ISSN: 0975-8585

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Brain Tumor Detection in Medical Imaging Using Soft Computing Techniques.

Kauser Ahmed P*, and MD Meraj Alam.

School of Computer Science and Engineering, VIT University, Vellore, Tamil Nadu, India.

ABSTRACT

Digital technology has made tremendous revolution in health care analytics. It includes electronic health record, medical imaging, remote patient monitoring and bioinformatics. This paper focuses on medical imaging analysis using soft computing techniques. Magnetic resonance imaging (MRI) is an advanced and quality medical imaging technique compared to X-ray furnishes rich information on the human soft tissue anatomy. Soft computing techniques like K-means and Fuzzy C means (FCM) is applied to analyze the geometric characteristics of brain tumor images, and has been applied widely to many applications such as image detection, image segmentation, image reduction and so on. Image Segmentation is done to extract meaningful features and performing analysis based on segmentation of images using K means clustering. Image reduction is done for fast processing of images using FCM technique. The proposed system can be widely used **for** treatment of brain tumor using medical image processing.

Keywords: Image Segmentation, Image Reduction, Clustering, Brain Tumor, Soft Computing.

Corresponding author

ISSN: 0975-8585

INTRODUCTION

Medical Image processing is a fruitful field to doctors which helps them for the analysis of complex disease such as cancer, brain tumor, heart attack, kidney stones, and so on. The detection of brain tumor is a very challenging task, in which special care is taken using medical image processing techniques. Various scanning applications for medical image analysis and techniques are available such as MRI, CT scan, X-rays. Brain tumor is a big cause of death worldwide and related abnormalities constitute for major changes in life. A tremendous research has been done in the last decade for brain tumor in the region of cerebral cancer diagnosis [1, 2, 3]. Varieties of image processing techniques are available to be applied on various imaging modalities for tumor detection that will detect certain features of the tumors such as the shape, border, calcification and texture[4, 5, 6]. These features will make the detection processes more accurate and easier as there are some standard characteristics of each feature for a specific tumor. Brain tumor segmentation requires the efficient knowledge of pathology and understanding the intensity and shape of MRI image [7, 8, 10]. The main problem in tumor segmentation arises due each tumor being of different shape, size, location and intensity. Detection of brain tumor can be done through MRI images using Fuzzy Clustering Means (FCM) and K-means techniques [1, 9]. Explanation of Fuzzy Clustering Means (FCM) and K-means algorithms is beyond the scope of this paper.

The system is expected to be efficient, reliable, portable, and usable. Moreover, it is expected to be economical, ethical, sustainable, and should follow health and safety guidelines.

PROPOSED METHODOLOGY

The proposed methodology is simple yet elegant. The RGB image is taken and converted into grayscale image using Matlab. The two dimentional image is then split into separate x and y dimentional images. Then the image clustering is done using K-means algorithm to extract the tumor from given image. Based on the clusters formed, the image is segmented. Image reduction can be done by converting the color image (RGB) is converted into HSV image. The clustering of image is done using FCM after the conversion. The proposed architecture diagram is shown in Fig. 1.

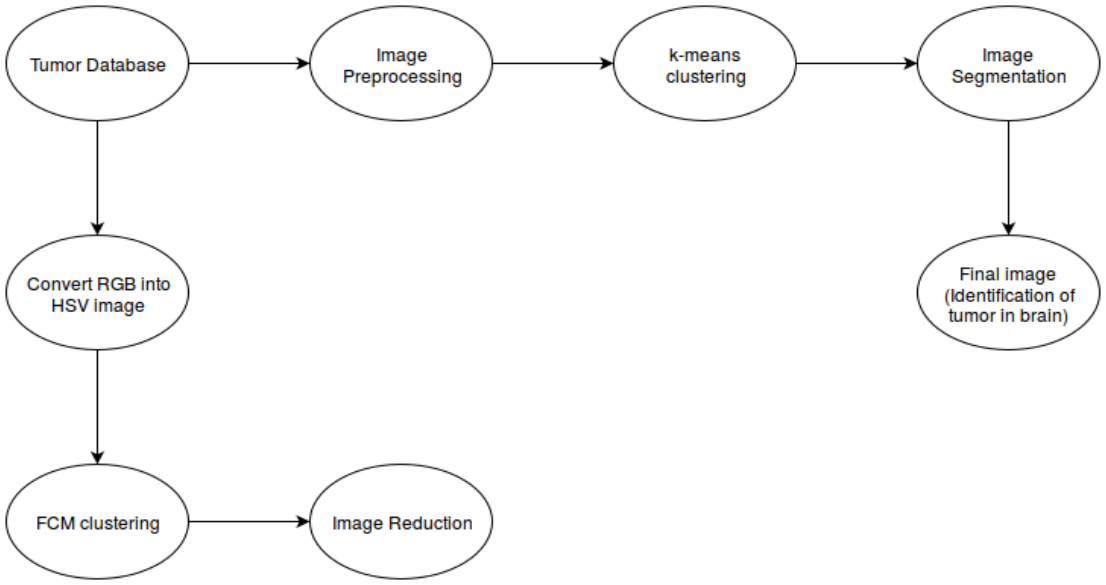

Fig. 1: Architecture Diagram for image segmentation and reduction

Algorithm for image segmentation using K means Clustering

1. Convert the given RGB image into grayscale image.
2. Convert the given RGB image into L*a*b color space.

3. Calculate scaling factor.
4. Initiate k-means clustering.
5. Calculate the objects in each cluster.

i. for 1 to whole color space repeat:
ii. save image in temp variable.
iii. rgb label for the temp variable is equal to zero for given k.
iv. segmented image becomes the temp variable.
v. end

6. Show the segmented image.

Algorithm for image reduction using FCM

1. Convert the input image into HSV and take its components.
2. Perform fuzzy clustering on HSV image.
3. Use fcm() function to cluster the color of the image.
4. Plot the reduced image.

RESULTS AND DISCUSSION

To show the effectiveness of the proposed methodology, original brain scan image of brain tumor is taken. The images below shows the result obtained and the effectiveness of the methodology. In Fig. 2 original and grayscale image is shown. Reducing image to grayscale is important to show different effect in the Matlab clearly. In Fig.3 one dimensional gray scale image of x and y direction is shown. Fig. 4 shows segmented image, which clearly shows brain tumor. Fig. 5 shows image reduction output. Here, original RGB is changed to HSV to save space and only 20 colours are retained for the reduction purpose. The effect of the same can be seen on the right side image as compared to left side image. Here, FCM is used to group the colors. The reduction is very effective as it reduced to an extent of 63.80%.

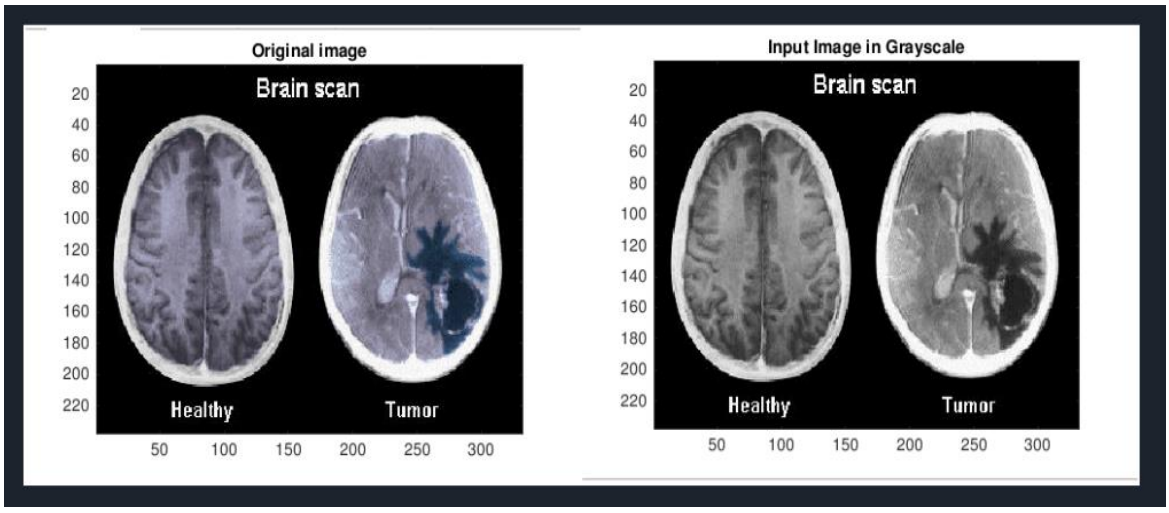

Fig. 2: Input and Gray scale image

ISSN: 0975-8585

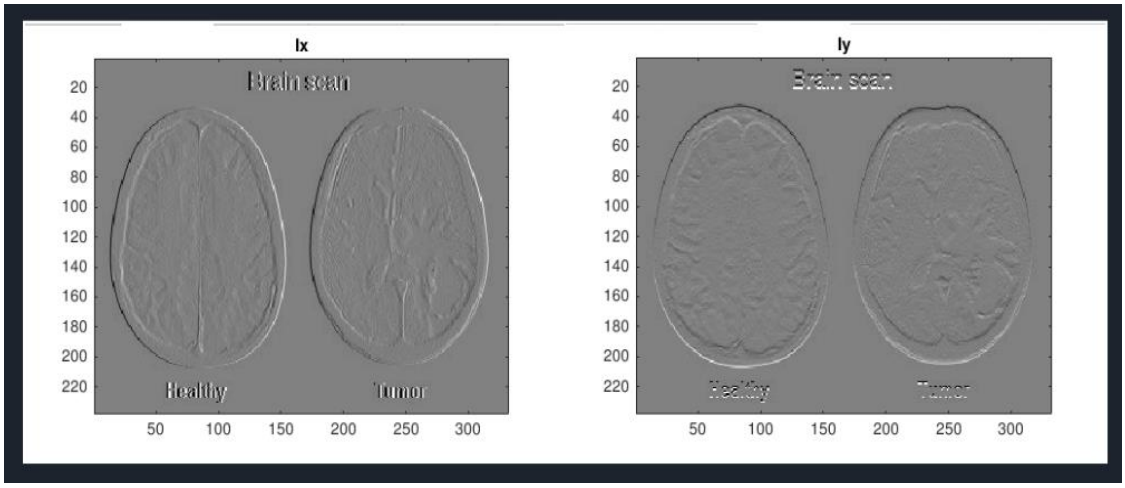

Fig.3: 1 D image

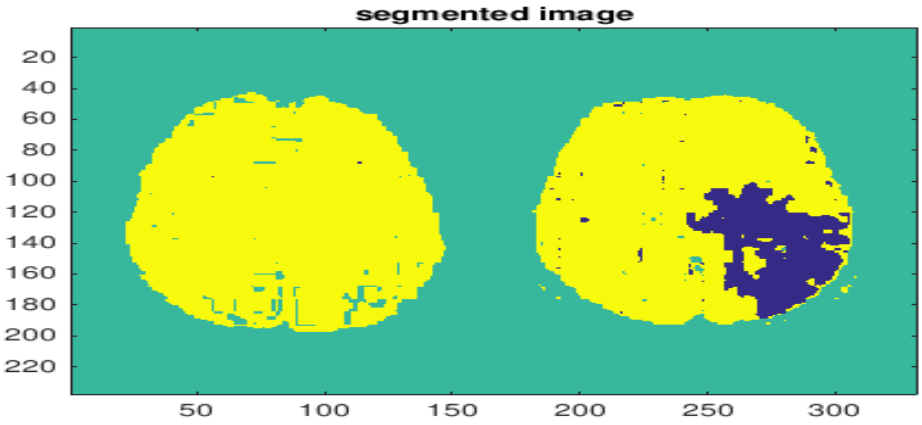

Fig.4: Segmented image

Fig. 5: Reduced image

CONCLUSION

Magnetic resonance image segmentation and reduction is an important problem in medical image processing. Traditional method is not suitable for image processing techniques. Development of automated algorithms is helpful in fast processing of MRI. We have proposed an efficient clustering system based on K means and FCM to detect the brain tumor. The MATLAB simulation is carried on different brain images and tumor is detected using image segmentation and image reduction techniques. Future work includes image segmentation and reduction using Meta heuristic algorithms for better results. In future, this prototype could be launched in the market and could be made accessible to common people.

ISSN: 0975-8585

ACKNOWLEDGEMENT

We would like to thank VIT University for giving us the resources and the required infrastructure supports in accomplishing this research well in time, we are expressing our deep gratitude to the Management members of VIT University for their encouragement and extensive support in preparing and publishing this paper.

REFERENCES

[1] EI papageorgiou, PP Spyridonos, Brain Tumor characterization using the soft computing technique of fuzzy cognitive maps, Applied soft computing, 2008, 8: 820-828.

[2] PK Saini, M Singh, Brain tumor detection in medical imaging using matlab, International Research Journal of Engineering and Technology, 2015, 2: 191–196.

[3] RR Laddha, and SA Ladhake, A Review on Brain Tumor Detection Using Segmentation And Threshold Operations, International Journal of Computer Science and Information Technologies, 2014, 5: 607–611.

[4] R Kandwal, An Automated System for Brain Tumor Detection and Segmentation, International Journal of Advanced Research in Computer Science and Software Engineering, 2014, 4:97–100.

[5] AR Kavitha, C Chellamuthu, K Rupa, An Efficient Approach for Brain Tumour Detection Based on Modified Region Growing and Neural Network in MRI Images, International Conference on Computing, Electronics and Electrical Technologies [ICCEET], 2011, 1087 – 1096.

[6] A Kharrat, MB Messaoud, N Benamrane, M Abid, Detection of Brain Tumor in Medical Images, IEEE International Conference on Signals, Circuits and Systems, 2009, 1-6.

[7] Murugavallil S, V Rajamani, An Improved Implementation of Brain Tumor Detection Using Segmentation Based on Neuro Fuzzy Technique, J. Compo Sc., 2007, 3:, 841-846.

[8] M Jain, S Jaiswal, S Maurya, M Yadav, A Novel Approach for the Detection and Analysis of Brain Tumor, International Journal of Emerging Technology and Advanced Engineering, 2015, 5: 54–59.

[9] D Manju and K Pavani, Brain Tumor Detection Using Multiple Kernel Fuzzy C-Means on Level set Method, International Journal of Application or Innovation in Engineering and Management (IJAIEM), 2014, 3: 197-200.

[10] A C Kaushik, V Sharma, Brain Tumor Segmentation from MRI images and volume calculation of Tumor" International Journal of Pharmaceutical Science Invention, 2013, 2: 23-26.