Segmentation of Brain MRI Using K-means Clustering Algorithm

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Abstract- To segment the medical image using K Means clustering algorithm. To propose an algorithm that can be better for large datasets and to find initial centroid. To compare the performance. An algorithm is described for segmenting MR brain image into *K* different tissue types, which include gray, white matter and CSF, and maybe other abnormal tissues. MR images considered can be either scale- or multi-valued. Each scale-valued image i s modeled **as** a collection of regions with slowly varying intensity plus a white Gaussian noise. The proposed algorithm is an adaptive K-means clustering algorithm for 3-dimensional and multi-valued images.

Each iteration consists of two steps: estimate mean intensity at each location for each type, and estimate tissue types, Its performance is tested using patient data.

Introduction

The advances in imaging technology, diagnostic imaging has become an indispensable tool in medicine today. X-ray angiography (XRA), magnetic resonance angiography (MRA), magnetic resonance imaging (MRI), computed tomography (CT), and other imaging modalities are heavily used in clinical practice. Such images provide complementary information about the patient. While increased size and volume in medical images required the automation of the diagnosis process, the latest advances in computer technology and reduced costs have made it possible to develop such systems.

Blood vessel delineation on medical images forms an essential step in solving several practical applications such as diagnosis of the vessels (e.g. stenosis or malformations) and registration of patient images obtained at different times. Segmentation

algorithms form the essence of medical image applications such as radiological diagnostic systems, multimodal image registration, creating anatomical atlases, visualization, and computer-aided surgery

Vessel segmentation algorithms are the key components of automated radiological diagnostic systems. Segmentation methods vary depending on the imaging modality, application domain, method being automatic or semi-automatic, and other specific factors. There is no single segmentation method that can extract vasculature from every medical image modality. While some methods employ pure intensity-based pattern recognition techniques such as thresholding followed by connected component analysis , some other methods apply explicit vessel models to extract the vessel contours. Depending on the image quality and the general image artifacts such as noise, some segmentation methods may require image preprocessing prior to the segmentation algorithm. On the other hand, some methods apply post-processing to overcome the problems arising from over segmentation.

vessel segmentation algorithms[1] and techniques can be divided into six main categories, pattern recognition techniques, model-based approaches, tracking-based approaches, artificial intelligence-based approaches, neural network-based approaches, and miscellaneous tube-like object detection approaches.

Pattern recognition techniques are further divided into seven categories, multi-scale approaches, skeleton-based approaches, region growing approaches, ridge-based approaches, differential geometry-based approaches, matching filters approaches, and mathematical morphology schemes.

Clustering analysis plays an important role in scientific research and commercial application. This thesis provides a survey of current vessel segmentation methods using clustering approach and provides both early and recent literature related to vessel segmentation algorithms and techniques.

Existing system

Initial centroid value is assumed.
Probability of getting a zero matrix.
Fails in large data sets

Proposed system

The improved K-means algorithm is a solution to handle large scale data, which can select initial clustering center purposefully, reduce the sensitivity to isolated point, avoid dissevering big cluster. By using this technique locating the initial seed point is easy and which will give more accurate and high-resolution result.By using various techniques we can study or compare the results and find out which technique gives higher resolution

Initial centroid algorithm is useful to avoid the formation of empty clusters, as the centroid values are taken with respect to the intensity value of the image. Proposed algorithm is better for large datasets and to find initial centroid.

Module description:

User Login:

Allow only authenticated users.
Restrict unauthorized access.
Table contains user information and also their brain reports.

Images Segmentation:

Extract 2-D images from the 3-D images.
Store that in different locations.
2-D image will be converted into 1-D image.

Clustering Analysis:

K-Means clustering algorithm – similar to nearest neighbor techniques (memory-based-reasoning and collaborative filtering) – depends on a geometric interpretation of the data

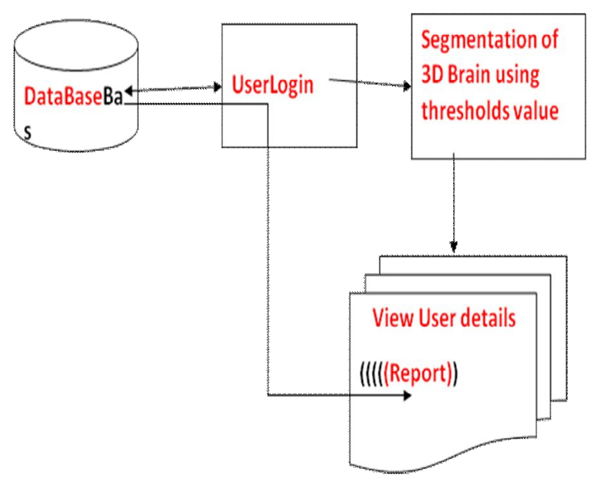
Organizing data into clusters shows internal structure of the data

Ex. Clusty and clustering genes above Sometimes the partitioning is the goal

Ex. Market segmentation Prepare for other AI techniques

Ex. Summarize news (cluster and then find centroid) Techniques for clustering is useful in knowledge discovery in data

Block Diagram:



Block diagram-Description:

- Back end: Sql Server2005
- Contains different type of tables.
- Mainly for User details and Login purpose.
- Scanned image will be stored in file locations.

K-means Algorithm:

Algorithm *k-means*

1. Decide on a value for K, the number of clusters.
2. Initialize the K cluster centers (randomly, if necessary).
3. Decide the class memberships of the N objects by assigning them to the nearest cluster center.
4. Re-estimate the K cluster centers, by assuming the memberships found above are correct.
5. Repeat 3 and 4 until none of the N objects changed membership in the last iteration.

Conclusion

Vessel segmentation methods have been a heavily researched area in recent years. Even though many promising techniques and algorithms have been developed, it is still an open area for more research. This algorithm does not require any user interaction, not even to identify a start point. Here seed points are selected randomly which determines the main branches of the vessel structure. Random selection of seed points does not yield accurate segmentation. Accuracy of the segmentation process is essential to achieve more precise and repeatable radiological diagnostic systems. Accuracy can be improved by incorporating a priori information on vessel anatomy and let high level knowledge guide the segmentation algorithm. k-means algorithm is a popular clustering algorithm applied widely, but the standard algorithm which selects **k** objects randomly **from** population as initial centrsoids can not always give a good and stable clustering. Experimental results show that selecting centroids by our algorithm can lead to **a** better clustering.

Along with the fast development of database and network, the data scale clustering tasks involved in which becomes more and more large. K-means algorithm is a

popular partition algorithm in cluster analysis, which has some limitations when there are some restrictions in computing resources and time, especially for huge size

dataset. The improved K-means algorithm presented in this paper is a solution to handle large scale data, which can select initial clustering center purposefully, reduce the sensitivity to isolated point, avoid dissevering big cluster, and overcome deflexion of data in some degree that caused by the disproportion in data partitioning owing to adoption of multi-sampling.

Our ongoing research focuses on the development of methods to segment coronary arteries in a sequence of angiographic images while preserving the topology of the vessel structure.

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