International Journal of Research in Engineering, Science and Management
Volume 4, Issue 3, March 2021
https://www.ijresm.com | ISSN (Online): 2581-5792

Study of Image Segmentation On MRI Images for Brain Tumour Detection

K. Alviya Babu[1], Flavya Shaiby[2], Josmy Mathew[3*]
[1,2,3]*Department of Computer Applications, Saintgits College of Applied Sciences, Pathamuttom, India*

***Abstract*: Latterly, researches on diagnosis or segmentation of brain tumors are easy with the help of MRI scans. This identification of the tumour can be done through MRI scans. The brain tumor is generated from the instant areas of the brain. Initially in diagnosing, the brain form is managed and checks the abnormalities. The second step includes segmentation that is morphological operation. Due to the composite structure of the brain, it is important to detach the tumour. The criterion for the removal of the tumor includes configuration, form, dimensions and image position. Image processing is an approach which is used for conversion of a picture into digital format. And then some tasks are carried out to get a preferable image data. In this task an image is inserted and proper algorithms are performed. The output can be anything like a picture or data. Image processing is a less time-consuming technique. One of the important steps in image processing is segmentation in different parts of an image. Each part provides useful information. Hence it is dominant to segmentize the fringes.**

***Keywords*: MRI, Image segmentation, Brain tumour detection.**

1. Introduction

The manufacturing of cells, which are not normal in the brain, is named as brain tumor. Magnetic Resonance Imaging is commonly used by doctors for analyzing the construction of the brain internally. The type of the abnormal cells and the stage is determined by the magnitude and position of brain tumor inside the brain. The human brain consists of two types of cells such as glial and neuron cells. Neuron cell controls the role of the brain and the nourishment is provided to the neuron cells by the glial cell. There are different methods used for the image segmentation using MRI scans which would be discussed in this paper.

A. Image Segmentation

Image segmentation is a technique which is used to abbreviate the picture from the first stage segmentation mainly focusing on the shape and colors. There are different methods used for the segmentation such as

1. Threshold-based image segmentation
2. Region based image segmentation
3. Fuzzy Theory -Based image segmentation
4. ANN based image segmentation
5. PDE based image segmentation

1) Threshold based image segmentation

Thresholding converts a scalar image into a binary image and a threshold value is given. This value is given based on the intensity of the image. The foreground (white pixels) and the background region (black pixels) are separated by giving the values 0 and 1 to the images based on the threshold value. Threshold can be of two types Global or Local. A global threshold is a process in which a lone threshold number is used for the whole image. While on the Local threshold, a distinct threshold value is used for the dividing of the images from the original picture.

2) Edge based image segmentation

Edge detection recognises the picture by estimating the magnitude of the form. The important process in the division is the spotting of the blade. There are two approaches for recognising the blade: Gray histogram and gradient.

3) Region based image segmentation

This method is used to segment homogenous regions of the images which has the same intensity value. This method can be applied to any shape of the images. It gives a speed point to every region. Pixels that are kept in touch with identical items are classified for division or the decomposition are done using this method. The region-based segmentation protects the threshold method. The boundary for partition is defined as fringe pixels.

4) Fuzzy theory-based image segmentation

Authentic information from all the pictures can be prepared using a fuzzy theory approach. Image noise can be reduced by Fuzzy.

5) ANN based image segmentation

ANN stands for Artificial Neural Network. ANN works on the basis of imitating the behavior of the neurons in the animals. Artificial neurons transmit the processed input signals within one another. This signals are traversed through the multiple intermediate hidden layers between the connection. ANN generates the output as non-linear function of the sum of the inputs. JSEG algorithm is taken for the preparation of image segmentation with ANN for the picture identification.

6) PDE based image segmentation

For the picture segmentation, Partial differential equations are commonly performed. Active Contour patterns are used for the division process. The issues related to the enhancement of the image are transformed into PDE using contour.

*Corresponding author: josmy.mathew@saintgits.org

7) k-Nearest Neighbour image segmentation

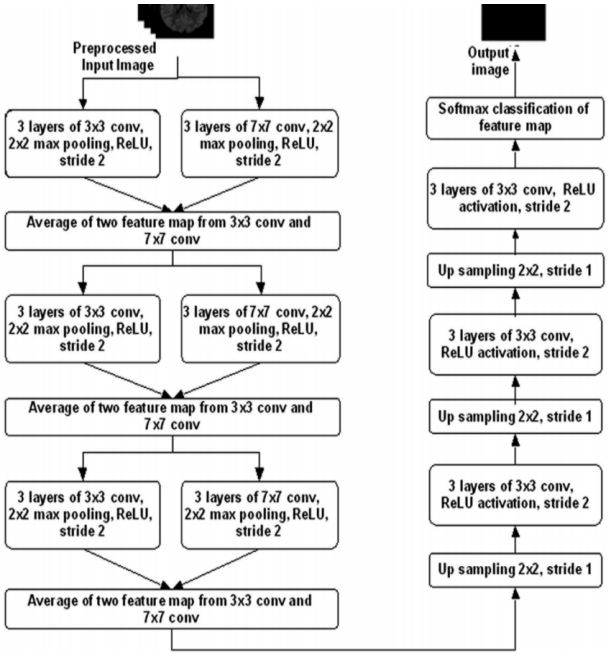
This is a memory-based learning algorithm. In this method, we compare the labelled samples and unlabelled samples in the training set. There are two stages in this method. In the first stage, nearest neighbours are identified and in the second stage the label or class is determined.

B. Di-phase midway convolution and deconvolution network

Di-phase midway convolution and deconvolution network can be used for novel automatic image segmentation techniques. It has three blocks for down sampling and upsampling layers for each convolution and deconvolution methods. In the first block, each input has two paths with 3 × 3 and 7 × 7 kernels. They are used to produce different feature maps. Their mean value is processed for upcoming blocks. Convolutional neural network (CNN), check image patches for performing image segmentation.

C. Di-phase midway convolution and deconvolution architecture

The CNN extract complex features of the input image in hierarchical order. All input images are 3D and are of the dimensions N × M × R, where N, M, and R are the width, height, and number of slices, respectively. There are four different modalities namely, FLAIR, T1, T1c, and T2 for each voxel.



Detailed architecture of di-phase midway convolution and deconvolution network

Fig. 1. Architecture of di-phase midway convolution and deconvolution network

1) Downsampling layer

There is a downsampling layer in which the preprocessed image is convoluted. Here we use a formula for finding the featured maps: The output feature maps from microkernels Ymic and larger kernels Ylar is achieved by combining weight w with input x and bios b of the input image.

2) Upsampling Layer

The up samplings layer expands feature dimensions to get the original size. Tumoral features can be extracted by processing a stock of convolution and deconvolution blocks.

3) Softmax Classification

Softmax Classification categorically distributes the final extracted output over the class labels. Through the minimization of the loss function, the accurate class labels are segmented.

4) Calculating the loss function

The measurement of errors between predicted output and targeted output is called loss function. The most commonly used loss function in deep learning is the Cross Entropy(XE).

5) Performance Evaluation

Pixel by pixel comparison between the segmented region and ground truth labels is used for the performance evaluation. The evaluating values are Accuracy, Dice score or Dice Similarity Coefficient (DSC), and Sensitivity values.

6) Tissue-type mapping

There are two types of tissues incorporated with the image of the brain namely tumor tissue and normal tissue. The tissue proportions and their pixel distributions of the brain image can be estimated using tissue-type mapping.

D. Gabor filter method

The manufacturing of huge amount of cells in brain is called brain tumour. The doctors usually prefer Magnetic Resonance Imaging for the visualisation of the tumor. The tumor that occur in the spinal cord or the brain is termed as Glioma. There are two different types of Glioma Low grade and high-grade Glioma.

LGG spread leisurely but HGG spread faster. Through brain tumour segmentation the tumor that is founded can be seen differently. For examining the core shape of the MRI is used because of non-ionising, non-invasive and good spatial and temporal resolution.

The two different types of cells in the brain are Glial and neuron cells. The division of brain tumor is done in different stages such as segmentation and classification, pre-processing feature extraction.

The pre-processed image is inserted to the segmentation that divide the image. Manual segmentation, semiautomatic segmentation is different are various types of technique for medical imaging. After the image segmentation the techniques are drawn out.

There are different tasks for extraction,

- GLCM for statistical texture features,
- CNN extractor
- DWT for texture feature

These extracted features for division and segmentation of images. The different types of techniques used for classification are SVM, random forest, logistics regression. The different methods for segmentation of the brain tumor are Threshold-based, boundary-based and region-based. Brain segmentation can be done using Machine Learning. In advanced system brain tumor division task and image segmentation has been done on MRI images.

There are different steps for image segmentation and division.

1. 1.Feature Extraction
2. 2.Feature selection
3. image segmentation
4. image classification.

1) Feature extraction

This method reduces the time of difficulty in division of image. This feature is used for solve the difficulty. MRI images get reacted at different pixels which changes the applied by Gabor filter method.

2) Feature selection

Result of the segmentation can be improved by Feature Selection. In this type of selection, the features are alike related. The advanced system checks same characteristics.

3) Segmentation

This technique use division based on pixels and the pixels are grouped. The forest classifier uses the method of grouping the pixels of the image pixels and produce an image with division.

4) Classification

In proposed method the images which are segmented are used in image grouping The grey-level co-occurrence matrix has been used for taking the numerical features of the images.

2. Experiment Results

The present model uses random forest for the division of the image. The precision can be calculated with dice score.

Brain tumor division or the segmentation is arduous and takes a lot of time. Deep learning is a systematic method yet it takes huge amount of power. The image can only be grasped with help of image segmentation. For instance, classification of tissue, identifying tumors, studying about blood cells, surgical planning. The precise and quantity of the tumors are identified and are important for diagnose. The brain tumor is a termed as an unusual extension of a section in the brain. The MRI is considered to be a workable for studying the brain tumor in the human body. MRI gives a complete picture for the examination of the human body. MRI images gives the important data about the location and about various tissues in the part of the human body. The weighted images are used to analyse the types of tumor. The contrast material inside the weighted pictures is used to border of the tissues which are not abnormal. The flair which is used in weighted scan shows axial.

3. Conclusion

This paper actually describes the image segmentation techniques and methods. The colorimetric analysis with dissimilar values between different methods aid the reviewer to put a supervision to evolve an extent the research.

Acknowledgement

We would like to express our sincere gratitude to Ms. Josmy Mathew and all other faculty members from Department of Computer Applications, Saintgits College of Applied Sciences, Pathamuttom for making the paper completion done successfully.

References

[1] Anurag Goswami, “An Analysis of Image Segmentation Methods for Brain Tumour Detection on MRI Images.”
[2] P. L. Chithra, “Di-phase midway convolution and deconvolution network for brain tumour segmentation in MRI images.”
[3] Umang Jitiya, “Brain Tumour Segmentation and Classification of MRI images using Gabor Filter method and machine learning.”
[4] Mehul Parikh, “Brain Tumour Segmentation and Classification of MRI images using Gabor Filter method and machine learning.”
[5] Anjali Wadhwa, Anuj Bhardwaj, Vivek Singh Verma, “A review on brain tumor segmentation of MRI images.”