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Ameliorating Brain Image Segmentation Using Fuzzy Clustering Techniques

Sana Tak[1], Toran Verma[2]

[1]M.Tech Scholar, Computer Science & Engineering Department,
Rungta College of Engineering and Technology, Kohka Kurud Road, Bhilai, Chhattisgarh, India

[2]M.Tech Co-ordinator, Computer Science & Engineering Department,
Rungta College of Engineering and Technology, Kohka Kurud Road, Bhilai, Chhattisgarh, India

Abstract: ***Image segmentation is usually outlined as a partition of pixels or image blocks into undiversified teams. These teams area unit characterized by a prototypic vector in feature area, e.g., the area of Gabor filter responses, by prototypic histograms of options or by combine wise dissimilarities between image blocks. For all three information formats price functions are planned to live distortion and, thereby, to cipher the standard of a partition. strong algorithms for image process area unit designed in step with the subsequent three steps: first steps include, structure in pictures must be outlined as a applied mathematics model. Second, AN economical improvement procedure to seek out sensible structures must be determined. we tend to advocate random improvement ways like simulated tempering or settled variants of it that maximize the entropy whereas maintaining the approximation accuracy of the structure live. Alternative improvement algorithms like interior purpose ways or continuation ways area unit equally appropriate. Third, a validation procedure must take a look at the noise sensitivity of the discovered image structures. This three step strategy is incontestable within the context of image analysis supported color and texture options. There has been a long-lived misunderstanding within the literature of AI and uncertainty modeling, concerning the role of many-valued logics (and fuzzy logic). The revenant question is that of the mathematical and pragmatic significance of a integrative calculus and also the validity of the excluded middle law. This confusion even arises the first developments of even logic, even after several warnings of some philosophers of chance. This results in some level of misunderstanding. It suggests that the basis of the controversies lies within the unfortunate confusion between degrees of belief and what logicians decision "degrees of truth". The latter area unit typically integrative, whereas the previous can not be thus. It's recalled that any belief illustration wherever compositionality is taken as a right is absolute to at the worst collapse to a mathematician truth assignment and at the best result in a poorly communicatory tool. we have a tendency to show the non-compositional belief illustration embedded within the normal symbolic logic. It seems to be associate degree all-or-nothing version of chance theory.Computed topography (CT) and resonance (MR) imaging area unit the foremost wide used photography techniques in designation, clinical studies and treatment designing. This review provides details of automatic segmentation ways, specifically mentioned within the context of CT and MR pictures. The motive is to debate the issues encountered in segmentation of CT and MR pictures, and also the relative deserves and limitations of ways presently on the market for segmentation of medical pictures.***

Keywords: Image processing and enhancement; Segmentation; Artificial intelligence techniques, computed tomography, magnetic resonance imaging, medical images artifacts, segmentation

1. Introduction

Image Segmentation is that the strategy of partitioning a digital image into multiple segments (sets of pixels, jointly named as super pixels). The essential motive of segmentation is to change and/or modification the subsequent illustration of an image into one issue that is simpler to analysis. Image segmentation is usually accustomed notice objects and limits (lines, curves, etc.) in photos. Plenty of precisely, image segmentation is that the strategy of assignment a label to every component in a very image such pixels with constant label share certain characteristics.

2. Role of Segmentation

The main ways involve the segmentation of tomography pictures and to get rid of the over segmentation drawback with the assistance of varied cluster techniques .These comprise of FCM cluster technique beside adaptive mean shift. The process of image segmentation consists of remodeling a picture into completely different phases (a cartoon version), whereas keeping track of necessary properties of every section. This could be used for analysis of the image and/or for any process of the image, as every of the various phases of the image is treated otherwise once a segmentation method. One massive application space is object detection. There exist many completely different ways for image segmentation.

3. Problem with MRI

There are three problems that can be associated with MRI images. The First problem is the partial volume effect in the images. Due to presence of partial volume the segmentation of the image may degrade. The second problem is the over segmentation. The third problem is the Noise due to sensors and related electronic system.

4. Methodology Used

The proposed algorithm is the modification of mean-shift algorithm, termed as the adaptive mean shift algorithm. The algorithm is divided into following layers whose functions are different and their functionality is shown below along with the respective figure. The basic steps are as follow:

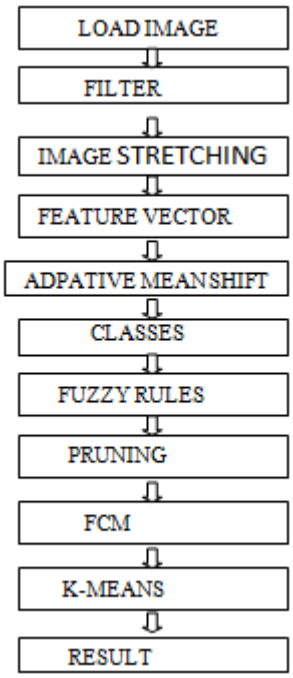


Figure 1: Proposed Algorithm

Step 1 Load Image: An image is a visual representation of something. In this section it will load the brain image followed by further functioning for the achievement of segmentation.

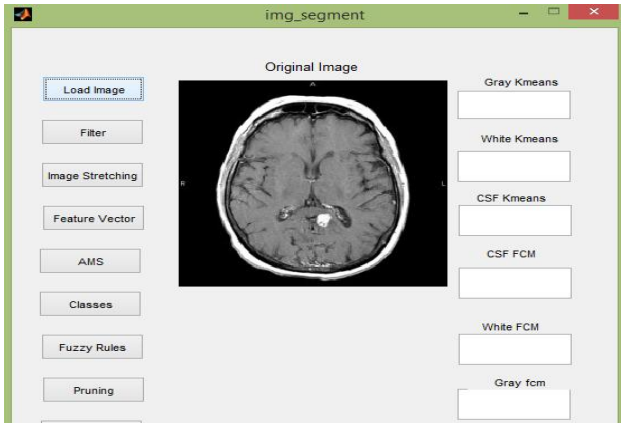


Figure 2: Processing of an image

Step 2 Preprocessing: The terribly opening of study of brain image segmentation is preprocessing. this pre-processing includes two steps which are as follows:

•A: **Homomorphic Low Pass Filtering**– It provides correction in intensity in-homogeneities and it performs wavelet on image i.e. on original image by elimination totally different variety of band say 'HH' or 'll' or 'HL' by rotten the image up to bound level.

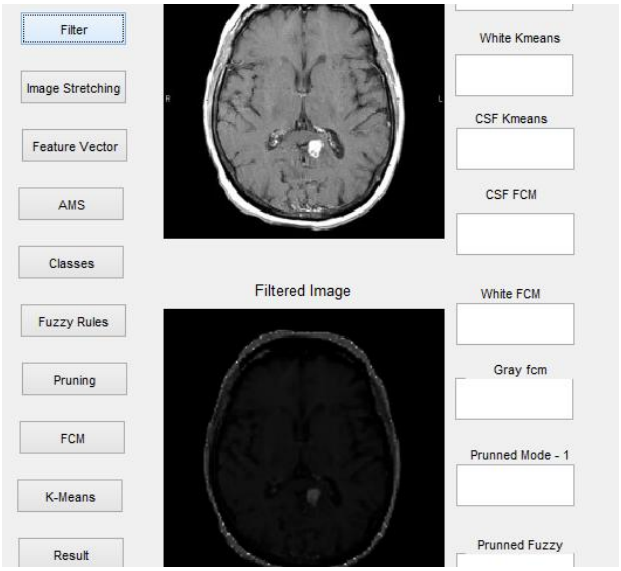


Figure 3: Preprocessing (Filtering)

•B: **Image Stretching** – It provides intensity values social control across input channels supported dark and bright points. It limits to a particular level of stretch image and alter image across intensity value of the image.

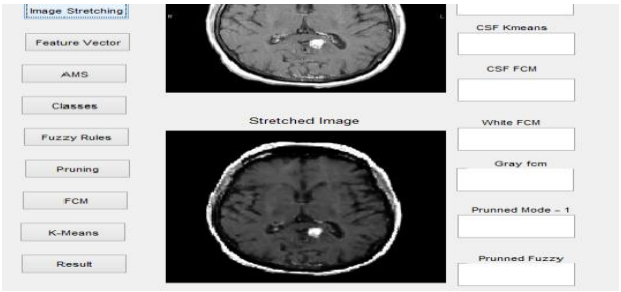


Figure 4: Preprocessing (stretched image)

Step 3 Feature Vector: Feature vector area unit extracted per input voxel. Intensity yet as spatial options i.e. voxel coordinates is enlisted. Voxels coordinates for overall spatial property of n is employed wherever n is that the variety of input intensity channels. The posture of feature vectors is input to the adaptive mean shift clustering stage. It handles the stretch image across the rows as well as columns for obtaining coordinate value. A pop up message will be displayed as done as shown below:

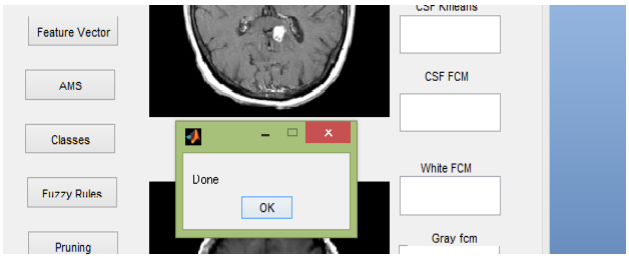


Figure 5: Extraction of input voxels

Step 4 Adaptive Mean Shift:. Adaptive mean shift pixel cluster implements the classic mean shift clustering algorithm and it produces output pixels for clustered image and output for averaged mean shift. The process starts by clustering the input feature vectors, which represent the multimodal MRI brain data using the FAMS implementation

of the AMS algorithm. The result obtained is further classified into number of classes for further segmentation.

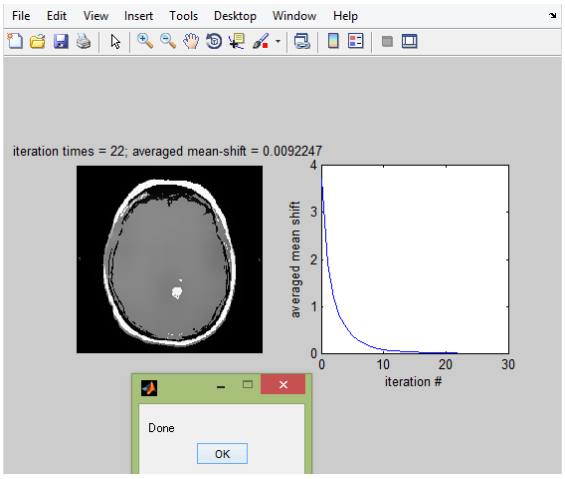


Figure 6: Output of Mean Shift

Step 5 Classes: we will calculate the length of cluster and is divided by number of cluster and total number of cluster is obtained.

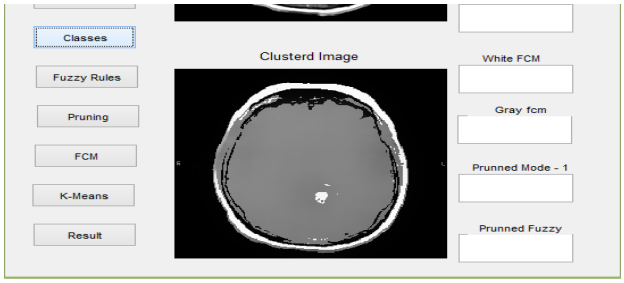
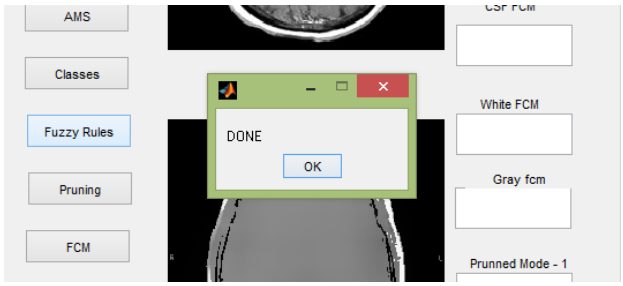


Figure 7: Clustered image

Step 6 Fuzzy Rules: This section includes calculating the distance between one cluster to another and further normalizing the values to be obtained in fuzzy inference system and rules are further created by making different membership function and different values as per the need. Different membership function includes say Triangular MF, Trapezoidal MF, Gaussian MF etc.



Step7 Pruning: The number of mode is large as compared to the initial data so mode pruning is therefore required. In purning mechanism, we will calculate fuzzy inference calculations and those obtained value of pixels which is less than 0.5 is merged for pruning to avoid under segmentation.

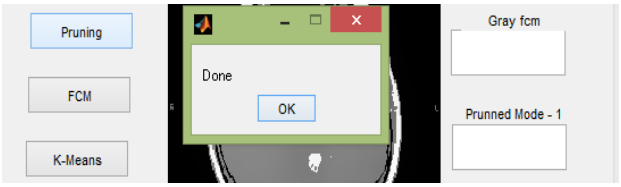


Figure 8: Pruning on image

Step7 Fuzzy C Means (FCM): The cluster is performed on numerous segmented elements and take a look at to beat the over segmentation. Fuzzy c-means (FCM) could be a knowledge cluster technique whereby every datum belongs to a cluster to some extent that\'s mere by a membership grade. It provides a technique that shows the way to cluster knowledge points that populate some three-dimensional area into a particular range of various clusters. Fuzzy Logic tool case command perform fcm starts with associate initial guess for the cluster centers, that area unit meant to mark the mean location of every cluster. The initial guess for these cluster centers is presumably incorrect. in addition, fcm assigns each datum a membership grade for every cluster. By iteratively change the cluster centers and also the membership grades for every datum, fcm iteratively moves the cluster centers to the proper location inside a knowledge set. This iteration relies on minimizing associate objective perform that represents the gap from any given datum to a cluster center weighted by that knowledge point's membership grade. The command performs fcm outputs a listing of cluster centers and several other membership grades for every datum. you\'ll use the knowledge came back by fcm to assist you build a fuzzy logical thinking system by making membership functions to represent the fuzzy qualities of every cluster.

5. Result

The following method shows the comparison of k-mean and fuzzy c-mean method and determines the numerical values of different matter say gray matter, white matter, and cerebro spinal fluid. It shows how under segmentation is avoided using fcm and by comparing it will be more useful.

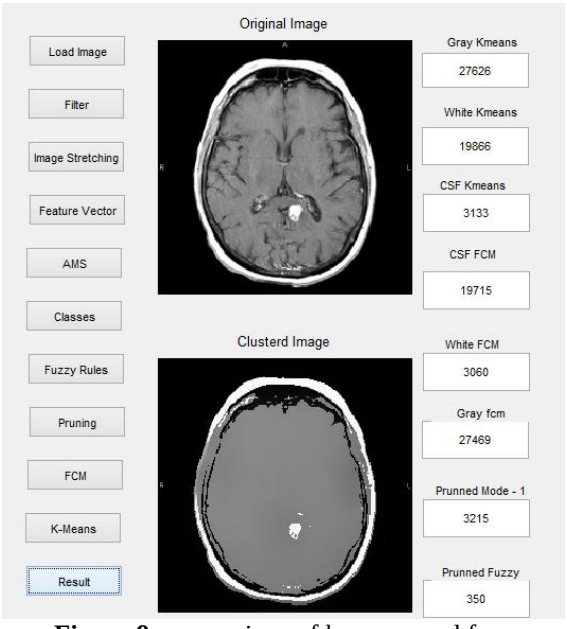


Figure 9: comparison of k-means and fcm

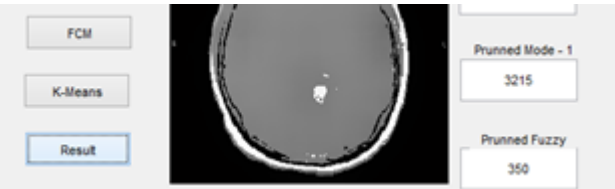


Figure 10: Comparison of Pruning values

The fig9 shows comparison of k means and fcm and shows the calculated value through pruning .It shows value that is obtained through mahalanobis distance i.e.(3215) and according to fcm obtained value is i.e. (350) .hence segmentation is carried out in three forms as shown below:

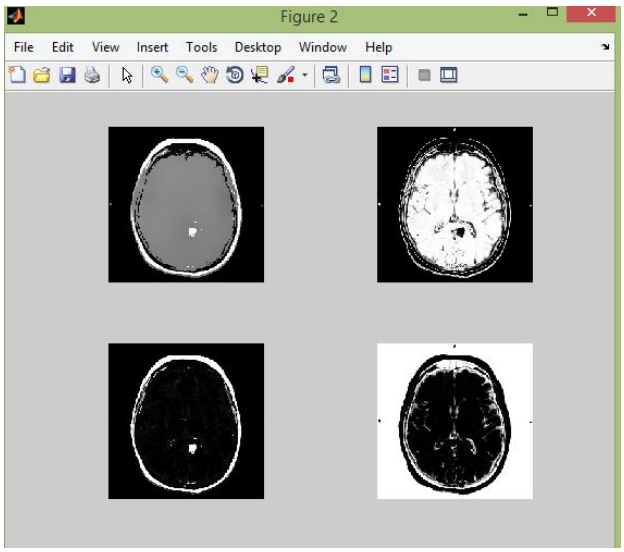


Figure 11: shows obtained result for selected MRI

6. Conclusion and Future Work

In this present thesis Neural Network approach using fuzzy c-means clustering has been applied for segmentation of MRI images. The work has been carried out in following steps which is discussed above. The present work has been done for improving segmented part in MRI image detection. Further the present work can be extended to recognize various clustering and the algorithm can be used for the color image segmentation. The present work has been carried to measure the segmentation through soft clustering methods.

References

[1] H. Greenspan, A. Ruf, J. Goldberger Constrained Gaussian mixture model framework for automatic segmentation of MR brain images IEEE Trans Med Imag, 25 (9) (2006), pp. 1233–1245.
[2] A.W.C. Liew, H. YanAn adaptive spatial fuzzy clustering algorithm for 3D MR image segmentation IEEE Trans Med Image, 22 (9) (2003), pp. 1063–1074.
[3] Cohen L., Cohen I., Finite-element methods for active contour models and balloons for 2-d and 3-d images. Pattern Anal Mach Intell IEEE Trans, 1993; 15(11):1131–1147.
[4] Abrantes AJ, Marques JS. A class of constrained clustering algorithms for object boundary extraction, IEEE Transactions on Image Processing, 1996; 5(11): 1507 – 1521.
[5] Vovk U, Pernus F, Likar B. A review of methods for correction of intensity in homogeneity in MRI. IEEE Trans Med Image, 2007; 26:405–21.
[6] Li CM, Liu JD, Fox M. 2005 "Segmentation of edge preserving gradient vector flow: an approach toward automatically initializing and splitting of snakes," 2005 IEEE computer society conference on Computer vision and pattern recognition. vol 1. p. 162–167.
[7] Xue JH, Pizurica A, Philips W, et al. An integrated method of adaptive enhancement for unsupervised segmentation of MRI bins images. Pattern Recogn Lett 2003; 24:2549–60.

Author Profile

Sana Tak received the B.E. From CSVTU Bhilai (C.G.), India in Computer Science & Engineering in the year 2013. She is currently pursuing M.Tech. Degree in Computer Science Engineering with specialization in Computer. Technology from CSVTU Bhilai (C.G.), India. Her research areas include Software Engineering, Neural Network, Pattern Recognition, Image Processing etc.

Toran Verma is Assistant Professor of Computer Science & Engineering at Rungta College of Engineering & Technology, Bhilai (C.G.), and India as well as M.Tech. Coordinator (CSE) and has given more than 10 years in RCET Bhilai, Completed M.Tech. From CSVTU, Bhilai in 2011, Gold medalist as well as University topper. More than 16 papers published in reputed journals. Areas of Interest are Image Processing, Fuzzy logic and Neural Network.