



## Implementation of Unsupervised Learning to Detect Brain Tumour Using MRI As Input

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**ABSTRACT:** *The part of the image that has the tumor has more intensity in that portion and we can make our assumptions about the radius of the tumor in the image, these are the basic things considered in the algorithm. First of all some image enhancement and noise reduction techniques are used to enhance the image quality, after that some morphological operations are applied to detect the tumor in the image. The morphological operations are basically applied on some assumptions about the size and shape of the tumor and in the end the tumor is mapped onto the original gray scale image with 255 intensity to make visible the tumor in the image. The algorithm has been tried on a number of different images from different angles and has always given the correct desired result.*

**Keywords:** *object recognition, characteristic vector, edge tracing, feature detection.*

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### I. INTRODUCTION

The purpose of our project is to identify a tumor from a given MRI scan of a brain using digital image processing techniques.

#### TUMOR

A tumor or tumour is the name for a neoplasm or a solid lesion formed by an abnormal growth of cells (termed neoplastic) which looks like a swelling. Tumor is not synonymous with cancer. A tumor can be benign, pre-malignant or malignant, whereas cancer is by definition malignant[1].

#### TYPES OF TUMOR

##### BENIGN TUMOR

A benign tumor is a tumor that lacks all three of the malignant properties of a cancer. Thus, by definition, a benign tumor does not grow in an unlimited, aggressive manner, does not invade surrounding tissues, and does not spread to non-adjacent tissues (metastasize). Common examples of benign tumors include moles and uterine fibroids.

##### MALIGNANT

Malignancy (from the Latin roots mal- = "bad" and -ignis = "fire") is the tendency of a medical condition, especially tumors, to become progressively worse and to potentially result in death. It is characterized by the properties of anaplasia, invasiveness, and metastasis. Malignant is a corresponding adjectival medical term used to describe a severe and progressively worsening disease. The term is most familiar as a description of cancer.

##### PREMALIGNANT

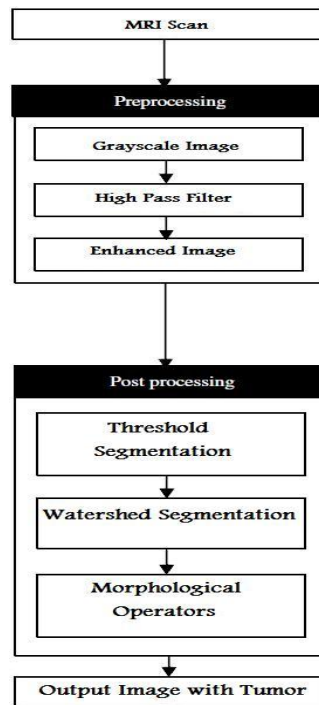
A precancerous condition (or premalignant condition) is a disease, syndrome, or finding that, if left untreated, may lead to cancer. It is a generalized state associated with a significantly increased risk of cancer.

#### MRI

Magnetic resonance imaging (MRI), or nuclear magnetic resonance imaging (NMRI), is primarily a medical imaging technique used in radiology to visualize detailed internal structure and limited function of the body[3]. MRI provides much greater contrast between the different soft tissues of the body than computed tomography (CT) does, making it especially useful in neurological (brain), musculoskeletal, cardiovascular, and oncological (cancer) imaging. Unlike CT, MRI uses no ionizing radiation. Rather, it uses a powerful magnetic field to align the nuclear magnetization of (usually) hydrogen atoms in water in the body. Radio frequency (RF) fields are used to systematically alter the alignment of this magnetization. This causes the hydrogen nuclei to produce a rotating magnetic field detectable by the scanner. This signal can be manipulated by additional magnetic fields to build up enough information to construct an image of the body.

## II. METHODOLOGY

The part of the image containing the tumor normally has more intensity than the other portion and we can assume the area, shape and radius of the tumor in the image. We have used these basic conditions to detect tumor in our code and the code goes through the following steps:



**Fig1 Flow of Processing**

## III. PREPROCESSING

In preprocessing some basic image enhancement and noise reduction techniques are implemented. Apart from that different ways to detect edges and doing segmentations have also been used[6]. The purpose of these steps is basically to improve the image and the image quality to get more surety and ease in detecting the tumor. The basic steps in preprocessing are the following:-

- Image is converted to gray scale image in first step.
- Noise is removed if any
- The obtained image is then passed through a high pass filter to detect edges
- Then the obtained image is added to original image to enhance it.

### A. PROCESSING

In processing the following different steps are followed:-

### B. THRESHOLD SEGMENTATION

Segmentation is done on basis of a threshold, due to which whole image is converted into binary image. Basic matlab commands for thresholding are used for this segmentation.

### C. WATERSHED SEGMENTATION

It is the best method to segment an image to separate a tumor but it suffers from over and under segmentation, due to which we have used it as a check to our output. We have not used watershed segmentation on our input, rather it is only used on our output to check if the result is correct or not and it gives the correct answer every time as is shown below.

### D. MORPHOLOGICAL OPERATORS

After that some morphological operations are applied on the image after converting it into binary form. The basic purpose of the operations is to show only that part of the image which has the tumor that is the part of the image having more intensity and more area than that specified in the strel command.

The basic commands used in this step are strel, imerode and imdilate.

Imerode()

It is used to erode an image.

Imdilate()

It is used to dilate an image.

#### IV. OUTPUTS/RESULTS

We have mapped the resultant tumor image onto the original grayscale image for presentation purposes.

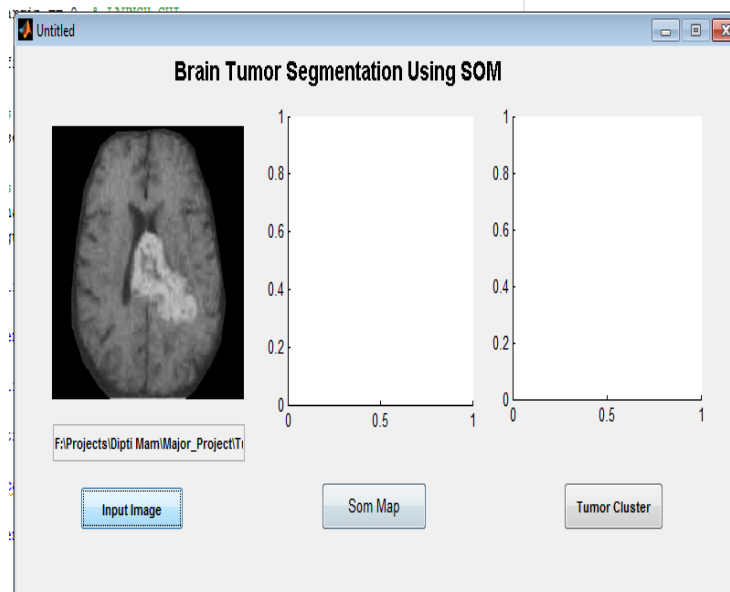


Fig 2.1 Expected Outcome

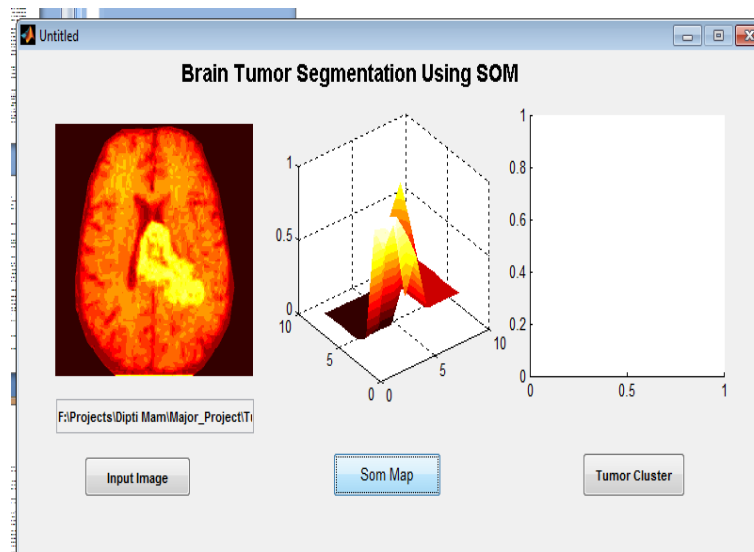


Fig 2.2 Expected Outcome

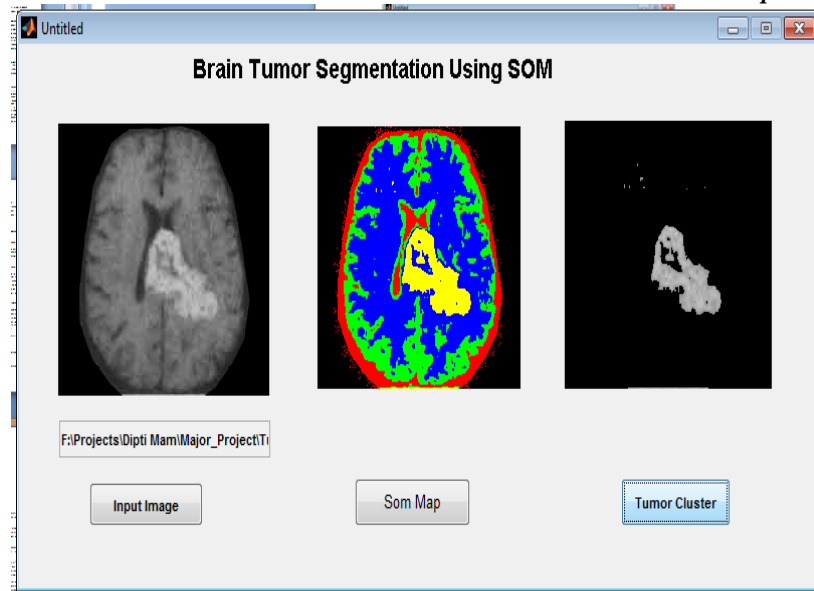


Fig2.3 Expected Outcome

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