



# Brain Tumor Exploration using Image Segmentation

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**Abstract** - This paper defines about a brain tumor exploration using image segmentation. Brain tumor is a abnormal growth of tissue in human brain. It is a life threatening disease and its early detection is most important to save a life. A brief explanation about the cause and detection of brain tumor is discussed. The treatment and classification also presented in this paper. Image segmentation is a best method to detect the brain tumor from MRI image because it produced accurate results.

**Keywords:** brain tumor, MRI (Magnetic Resonance Imaging) image, image segmentation.

## 1. INTRODUCTION

Human body consists 100 trillions of cells and each has its own function. A cell can grow unwontedly without any control known as Tumors. The tumors can occur in any parts of the body either directly or indirectly. The brain tumor is an irregular growth of cell in brain. It is the life threatening and its early detection is most important to save a life. There are two types of tumor: Benign- Non-cancerous and Malignant- Cancerous

Benign is a non-cancerous tumor. It does not spread nearby tissues. The growth of the tumor is slower than malignant. So it is not a life threatening. Malignant is a cancerous tumor and it spread throughout the body. The growth of the tumor is faster than benign. It is life threatening. The brain tumor depends mainly on their location and size of tumor occurred in brain. Headache is a common symptom of brain tumor. Image segmentation is one of the best methods to detect the tumor in brain (Varuna Shree , T.N.R Kumar, 2018). There are various methods used to detect and classify the brain tumor. The MRI is the best method for brain tumor detection because it produced the accurate result.

## 2. BRAIN TUMOR-CLASSIFICATION

The brain tumor is classified into two ways: primary and secondary brain tumor.

### 2.1 Primary Brain Tumor

Tumors that originate within the brain tissue are known as primary brain tumor (Lewis, Heitkemper, Dirksen, 2017). Primary brain tumors are classified by the type of tissue in which they arise. The most common primary tumor is gliomas. There are several types of gliomas including the following

- Astrocytomas arise from small, star-shaped cells called astrocytes. They may grow anywhere in the brain or spinal cord.
- Oligodendrogliomas arise in the cells that produce myelin, the fatty covering that protects nerves. These tumors normally arise in the cerebrum. They grow slowly and usually do not spread into nearby cell.
- Ependymomas normally developed in the lining of the ventricles. They may also occur in the spinal cord.

## 2.2 Secondary Brain Tumors

The secondary brain tumors are tumors caused from the cancer that originates in another parts of the body. These tumors are not the same as primary brain tumors. The spread of tumor within the body is called metastasis. Cancer that spread to the brain is the same disease and has same name as the original (primary) cancer.

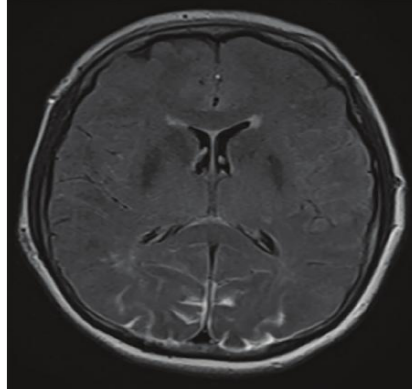


Figure 1. Normal brain MRI image

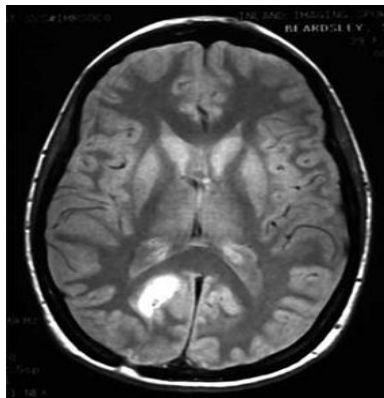


Figure2. Brain tumor MRI image

## 3. BRAIN TUMOR- SYMPTOMS & CAUSES

The sign and symptoms of a brain tumor depend on the tumor size ([http://en.m.wikipedia.org/wiki/brain\\_tumor](http://en.m.wikipedia.org/wiki/brain_tumor)) location and growth

### 3.1. Symptoms

- Change in pattern of headache.
- Unexplained nausea or vomiting.
- Speech difficulties.
- Confusion.
- Personality or behavior changes.
- Vision problems, such as blurred vision or double vision.
- Loss of sensation.
- Difficulty with balance.
- Hearing problem.

### 3.2. Causes

Many different types of primary brain tumors exist. Examples include.

- Gliomas: These are begin tumor in the brain or spinal cord and include astrocytomas, ependymomas, glioblastomas and oligodendrogliomas.
- Meningiomas: It is a tumor that arises from membranes that surround in brain and spinal cord. This is noncancerous tumor.
- Acoustic neuromas: These are benign tumors that develop on the nerves that control balance and hearing leading from the inner ear of the brain.
- Pituitary adenomas: These are mostly benign tumors that develop in the pituitary gland at the base of the brain. These can affect pituitary hormones throughout the body.
- Germ cell tumors: These may develop during childhood where the testicles or ovaries will form. Sometimes these affect other parts of the body such as the brain.
- Craniopharyngiomas: These are noncancerous tumor start near the brain pituitary gland, which secretes hormones that control many body functions.

## 4. BRAIN TUMOR –DIAGNOSIS AND TREATEMENT

There are several ways used to diagnosis and take a treatment depend on the tumor.

### 4.1 Diagnosis

In brain tumor may recommend to the number of tests and procedures used to diagnosis the tumor cell.

- A neurological exam: A neurological exam may include such as checking the vision, hearing, balance, coordination strength and reflexes. It may be difficult in one or more area may provide the clues about the part of the brain.
- Imaging tests: Magnetic Resonance Imaging (MRI) is commonly used to diagnose brain tumors because it produced accurate result. The other types of imaging tests are computerized tomography (CT), positron emission tomography (PET). There are several MRI scan components are used such as MRI perfusion, functional MRI and Magnetic resonance spectroscopy.
- Tests to find the cancer in other parts of the body: The brain tumor results may be spread from the other parts of the body based on the tests and procedure to determine where the tumor originated.
- Biopsy: Biopsy is performed as parts of an operation to remove the tumor cells using needles based on CT or MRI scanning.

### 4.2 Treatment

The treatment for brain tumor is based on the location and their size in tumor is presented. In brain tumor based treatments are Surgery, Radiation therapy, Radio surgery, Chemotherapy, Targeted drug therapy.

- Surgery: The surgery is used to remove the tumor cells as much as possible. In benign tumors are small and easy to separate from surrounding brain tissue and it makes easy to remove the tumors using surgery. The malignant can't separate from nearby tissue, the surgery will be risk. The surgery is used to remove the tumor cells risks such as infection and bleeding. The risks are based on the tumor size and location

- Radiation therapy: Radiation therapy is the high energy beams such as x-rays, protons is used to kill the tumor cells. The side effects of radiation therapy based on the type and dose of radiation is received. Common side effects of this method are fatigue, headache, and memory loss.
- Chemotherapy: Chemotherapy is used the drugs to kill the tumor cells. These drugs are taken from either tablets or injection into vein. These drugs based on the type of the tumor.
- Targeted drug therapy: The targeted drug therapy focused on the specific abnormalities present within cancer cells. It is used to remove the abnormalities of the cancer cell.

## 5. IMAGE SEGMENTATION

Image segmentation is a process to partitioning a image into multiple segments. There are several method used to segment the images based on the edges, boundary, regions, splitting and merging, clustering. Brain tumor detection from the MRI image is used to detect the tumor cell and produced the accurate results of the disease.

The clustering most widely used technique for segmentation. There are several clustering algorithm are used such as k-mean clustering, fuzzy c-mean clustering, genetic algorithm based clustering are used to detect the brain tumor.

The two main purpose of this method is decompose the image into region for further processing and change the representation of the tumor image.

## 6. METHODOLOGY

In image segmentation there are various methods to detect the tumor cell from MRI images. The clustering is most commonly used technique for segmentation.

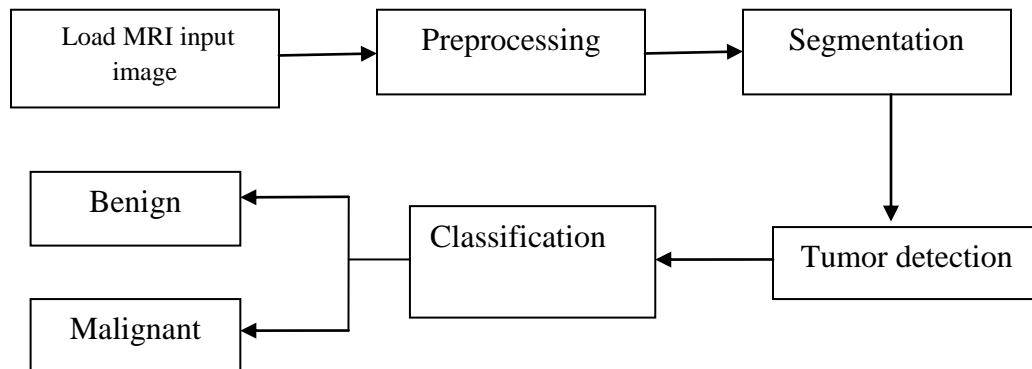


Figure 2. Image Segmentation Methodology

### 6.1. Preprocessing

In Preprocessing is used to improve the quality of MRI image (Atish Chaudhary, Vandana Bhattacharjee, 2018) for further processing such as segmentation. It also improves the parameter for removing the irrelevant noise using various filters.

### 6.2. Segmentation

The segmentation is a process used to partition into the different regions. There are several technique is used to segment the image such as threshold, splitting and merging, region growing, edge or boundary detection. The two main purpose of this method is decompose the image into region for further processing and change the representation.

### 6.3. Tumor detection

In this phase to detect the tumor from MRI image using morphological operation. The morphological operation is the one of the best methods to detect the tumor cell. It is used to extract the shapes and boundary from the images. It rearranged the order of pixel values.

### 6.4. Classification

The classification is used to classify the input images using suitable classifier. The Support Vector Machine (SVM) is one of the best methods to classify the images. SVM is the supervised learning technique. It is used to classified the tumors are either benign or malignant.

## 7. THE COMPARATIVE RESULTS OF DIFFERENT METHODS IN BRIAN TUMOR

In this section to define the comparative results using different methods to detect the tumors in brain based on MRI images.

Table 1. A comparative result in brain tumor

S.NO	Author	Technique used	Accuracy	Year
1.	Bahadure et.al	BWT & SVM	95%	2017
2.	Joseph et.al	k-mean clustering algorithm	98%	2014
3.	Yao et.al	Texture feature with wavelet transform	83%	2009
4.	Kumar and vijayakumar	PCA and RBF with SVM	94%	2015
5.	Sharma et.al	ANN	100%	2008
6.	Sachdeva et.al	PCA-ANN	75-90%	2013

## 8. CONCLUSION

In this paper to define an overview of brain tumor detection and its classification, symptoms, diagnosis and treatment based on abnormal growth of the cells or tissues. The image segmentation is one of the best methods to detect the tumor cells from MRI image. Segmentation is necessary approaches to reduce the fault and to detect the tumor disease with good accuracy rates. In future to introduce a new methods to detect the tumor cells with high frequency and low computational time.

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