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Method for Abnormal and Normal Tissue Detection of MRI

Samir Kumar Bandyopadhyay* | *Advisor to Chancellor, JIS University, India*

Abstract

Binarization is used as intermediate steps of MRI of brain normal and abnormal tissues detection. One of the main problems of MRI binarization is that many pixels of brain part cannot be correctly binarized due to the extensive black background or the large variation in contrast between background and foreground of MRI. The paper determines a threshold value using mean, variance, standard deviation and entropy followed by a non-gamut enhancement that can overcome the binarization problem. The proposed binarization technique is extensively tested with a variety of MRI and generates good binarization with improved accuracy.

Keywords: MRI, Binarization; Entropy; Standard deviation

Introduction

An extreme understanding of image information is essential and medical image segmentation, predominantly binarization, performing a significant role. Segmented images are normally used in a multitude of different applications, such as, diagnosis, treatment planning, localization of pathology, learning anatomical organization, and computer incorporated surgery. Particularly binarization is a complex job due to the unpredictability of object shapes, spatial intensity variation of different parts and the variation in image quality. Most intensity based segmentation of white matter, gray matter, and cerebrospinal fluid need binarization as preprocessing. It is also easy to detect brain abnormality if we process a binarized image. Thus, accurate abnormality selection and features extraction both highly depend on binarization. Recently, image binarization techniques are widely used in several medical areas for image improvement to be used in advance detection and treatment stages. The time factor is very important to find out the abnormality issues in target images, especially in diverse cancer tumors such as lung cancer, breast cancer, brain tumor, etc. The threshold selection of binarization procedures can be broadly classified as global thresholding and local thresholding. Global thresholding methods utilize a single intensity threshold value, and this value is determined on some heuristics or comprehensive image features to classify image pixels into the foreground or background pixels of the image. The paper proposed a method to convert MRI of brain images in a bi-level form in such way that the foreground information brain part is represented by white pixels and the background of brain part by black pixels.

Literature Review

The threshold selection of binarization procedures can be broadly classified as global thresholding and local thresholding. Global thresholding methods utilize a single intensity threshold value, and this value is determined on some heuristics or comprehensive image features to classify image pixels into the foreground or background pixels of the image. Local thresholding method can be used to calculate a threshold

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***Corresponding Author:** Samir Kumar Bandyopadhyay, Advisor to Chancellor, JIS University, India, Tel: 9831030823; Email: 1954samir(at)gmail.com

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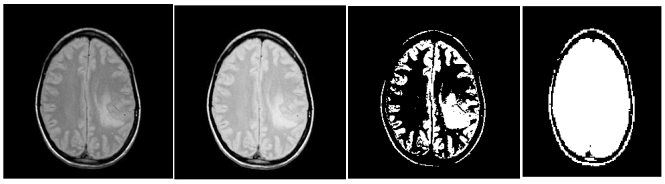
for every pixel in the image on the origin of the substance in its locality [1]. As contrasting to global thresholding, local methods normally not performed well on MR images for binarization, this is due to the dynamic characteristics of brain tissue intensity. Otsu selects threshold value by minimizing the weighted sum of within-class variances [2]. Some Researchers uses a different thresholding criterion suitable for incremental update within the sliding window, and this algorithm gives better results on difficult portal images than various publicly available adaptive thresholding routines [3]. The threshold is selected as an average brightness of the fragment gives very average results. Some other researchers proposed a mutual information based [4] method from information theory has no underlying free parameters, nor it requires training or calibration [4]. The method is based on finding an optimal set of global thresholds, one for each image, by maximizing the mutual information above the thresholds while minimizing the mutual information below the thresholds. It was tested on both synthetic and medical images from clinical practice and compared against three other thresholding methods: the Conaire method, the popular Otsu thresholding method, and 2D entropy based binarization [5]. Their result suggests that the method is less sensitive to such irregularities as it does not make assumptions about the distribution of intensities in the images [4].

Proposed Method

In first phase foreground image contrast enhancement techniques involve scaling and shifting operations; the net result of these operations on an image is that all its pixel values above a certain reference value, with respect to that particular image, are pushed to a higher value while all the pixels with level below that point are pushed to lower gray values. Contrast enhancement is performed only for those pixels where the difference between maximum and minimum of RGB component is less than 128. In the second phase, calculation of final threshold value for the binarization using entropy and standard deviation from the gray MR image is performed.

Results

The results of the proposed technique on an MRI of brain dataset "Whole Brain Atlas" which consists of T1 weighted, T2 weighted, and proton density (PD) MRI has been discussed here[5]. The result of proposed method is reflected in Figure 1(c) followed by foreground image enhancement step shown in Figure 1(b) for the input MRI (Figure 1(a)). Observing in Figure 1(c), it is very clear that foreground of the brain part is assigned as white and background of brain part is assign as black, and this result being utilized for features extraction and detection of a different type of brain abnormality. Most of the binarization algorithms do not treat background (black region) as a part of the brain image. It is important



(a) (b) (c) (d)

Figure 1: (a)Source image is taken from MRI dataset [5], (b)enhance brain part by proposed method, (c) binarized MR image by proposed method and (d)binarization by Otsu method.

to notice that due to the combination of standard deviation and entropy followed by gamut less enhancement method correctly binarized the brain part that the object of interest. This could be verified from the binarization results of this experiment, where it can also be observed that the proposed binarization technique leads to suitable results for all type of MR of brain images. The result of the Otsu method has been shown in Figure 1(d).It shows extremely few pixels are set as 0 in brain part, so many unnecessary brain part area pixels are converted to 1 which bring about its limitation. The results obtained by the proposed method is shown in Figure 1.

Conclusion

Binarize of the MR images has several applications towards brain abnormality detection and features extraction. The technique performed in two steps has proved that the proposed method is capable of working in different MR of brain images and their application domains. The comparisons verified that the proposed method for image binarization is performed better than other well-known methods. Binarize of the MR images has several applications towards brain abnormality detection and features extraction. The technique performed in two steps has proved that the proposed method is capable of working in different MR of brain images and their application domains. The comparisons verified that the proposed method for image binarization is performed better than other well-known methods.

References

1. Mehmet S, Bu¨lent S (2004) Survey over image thresholding techniques and quantitative performance evaluation. Journal of Electronic Imaging13: 146-165.
2. Otsu N (1979) A threshold selection method from gray level histograms. IEEE Trans. on System, Man and Cybernetics SMC9: 62-66.
3. Sund T, Eilertsen K (2003)An algorithm for fast adaptive image binarization with applications in radiotherapy imaging. IEEE Transactions on Medical Imaging22: 22-28.
4. Yaniv G, Andrew M, Stephen R, Stuart C (2013) Mutual information based binarization of multiple images of an object: An application in medical imaging. IET Computer Vision7: 3-24.
5. Whole Brain Atlas:MR brain image (2013) http://www.med.harvad.edu/AANLB/home.html.