BRAIN TUMOR DETECTION IN MRI IMAGES

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SUBJECT
ARTIFICIAL INTELLIGENCE

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ABSTRACT

- **Brain tumor** extraction and its analysis are challenging tasks in Medical image processing because brain image is complicated.
- Segmentation plays a very important role in the medical image processing.
- In that way MRI (magnetic resonance imaging) has become a useful medical diagnostic tool for the diagnosis of brain & other medical images.
- In this project, we are presenting a comparative study of **Three segmentation methods** implemented for tumor detection.
- The methods include k-means clustering using watershed algorithm, optimized k-means and optimized c-means using genetic algorithm.

INTRODUCTION

- **The BRAIN is the most important part of central nervous system.**
- **The main task of the doctors is to detect the tumor which is a time consuming for which they feel burden.**
- **Brain tumor is an intracranial solid neoplasm.**
- **The only optimal solution for this problem is the use of 'Image Segmentation'.**

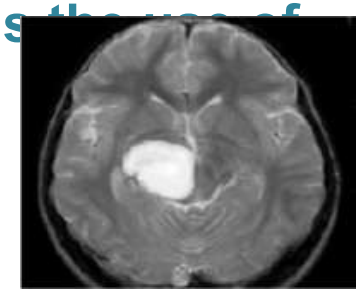
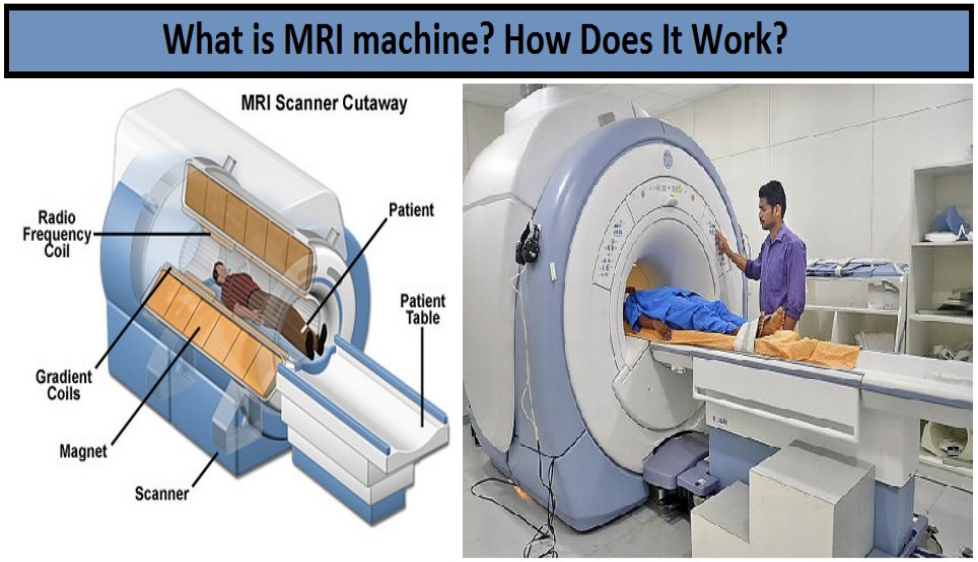
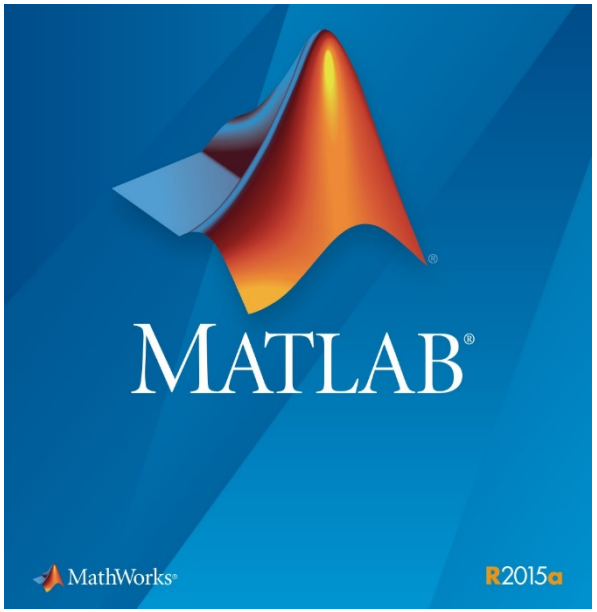


Figure : Example of an MRI showing the presence of tumor in

Technology



1. MRI MACHINE



1. MATLAB SOFTWARE

Image segmentation

- The purpose of image segmentation is to partition an image into meaningful regions with respect to a particular application.
- The segmentation might be grey level, colour, texture, depth or motion.
- Example:

...

...

EXISTING METHODS

Fusion based : Overlapping the train image of the victim over a test image of same age group, thereby detecting the tumor.

Demerits :

- The overlapping creates complexity due to different dimensions of both images.
- Time consuming process.

Canny Based : To overcome the problem of detecting the edges, the better way is the use of Canny based edge detection.

Demerits :

- Not support color images.

PROPOSED METHOD

- **The method include**

  'k-means clustering +watershed,

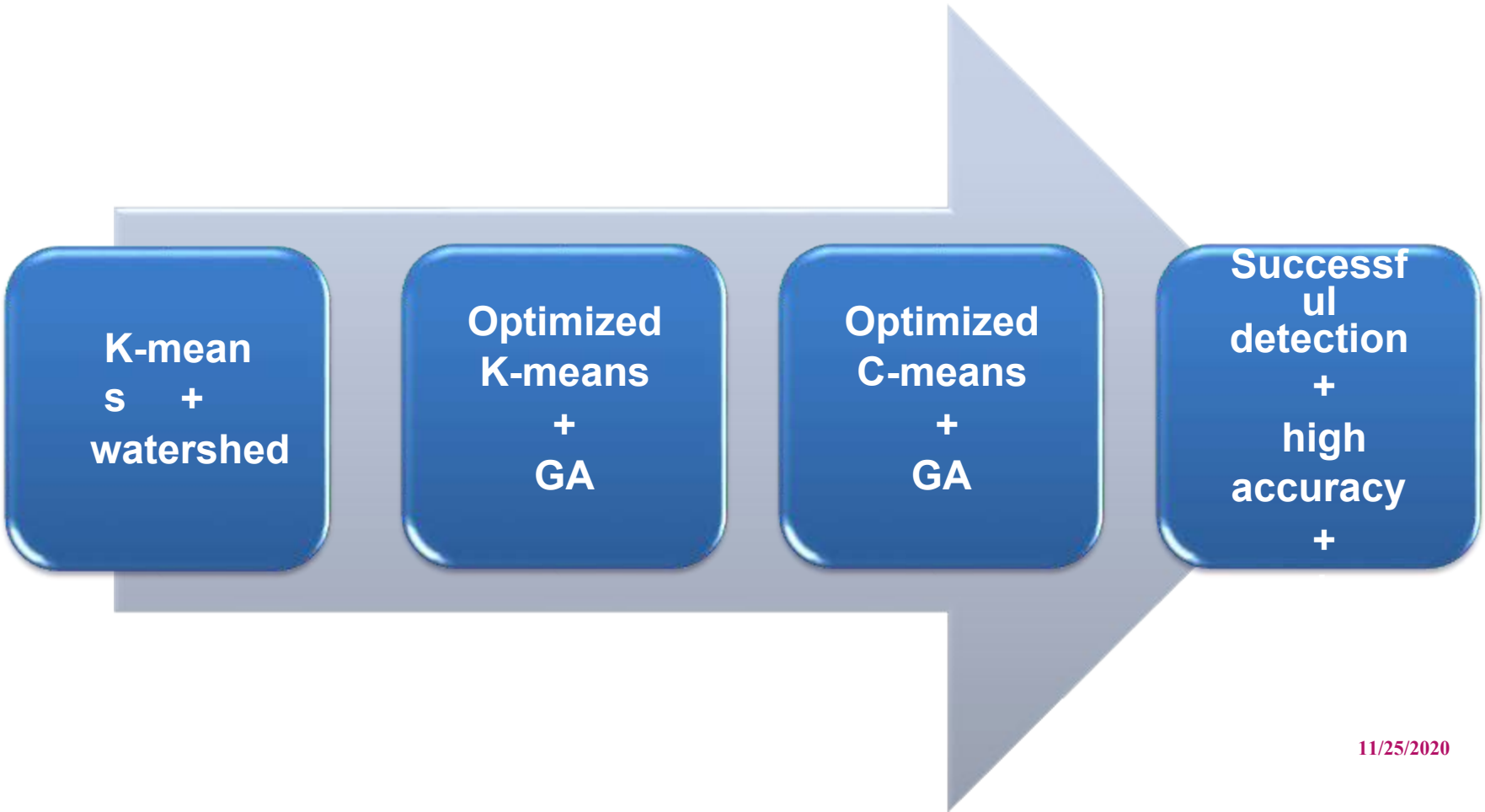
  optimized k-means +genetic algorithm

  and

  optimized C- means +genetic algorithm'.

- **At the end of process the tumor is extracted from the MRI image and also its exact position and shape are determined in colour.**

THEME OF PROPOSED METHOD



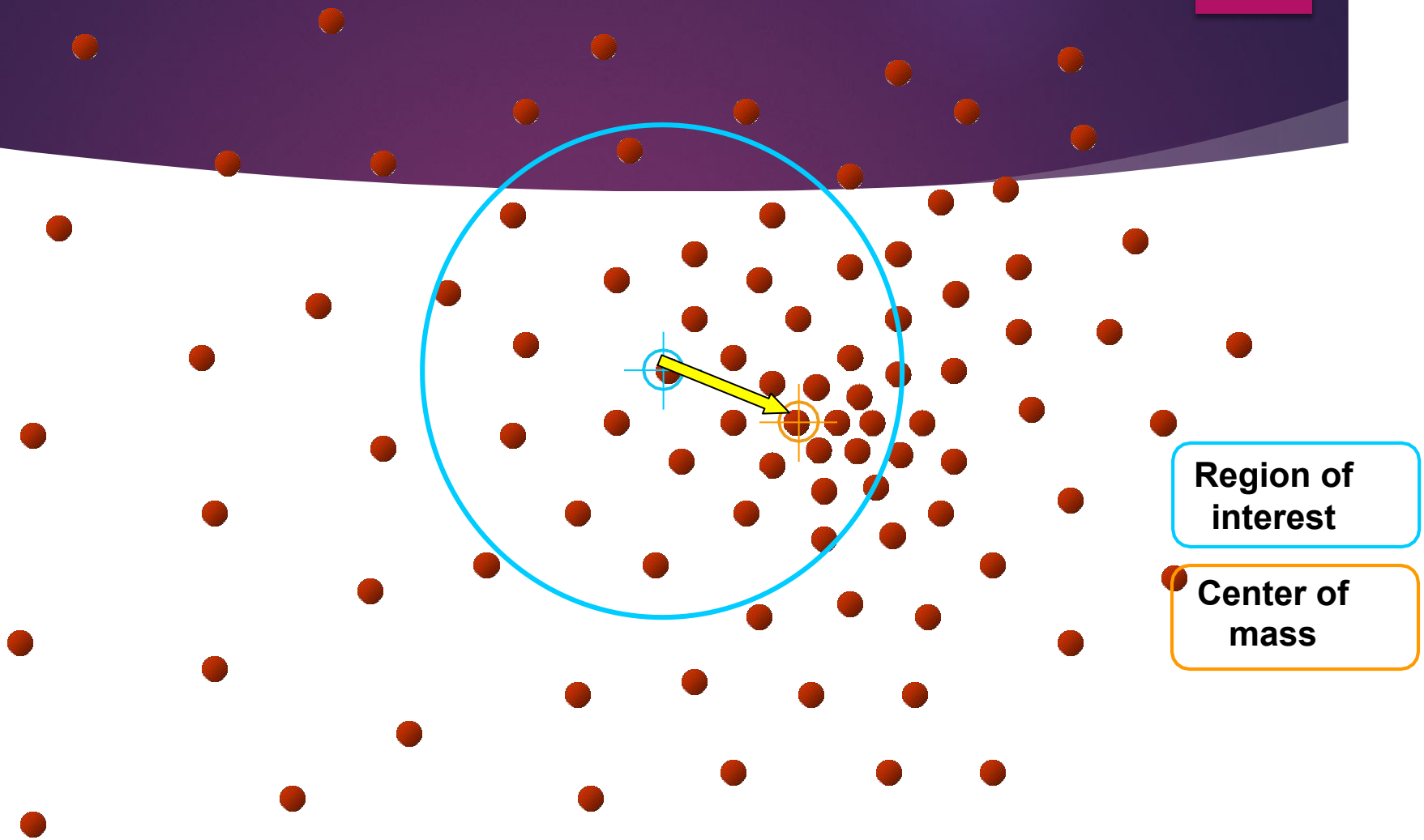
Clustering

- Clustering is a process of **collection** of objects which are similar between them while dissimilar objects belong to other clusters.

- A **clustering** technique is used to obtain a partition of **N**

  objects using a suitable measure such as resemblance function as a distance measure ‘**d**’.

CLUSTERING PROCESS



Final Clusters

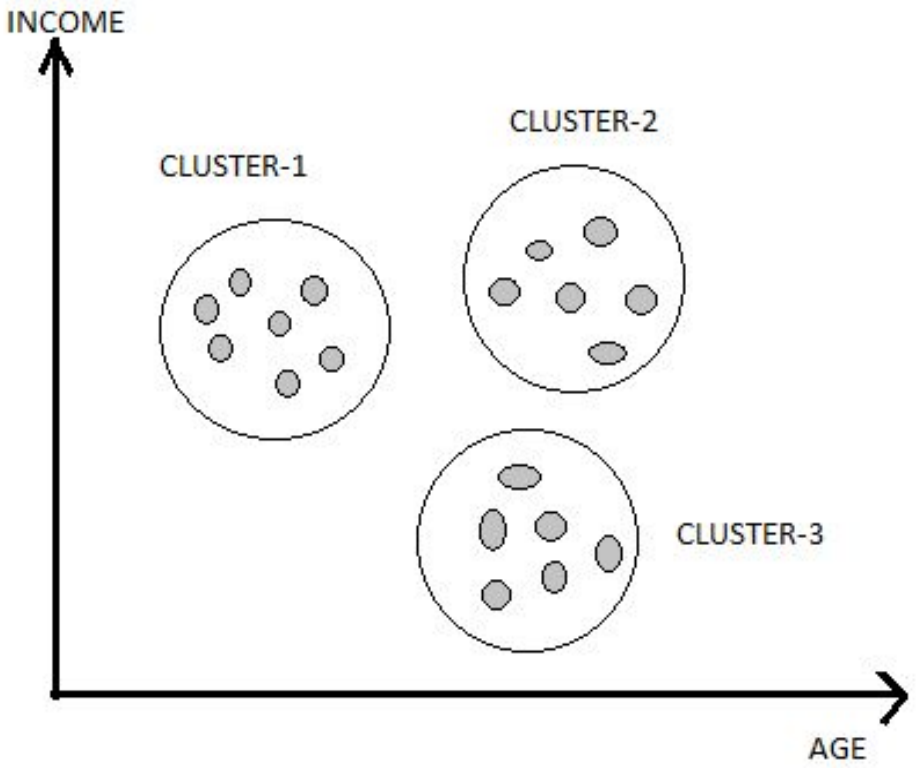
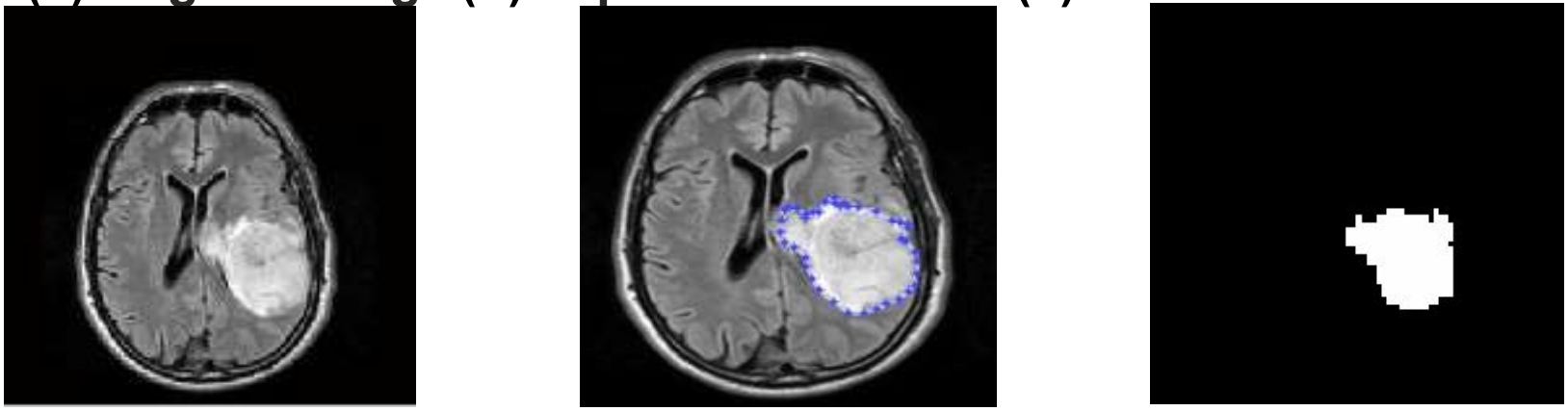


Figure : Clustering Technique

K-means clustering

***k*-means clustering aims to partition *n* observations into 'K' clusters in which each observation belongs to the cluster with the nearest mean.**

(a) original image (b) expert selection (c) K-means selection



WATERSHED ALGORITHM

- Watershed algorithm is used in image process primarily for **segmentation** purposes.
- This algorithm can be used if the **foreground** and **background** of the image can be identified.

MERITS:

- It works best to capture the weak edges.
- Watershed algorithm improves the primary results of segmentation of tumour done by k-means.

K-means clustering with watershed

Merits:

- If variables are huge, then K-Means most of the times computationally faster than, if we keep k small.
- Watershed algorithm improves the primary results of segmentation of tumour done by k-means.

Demerits:

- Difficult to predict K-Value & k-means cannot find non- convex clusters.
- Different initial partitions can result in different final clusters.
- This method does not work well with clusters of

C-means clustering

- It is well known that the output of K-Means algorithm depends hardly on the **initial seeds** number as well as the **final clusters number.**
- Therefore to avoid such obstacle **FCM** is suggested.
- The fuzzy C-means relax the condition by allowing the feature vector to have **multiple membership** grades to multiple cluster**.**

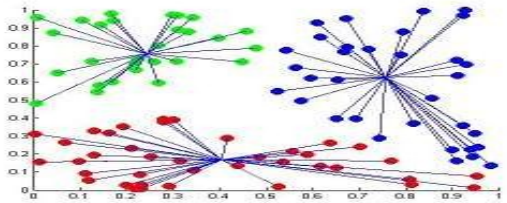


Figure: Result of Fuzzy C-means

GENETIC ALGORITHM

- The term genetic is derived from Greek word ‘genesis’ which means **‘to grow ‘or ‘to become’.**

- The implementation of Genetic algorithm begins with an initial population of chromosomes which are randomly selected.

MERIT:

- It is the best optimizing tool.

- It gives best result when used with Fuzzy c-means clustering…

C-means clustering with Genetic algorithm

MERITS:

- This method considers only image intensity.
- Unlike k-means where data point must exclusively belong to one cluster center here data point is assigned to 2 or more clusters.

DEMERITS:

- Aprior specification of the number of clusters.
- We get the better result but at the expense of more number of iteration.

MAIN STRATEGY OF PROPOSED METHOD

K-means Clustering + Watershed algorithm

- It is computationally faster, if we take K value small
- WA used to capture weak edges

C-means clustering + Genetic algorithm

- Here data point is assigned to 2 or more clusters
- GA gives best result in little time
- Best when works with C-means

Proposed Method

- Tumor is detected with high accuracy
- Effectively detects the tumor area & internal Structure
- We get the resultant image in color

FUTURE SCOPE

In terms of the near-future

- 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.

RESULTS :

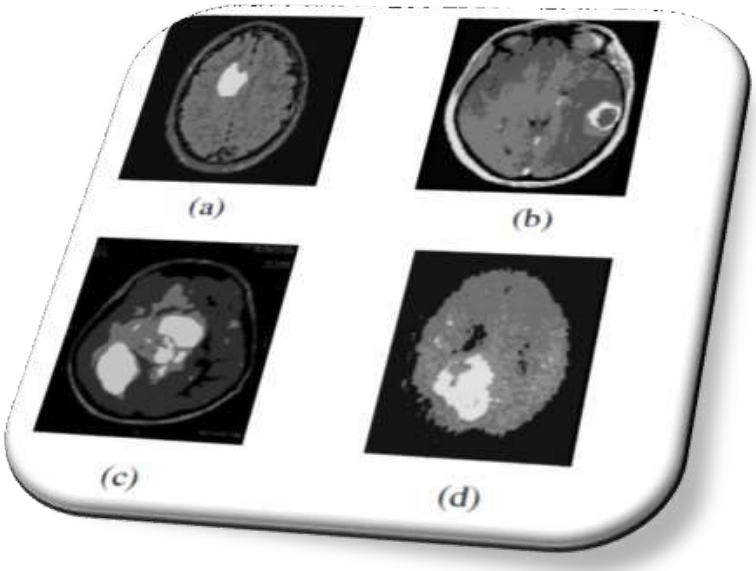


Fig.1.Results for first stage as K-means clustering.

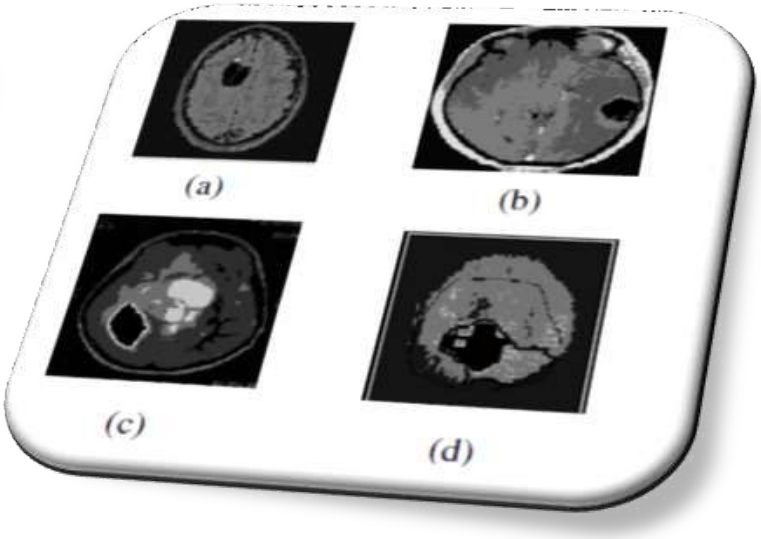


Fig.2.Results of Watershed algorithm

LINK FOR CODE

CLICK HERE TO OPEN CODE:

thank
you!