Clustering based Segmentation Approach to Detect Brain Tumor from MRI Scan

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ABSTRACT
To detect the tumor in the brain is very important task but the major problem occurred is that its very time consuming. We provide an approach towards the automation of this process in this paper. We take magnetic resonance images of the brain as a input and attempt to calculated the position and the size of the tumor. Each pixel in each slice will be processed to detect the tumor. All the process used is automatic and independent from users capability demonstration of the experiment that methods can successfully achieve segmentation for MRI to help pathologist distinguish exactly size and region.

Keywords
biomedical, k-means algorithm, magnetic resonance images, nervous system, spinal cord, skull.

1. INTRODUCTION
For the central nervous system brain is the most anterior part. Tumor is an uncontrolled growth of tissues in any part of the body[6].Along with the spinal cord, it forms the Central Nervous System(CNS). The Cranium, a bony box in the skull protects it. The structure and function of the brain can be studied noninvasive by doctors and researchers using Magnetic Resonance Imaging (MRI).Magnetic Resonance Imaging (MRI), strongly depends on computer technology to generate or display digital images. Segmentation is an important process in most medical image analysis. It is very difficult to conduct surgery without using image processing techniques. Analysis of Clustering Algorithms in Brain Tumor Detection of MR Images 322 Complex medical processes cannot be done without image processing techniques.The brain tissue and skull cannot be identified without image segmentation. Image Segmentation is needed to extract complex information from images. It takes a long time for diagnosis without using image processing techniques. Clustering to Magnetic Resonance (MR) brain tumors maintains efficiency. Clustering is suitable for biomedical image segmentation as the number of clusters is usually known for images of particular regions of the human anatomy. This system uses color-based segmentation method. An image segmentation scheme to segment 3D brain tumor from MRI images through the clustering process[11]. This system analyses various clustering techniques to track tumor objects in Magnetic Resonance (MR) brain images. The Clustering algorithms used are K-means, SOM, Hierarchical Clustering and Fuzzy C-Means Clustering. A given gray-level MR image is converted into a color space image and clustering algorithms are applied. In the tumor objects the position is separated from other items of an MR image by using clustering algorithms and histogram-clustering. In this system we combine, various clustering algorithms one by one and apply Histogram Clustering. After the clustering process, the cluster containing the tumor is selected as the primary segment. To eliminate the pixels which are not related to the tumor pixels, Histogram clustering is applied. The analysis of performance is conducted by taking a MRI Brain Tumor image as the input and applying all the four clustering algorithms to the image. The performance of the above four clustering algorithms are found based on the execution time and the number of tumor pixels. It provides a convenient environment for the retrieved images[8].

2. PROPOSED SYSTEM
In the project it deal with Brain tumor segmentation means we store the MRI brain images of patients in computer database and store patient details in database. After we find the MRI image through this software we take MRI image as input then first converted into Gray scale then use segmentation and K-means algorithm to find out the tumor is affected or not. In this project various Algorithms are used.We used algorithms such as pixel to pixel comparison, gray scale, segmentation, K-mean. K- means algorithm is used to implement the segmentation of the MRI brain image. cluster is the important part of brain and it finds the structure of data which is not labeled .A clustering is the process of organizing similar objects into groups. The k-means algorithm is used for partition the MRI into K cluster.

1. Acquisition of image:
In image acquisition the color image is converted into gray-scale image.

2. Classification of image:
In classification we take MRI as a input and we check the input is in the form of image or text.

3. Noise Reduction:
It is a process of checking the problems in the images. If we find problems in this image then it reduced error image then display the original image.

4.Detection of Tumor:

It detects the tumor whether in image or not.

5.Segmentation: In segmentation, we divide the image in no of segment then it find the center of the image by using K-means algorithm. It works in circular manner and detect the image

There are two basic methods for implementing in system, which are as follows:

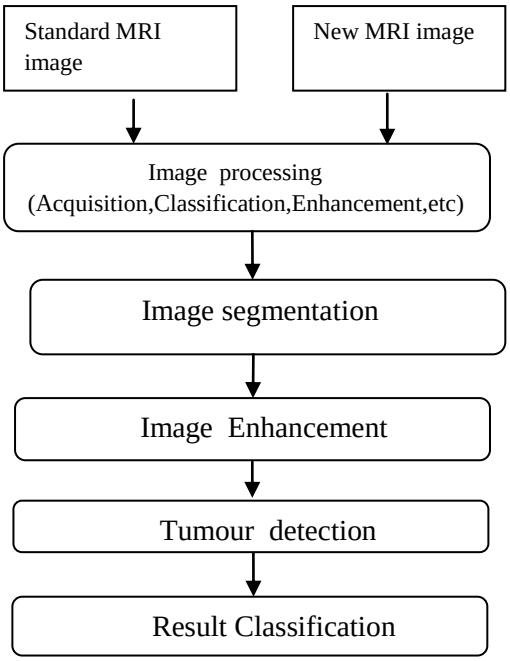
1. **Segmentation:**

The K-Means algorithm is used for implementing the segmentation of the brain image. Cluster is the process of organizing some objects into a groups. A cluster is a collection of objects which are similar and dissimilar to the objects. The goal of clustering is to determine the intrinsic grouping in a set of data which is not lebled. There is no absolute “best” criterion which can be independent of the final clustering. We are implementing the k-means algorithm

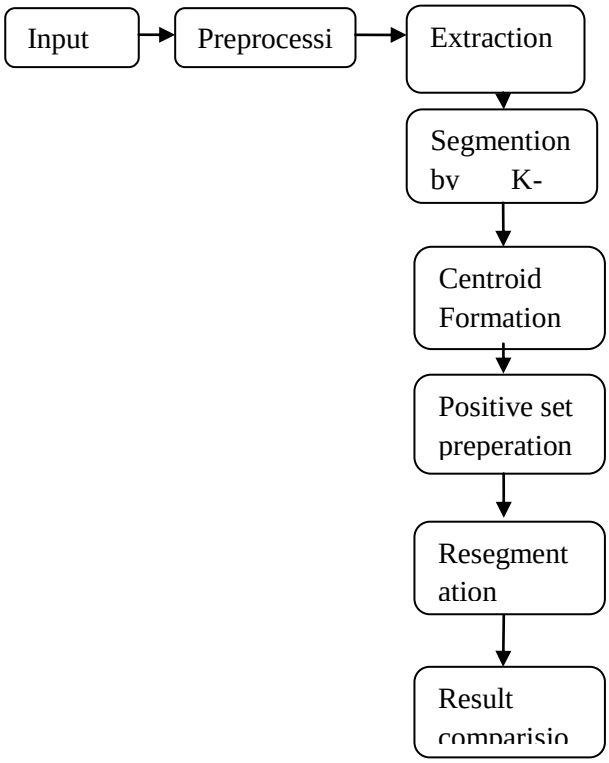
with MRI brain image. The algorithm will cluster the MRI brain image that differentiate the cells into the affected cluster region and unaffected cluster region.

2. Reconstruction:
n reconstruction only affected area will be selected as a cluster and also construct as an image and it is display in the label. The threshold values is calculated by using constructed area and the identification process of tumor will performed based on the threshold values. In our system will show the option pane message dialog contain the image is affected or not.

3. BLOCK DIAGRAM



4. SYSTEM ARCHITECTURE



5. MATHEMATICAL CALCULATION

Approximate Reasoning steps of Binary Image Representation

$$I = \sum_{W=0}^{255}\sum_{H=0}^{255}[f(0) + f(1)]$$

Pixels = Width (W) X Height (H) = 256 X 256

f (0) = white pixel (digit 0)

f(l) = black pixel (digit 1)

No. of White Pixels :

$$P = \sum_{W=0}^{255}\sum_{H=0}^{255}[f(0)]$$

P = number of white pixels (width*height)

1 Pixel = 0.264 mm

Size of Tumor:

$$S = [0.264(\sqrt{P})]mm\text{^}2$$

P= no-of white pixels;

W=width; H=height

6. 6. ALGORITHM

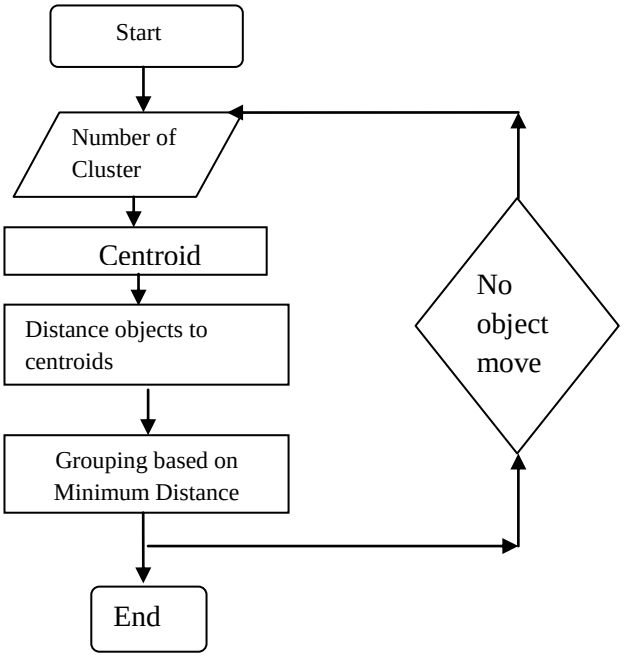
Demonstration of the algorithm:

Step 1:-Choose the pixel from the Image randomly.

Step 2:-K-clusters are created by associated every observation with the nearest mean.

Step 3:- The centroid of each k-cluster becomes the new mean

Step 4:-Step 2 and 3 are repeat until convergence has been reached .



7. DESIGN INTRODUCTION AND ANALYSIS:

Analysis:
The main function of the analysis phase is to look carefully at the requested features with an eye toward the issue that each may create in the actual coding. This phase is the time during which reasonably deliverable thoughts of each team member can be decided. The analysis phase depends on completing the deliverable that are provided during the requirements gathering phase particularly, in the Requirement Documents. After analyzing the requirements document phase, the project team members create several deliverable, which act as input to other process.

Design:
The design phase is the one, where the technical problems are really solved that makes the project a reality. In this phase the relationship of the code, database, user interface, and classes to take shape in the minds of the project team. In the design phase, project team is responsible for seven deliverable:

1) Data model design
2) User interface design
3) Functional specifications
4) Documentation plan
5) Software Quality Assurance test plan
6) Test cases
7) Detailed design specifications.

Data model or schema:
The primary objective in designing the data model or schema is to meet the high level software specifications that the requirement document outlines. Usually the database administrator (DBA) designs the data model for the software project.

User interface:
The user interface is the first part of the software application that is visible to the user. The UI provides the user with the capability of navigating through the software application. The UI is often known in the software industry as the look and feel aspect of the software application. The design of the UI must be such that, the software application provides an interface that is as user friendly and as cosmetically attractive as possible.

Prototype:
After the data model and UI design are ready, project team can design the prototype for the project. Sales and marketing teams generally cannot wait to get prototype in hands to show it off to sales prospects and industry trade shows.

Functional specification:
It provides the definitive overview of what is included in the project. This deliverables incorporates many of the documents that prepare to this point, gathering them into one place for easy reference.

Documentation plan:
The technical publications manager or the technical writer on the project writes the documentation plan. The plan provides an overview of the software product documenting, the recommended processes and procedures, and a list of document deliverable for the project.

Detailed design specifications:
It provides a high level view of the project. Entire design specifications layout the blueprint of how to develop the project. The design specifications includes document that has been created to design phase but in some cases and provides step by step information on how to implement the specifications.

Software quality assurance test plan and test cases:
Deliverables are software quality assurance test plan, test cases, test data, entrance test plan test automation requirements.

8. SYSTEM FEATURE:

1)The design of a computer system able to detect the presence of a tumor in the digital images of the brain, and to accurately define its borderlines.

2) The basic assumption is that different local texture in image can describe different physical characteristics corresponding to different objects .We will be using this in wide range of fields such as Oceanography, Bio medical informatics , Computer vision.

3) The assumption is that local texture of tumor cells is highly different from local texture of other biological tissues. Thus, texture measurements in the image could be part of an effective discrimination technique between healthy tissues and possible tumor areas.

4) A computer system has been designed and developed to recognize the typical features of the tumor in the digital form of images.

5) The textural features have been extracted using a co-occurrence approach. The level of recognition, among three possible types of image areas:non-tumor ,tumor and back ground. We are into tumor image segmentation.

9. DISADVANTAGE OF EXISTING SYSTEM:

1) In existing system some of the work done manually.
2) The cost is very high.
3) The existing system has low accuracy.
4) The existing system has low efficiency.

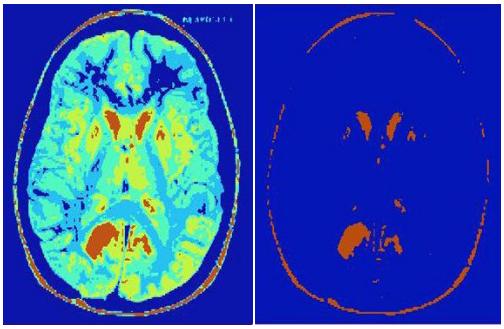
10. ADVANTAGES OF PROPOSED SYSTEM:

1) Accurate results due to k means algorithm .
2) Image processing is fast.
3) Quick identification of tumor is possible .
4) More secure.
5) The proposed system is more reliable.

11. RESULT:

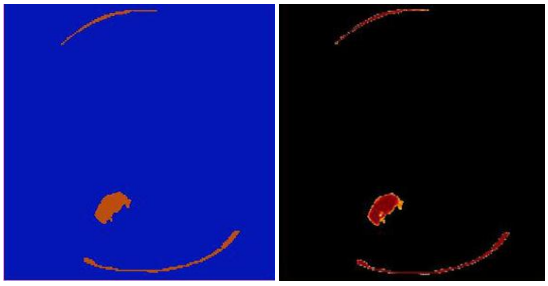
1.K-means clustered image

2.Image after Cluster Selection



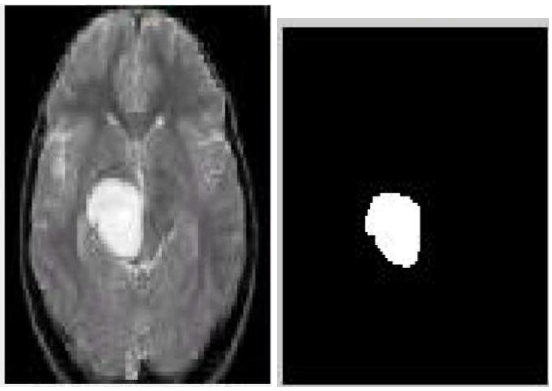
(a) **(b)**

3.Image after region elimination image **4.Segmented Tumor image**



(c) **(d)**

Input Image **Output Image**



(e) **(f)**

12. FUTURE SCOPE AND ACKNOWLEDGMENT:

Integrating with real time environment and getting data from real time MRI images.Trying to modify the program to get more faster software possible.Trying to get more reliable and also will add more security.Eliminating the problems that are faced in the current system is the "Future Enhancement".

13. CONCLUSION:

K-means algorithm is used to extract features from the brain cells. Noise is removed before the K-means process.The noise free image is take as a input to the k-means and tumor is extracted from the MRI image.Finally approximate reasoning for calculating tumor shape and position calculation.

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