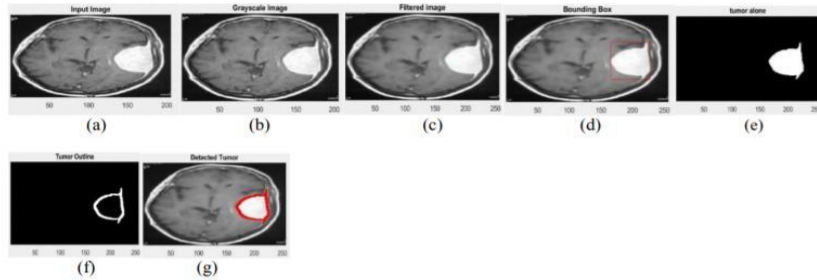


Fig. 2 Different segmentation methods

Image Processing:

In this process image gets divided into tiny parts to collect important information from the MRI image so that there could not be any chances remaining for inappropriate results. When the process is done it gives us a best quality image in return to focus the tumour region.

K-Means Algorithm:

k-betokens clustering is a method of vector quantization, pristinely from signal processing, that aims to partition n visual examinations into k clusters in which each optical discernment belongs to the cluster with the most proximate mean, accommodating as an archetype of the cluster.

J: Objective Function
 K: Number of c
 N: Number of cases
 Cj: Centroid of cluster 'j'

$$J = \sum_{j=1}^k \sum_{i=1}^n \|x_i^{(j)} - c_j\|^2 \text{-----(1)}$$

Methods for Segmentation	Used parameter	Prone towards
Threshold method	gradient magnitude is applied to find the potential edge pixels [11].	Difficult to be applied to pictures having low contrast.
Region Based method	Used for separation of regions in an image based on similar properties [13].	Quality of final result may be impacted by noise.
Fuzzy C Means, K Means and Level Set Techniques	Can be applied to pictures with large size and poor contrast.	Establishment of fuzzy sets and selecting sample may be bit hard [15].

Fig. 3 Different segmentation methods

CNN Algorithm:

CNN is a widely used algorithm especially for classification and in this project it is used as image classification tool so that we can find the particular size and region of the tumor. Utilizing convolutional layer as the neophyte layer, an input the shape of the MRI images is engendered which is 64*64*3 converting all the images into a homogeneous dimension. After accumulating all the images in the same aspect, we engendered a convolutional kernel that is convoluted with the input layer — administering with 32 convolutional filters of

size 3*3 each with the fortification of 3 channel tensors. ReLU is utilized as an activation function so that it's not corroborating with the output.

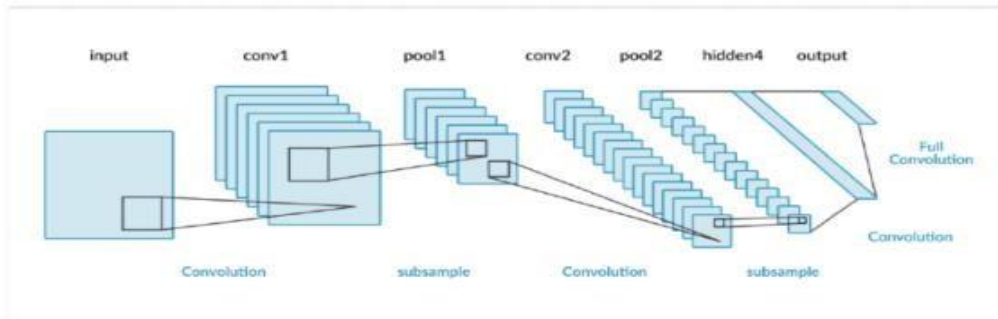


Fig.4 Classification of CNN

Tkinter:

Tkinter is a most commonly used library of python which is used as a GUI development tool. With the help of tkinter one can design GUI very easily and it is free to access. This is used to design the GUI and it gives lots of features like designing buttons, frames, sections, etc. All these are possible because of tk toolkit provided by tkinter.

IV. RESULTS AND DISCUSSION

So finally we got the required result after the successful implementation of CNN, K-means, and algorithms and also feature extraction, segmentation and image processing features. In this system user have to input the MRI of the person the system will do operation on it then the result will be displayed on the screen. If the person is having tumor, it will indicate in red colour on the screen and if not it will show no tumor detected.

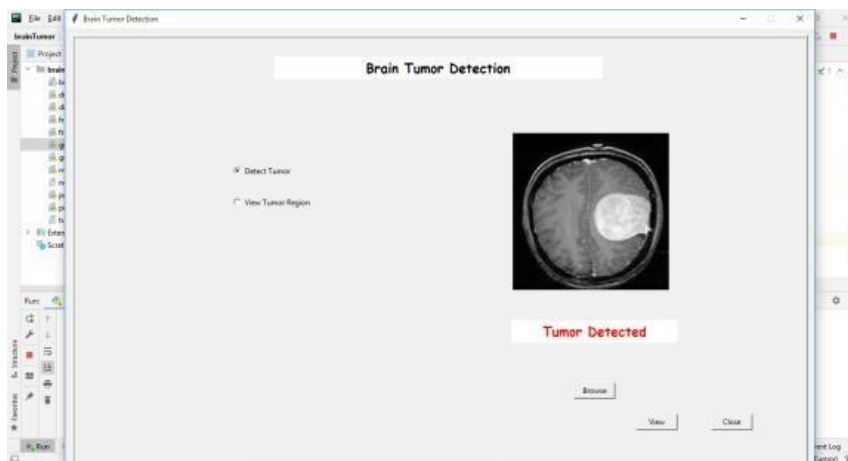


Fig. 5 Detected Tumor Result

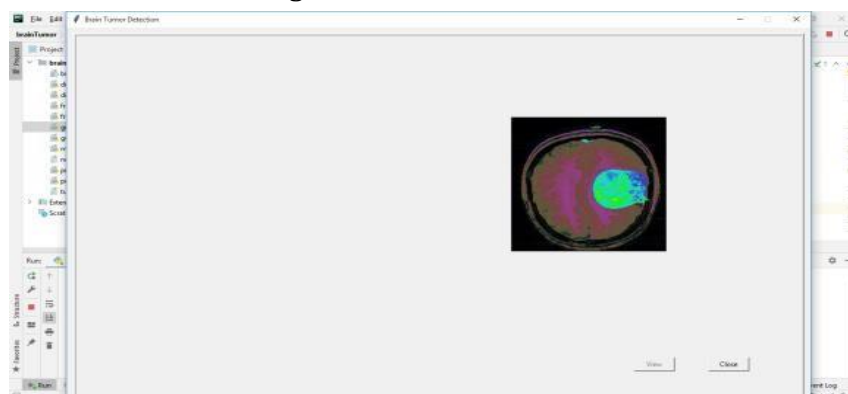


Fig. 6 Image Conversion (RGB to HSV)

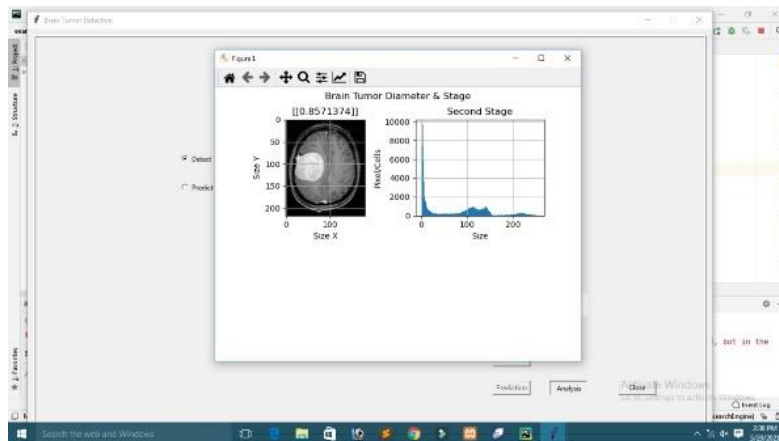


Fig. 7 Brain tumor diameter and stage result

V. CONCLUSION

In the proposed project we have used two amazing algorithms that is k-means and CNN to satisfy the outcome and the project is working accurately because of all the steps were followed properly. MRI of a person is needed to acquire the perfect result. In this whole process presage, detection, analysis, diameter, stage of an encephalon tumor are going to be implemented. All this will be shown directly on the screen utilizing python, machine learning, feature extraction, segmentation and the k-mean algorithm is utilized. MRI is a main key of this project as all the operation is done on the MRI. With the use of this one can accurately find the tumor is present or not also with other features mentioned above. The precision achieved at the cessation relies upon the processing of every step. There are a lot of exiting methods for every step, hence the methods that offer better results are culled. At the last, encephalon tumor relegation takes place. To detect encephalon tumor detection there subsist different classical approaches but the present work utilizes the traditional neural network approach for detecting encephalon tumor since the encephalon tumor detection images rely upon the neighbourhood pixels. The CNN approach provides potent encephalon tumor detection. The proposed algorithm is implemented on multiple images and the output retrieved is best and efficacious.

VI. REFERENCES

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- [8]