# IMPROVED BRAIN TUMOR DETECTION WITH ONTOLOGY

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**Abstract**
Computer aided diagnosis systems for detecting Brain tumour for medical purpose have been investigated using several techniques. In this paper our concern is to presents an approach which will be useful for improved detection of brain tumour using Post -processing and Pre-processing steps of Digital image processing.

The occurrence of tumour is basically due to mass or cluster formation that will help to classify the type of cancer with the processing method on MRI images for cancer detection. Taking the six variant ways of processing an image is applied on to our MRI images. The result is observed on various types of MRI images with different types of cancer regions.

**Keyword:** Brain cancer, Ontology, recognition, MRI.

## I. Introduction

Brain cancer is one of the most deadly and intractable diseases. Tumors may be embedded in regions of the brain that are critical to provide the body's vital functions, while they shed cells to invade other parts of the brain, forming more tumours that are too small to detect using the normal imaging techniques. Brain cancer's location is sometime hard to identify and that makes it difficult to some people who has to fight with their life.

In Recent years we have seen that the rise in cancer patient have outnumbered than the normal. The tumor in the early stage is certainly hard to identify but once it gets identified the treatment can be done and is curable with techniques like chemotherapy. But certainly late detection of tumour is deadly.

But the cancer is kind of disease in which symptoms are identified late. The use of computer assisted technology have taken a wide step in detection of tumour these days like used in Neuro surgery [1].The availability of 3-D images with the relationships of their critical structures (e.g., functionally significant cortical areas, vascular structures) and disease [2] .

A brain tumor can be defined as a disease in which cells grow uncontrollably in the brain. Brain tumor is basically of two types:

1) Benign tumors
2) Malignant tumors

Benign tumors do not have the ability to spread beyond the brain itself. Benign tumors in the brain have limited self-growth and it do not to be treated. But they can create problem due to their location and has to be treated as early as possible.

Malignant tumor is the actual brain cancer. These tumours can even spread outside of the brain rapidly. Malignant tumors are left almost untreated most of the time as the growth is so fast that it gets too late for the surgeon to control or operate it. Brain malignancies again of two types:

i) Primary brain cancer originated in the brain.
ii) Secondary or metastatic brain cancer spread to the brain from another site in the body.

In general the cell grows in particular speed and in a proper manner but when the rapid growth of cell (here brain cell) is observed, and it keeps on dividing uncontrollably, when the new cells are not required, a mass of tissue forms which seems like a cluster, this is called as tumor.

## II. Materials and Methods

The present work implements a system for the improved detection of brain tumor using various steps of processing steps. The implemented work can be useful for biomedical early and improved brain cancer detection. The proposed work will also take input from the output of this application and integrate them with the concept of ontology. [3]

Fig.1 shows a block diagram for the proposed algorithm.

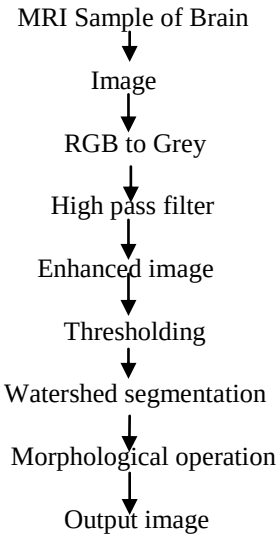
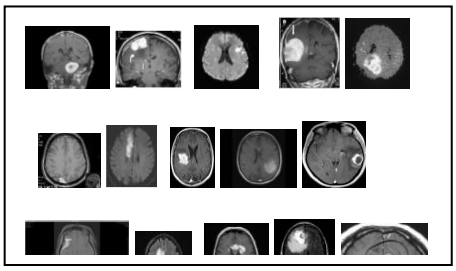



Image pre-processing including converting RGB image into grey scale then passing that image to the high pass filter in order to remove noise is done and finally the last we get enhanced image for post-processing that will include watershed segmentation and thresholding as well as morphological operation.( erosion and dilation).

**1. Data Set**

For the implementation of this application we need to have the images of different patients in our database in order to identify their condition. The MRI image is stored along with our main file from various sources. Various class of MRI image is considered.



## 2. Pre-processing

The first step is to get the MRI image and application of pre-processing steps. There are various methods which come under this step; we will be dealing with only grey scale and filters. Basically pre-processing is done to remove noise and blurring as well as ringing effect in order to get the enhanced and much clear image for our purpose. The filter which we have used is median filter but as we are working on image samples that are required for the medical purpose. The median filter has to be passed with mask for better image, to achieve this we are using sobel operator.

## 3. Image Enhancement

The enhancement is needed in MRI to increase its contrast. Contrast between the brain and the tumour region may be present on a MRI but might be not clearly visible through the eyes of human eyes. Thus, to enhance contrast between the normal brain and tumour region, a high pass filter is applied to the digitized and smoothen the MRI which results in better and enhanced image with fairly visible contrast.

## 4. Thresholding

Sometimes it is important as well as necessary to separate the region in which we are much more interested from the background. Thresholding provides an easy and the most it is the convenient way to carry out this activity by separating the

foreground and background. We set the certain thresholding value; the pixels which are having intensity value more than the thresholding are set as white as output and rest are assigned as black. Basically it provides binarisation for an image. This is also one of the steps of image segmentation.Thresholding takes filtered image as their input.

## 5. Morphological operation

For the extraction of text region, we use morphological operator. In text regions, vertical edges, Horizontal edges and diagonal edges are mixed together but they are distributed separately in non-text regions. Since text regions are composed of vertical edges, horizontal edges and diagonal edge. At different orientation these text are connected together differently. We have used Morphological dilation and Erosion operators here, erosion function helps the image to expand and provide better quality picture whereas, the dilation helps to fill the gaps in the image. Opening is said when the erosion is done followed by dilation and closing is done when dilation is done when followed by erosion[4]

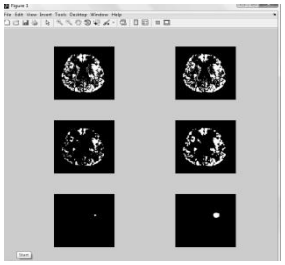


**Fig.3** shows the Morphological operated scaled image.

## 6. Function which is used

**i) Pre-processing**

```
img= imread('mala.jpg');
img_gray=rgb2gray('img');
hp_fil=(-1 2 -1,0 0 0,1 -2 1);
```

**ii) To make binary of an image**

```
T=graythresh(c);
bw= im2bw(c ,T+.03);
imshow(bw);

For watershed
bw5= watershed(bw1);
imshow(bw5);
```

i) Erode and Dilate functions

```
bw1= imerode(bw,SE);
imshow(bw);
bw1=imdilate(bw1,SE);
imshow(bw1);
```

## 7. Ontology

Various work has been done regarding the detection of brain tumour like Murugavalli1 and Rajamani , A high speed parallel fuzzy c-mean algorithm for brain tumor segmentation[5] Murugavalli1 and Rajamani, An Improved Implementation of Brain Tumor Detection

Using Segmentation Based on Neuro Fuzzy Technique [6], different people have put their different approach in finding of the optimal results for this disease. Some of the technique brain tumor detction using segentation based
soft computing [7].

The other work toward this field includes the use of neural network[8] and also Computerized Tumor Boundary Detection Using a Hopfield Neural Netwok", In recent years the concepts of ontology has taken a wide leap from formal specification to the area of artificial intelligence in the domain of experts system. Ontology has been common on World Wide Web. This concept basically deals with classes, sub-classes and their association from the basic categorisation of product along with their features. The WWW Consortium (W3C) is developing the Resource Description Framework (Brickley and Guha 1999), a language for encoding knowledge on Web pages to make it understandable to electronic agents searching for information. The Defense Advanced Research Projects Agency (DARPA), in conjunction with the W3C, is developing DARPA Agent Markup Language (DAML) by extending RDF with more expressive constructs aimed at facilitating agent interaction on the Web (Hendler and McGuinness 2000)[3]. The Ontology uses the OWL. The software Protégé 4.1 can be downloaded through which we can create

our classes along with their attributes. In the present work our objective is to get the output of our application as its input and perform the data or pattern matching with the data that is stored in our knowledge base. The tool HermiT [9]. is use for analysing the image and is known as a reasoner. HermiT is reasoner for ontologies written using the Web Ontology Language (OWL)[10]. Given an OWL file, HermiT can determine whether or not the ontology is consistent, identify sub assumption relationships between classes, and much more. The user will provide his/her name, then next task is to provide the MRI image of that patient from the database and final its processing, after checking the various symptoms of the patient . The system will check the type of tumor and the reason behind, it might be possible that the cluster formation is due to some other reason, so it is our prime concern to detect the tumour correctly.

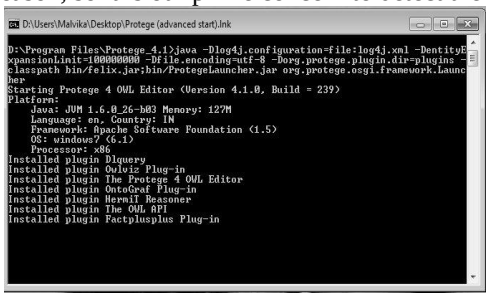



**Fig.4** The cmd window before starting of protégé window.

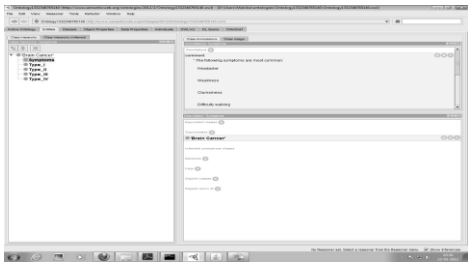


**Fig.5** The protégé window with reprsentaion of classes.

## III. Result and Discussions

Figure which we get after the application of various fundamental steps of processing on MRI image illustrate the suspicious region of tumour in brain.

The figure 6, figure 7 and figure 8 shows the main GUI of the application, processing steps and the final output with detected tumour respectively.

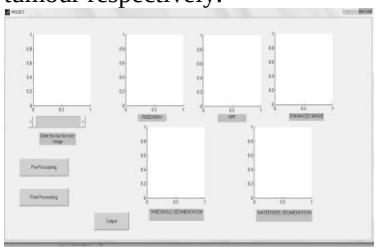


**Fig.6** GUI of the Application

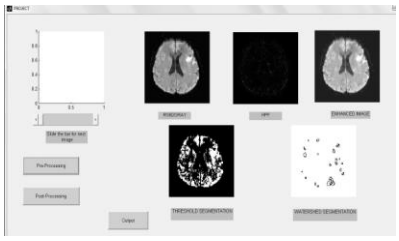


**Fig.7** various steps of processing

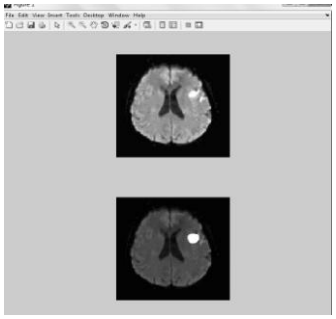


**Fig.8** The original image and the output Image with the suspicious region.

## IV. Discussion

This application can be used to detect tumour early and provide us with 50-60% improved result; with the help of processing steps we have. Our application is able to detect the suspicious region on which we would like to work further, its output will be stored in a database so that it can be matched with the some of the sample which will be pre-stored in a database, so that according to the symptoms we would be able to detect tumor in improved manner.
The future work includes the integration with the concept of ontology that can be used for better and accurate results.

## V. Acknowledgement

We would like thank our institution "AMITY UNIVERSITY" for providing us a platform for sharing our idea and scrutinize our thoughts in a better way. It gives us an immense pleasure to thank our guide "Ms. Nitasha Hasteer" for her constant support and guidance in order to complete this paper, we would also like to thank our faculty "Ms. Anuranjana" who held our hand through-out the review of the presented paper.

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