A Review Paper on Detection of Brain Cancer Through Image Fusion By Using Image Segmentation

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Abstract- *This paper introduces the detection of brain cancer through image fusion by using image segmentation. Brain is important part of human body. Already, various algorithms are develop for image segmentation .This paper deals with mainly two segmentation algorithm such as expectation maximization algorithm and watershed algorithm. The expectation maximization algorithm is used for finding maximum likelihood estimation of model parameter and watershed algorithm is used for searching region having high accuracy. Both the algorithm is used for finding gradient of an image .The methodology consist of four steps : image acquisition, pre-processing, segmentation, post-processing.*

Keywords- Image fusion, Image segmentation, Expectation Maximization Algorithm (EM).

I. INTRODUCTION

Brain is one of the largest and most complex part of human body .brain is a very special and sensitive organ of human body. Brain cancer is a disease of the brain in which cancer cells (malignant cells) arise in the brain tissue .cancer cells grow to form a mass of abnormal growth of cancer tissue (tumour) in the brain or around the brain that interferes with brain function such as muscle control, sensation ,memory and other normal body function. Tumor composed of cancer cells are called malignant tumor cell. The malignant tumor cell can penetrate and destroy adjacent tissue and can metastasize or travel through the circulation to distance part of body from new tumors .and the second one is the tumor composed of non - cancer cells are called benign tumor. The benign tumors do not spread to other part of body. Image fusion is the process of combining two or more image into single image .the resulting image is more informative than any input image .Image fusion are mainly used in medical image in which some part of image cannot clearly visible so to obtain clearly and more informative image visible image the image fusion is used.

II. LITERATURE REVIEW

There are various method used for detection of brain cancer by using image fusion. Many of the researchers proposed many methods. Rohit Kempanna Atyali,

Shivchandra R Khot [1], Ashishgoud Purushotham , G. Usha Rani, Samiha Naik [2],Yong Yang [12]. They Presents the novel technique for detection of brain cancer by using discrete wavelet transform (DWT) .In discrete wavelet transform the wavelet are discretely sampled. This method is used for transformation of frequency and time information of digital image into wavelet.

Rohit Kempanna Atyali, Shivchandra R Khot [1], Ashishgoud Purushotham , G. Usha Rani, Samiha Naik [2], Amarjot Kaur, Sunil Khullar [3], They explain about the other method for detection of brain cancer such as principal component analysis (PCA).This method is used to indicate similarities and difference within the given set of data. It is used in the application where large data set is present .The data can be analyze in such a way that it will focus only similarities and difference without much noise or loss of information. The advantages of PCA are low sensitive to noise, high efficiency, the requirement of capacity and memory is less. Along with advantages there are some disadvantages such as lack of redundancy of data, complexity in image is less, because of maximum variation reduction in noise.

Amarjot Kaur, Sunil Khullar [3], they explain about Histogram Equalization this method is used for adjusting image intensities to enhance the contrast of image. It is also useful in image with background and foreground that are both bright or both dark. The advantages of this method is straight forward .There are also some disadvantages of this method is that because of increasing contrast of background noise there is chance of loss of usable signal.

Bin Luo, Muhammad Murtaza Khan, Thibaut Bienvenu, Jocelyn Chanussot, Liangpei Zhang [13],They explain another important method of brain cancer detection by using image fusion for pan sharpening of remote sensing .It is process of merging high resolution panchromatic and low resolution multispectral image to create single high resolution colour image. There are various pan sharpening method. First one is AWLP (A tours wavelet transforms based pan sharpening). This method is used for extracting high resolution image from pan image. The second method is context-adaptive

a tours wavelet pan sharpening. This method is used for determining fixed size window .while determining the model this method do not consider the information about the size of object or region.

Gopi Karnam and Ramashri Thirumala [15] both the author gives detail information about the detection of brain cancer through image fusion by using computer aided detection tool. This tool is used for analyze and classify the specific feature of image .this tool support different file format such as standard file format which consist of .jpg, . bmp and .tiff file format .and DICOM format nothing bust digital imaging and communication in medicine. Is a standard for handling, storing, printing and transmitting information in medical image.

Also there are various method used for detection of brain tumor in that Deepa and Akansha Singh [5], Rajeshwari G Tayade , Miss. P. H. Patil , Miss. Prachi A. Sonawane [6] They all are explain about the Magnetic resonance Imaging (MRI) . This method is able to visualize the detail of internal structure.MRI image observe different soft tissue of the human body and is capable to contrast between these tissue. MR has given better result than other medical imaging.

Ehab F. Badran, Esraa Galal Mahmoud, and Nadder Hamdy [7] They explain the Feature extraction method for detection of brain cancer .This method is used in image processing to detect the various desired portion of a digital image or video stream .this is also used to get most important feature of image by reducing it's complexity.

The method is detection of brain tumor by using adaptive filtering. there are various adaptive filters are used. Minu Samantaray, Millee Panigrahi, K.C. Patra, Avipsa S.Panda, Rina Mahakud[8] , they give brief overview of various adaptive filter such as mean filter, median filter, homomorphic filter. Mean filter: this filter take average value of pixel. It is very simple and easy method for implement. It is used to reduce intensity variation between one pixel to next pixel and also used to reduce noise in an image. This filter mostly reduces Gaussian noise . The result produced by this filter is distorted boundaries and edge. Second is Median filter: This filter is based on median value of pixel .median filter is widely used in image processing because it is simple filter and it reduces noise very easily. It is mainly used to remove salt and pepper and impulse noise. The result produced by this filter is preserve boundaries and edges. The third filter is Homomorphic filter : This filter is used for removing multiplicative noise in an image .It is used for improving appearance of an gray scale image by intensity range compression and contrast enhancement . Vipin Y.

Borole , Sunil S. Nimbhore, Dr. Seema S. Kawthekar [10]. They proposed about the various de-noising filters such as The fourth filter is Wiener Filter: the wiener filter is based on inverse filtering in frequency domain. It is used for removing blurring effect in an image .The speed of wiener filter is slow because it is working in frequency domain. The fifth filter is Hybrid filter: This is the combination of median and wiener filter. It is used for removing blurring effect and impulse noise in an image .It is complex and time consuming. The sixth filter is Modified Hybrid Median Filter: This is combination of Mean and Median filter. It is used for removing salt and pepper noise and Gaussian noise. Computation time modified hybrid median filter is more than median filter. Anupuraba Nandi [11] explains about High-pass filter: In an image if there is some sort of noise is present the image is not clearly visible so as to remove noise present in an image this filter is used. It is also used to amplify noise and provide sharpness to an image.

Ahmed KHARRAT , Nacéra BENAMRANE , Mohamed ABID ,Mohamed Ben MESSAOUD [9] , Anupuraba Nandi [11], Gopi Karnam and Ramashri Thirumala [15] They explain the K-means clustering method. This is unsupervised classification algorithm. In K-means group is done by minimizing the distance between data and cluster centroid. The K-means clustering is used for separating different intensity pixel into group of pixel having similar characteristics.

Sangeeta Sehrawat, Ritu khatri [4], Rajeshwari G Tayade , Miss. P. H. Patil , Miss. Prachi A. Sonawane [6] They explain detail study of Fuzzy C-means. This method is used when one piece of data belongs to two or more cluster. for accurate shape extraction Fuzzy C-means clustering is used .This clustering method is more normal than hard clustering It has long computational time , sensitivity to noise .

Rajeshwari G Tayade, Miss. P. H. Patil , Miss. Prachi A. Sonawane [6], They explain the proximal support vector machine. This method is subpart of support vector machine .It is used for automatic brain tumor detection. It provides high accuracy and less error .complexity reduces. It is very fast and simple algorithm. Instead of dividing the space into disjoint region for each class the point is assigned to proximity to the hyper plane.

III. WRITE DOWN YOUR STUDIES AND FINDINGS

The Implementation of Expectation Maximization Algorithm and Watershed Algorithm are as follow.

There are various segmentation technique used for detection of brain cancer such as thersholding method, k-means clustering, Fuzzy c- means clustering, region based segmentation, edge detection method etc .In this paper two segmentation algorithm are used Expectation maximization algorithm and watershed algorithm.

The first step is image fusion in which the database of CT and MRI image is used .After certain fusion rule is applied on the coefficient of different part of input image. After the fusion rule CT and MRI images are sent to image acquisition block .The function of this block is to create photographic image .

Pre-processing:

The next block is pre-processing. After image acquisition the Photographic image is Pre-processed. Pre-processing is used for improvement of image data that suppress the unwanted distortion or enhance some image feature for further processing .In that pre-processing two part is used gray scale conversion convert colour images into black and white format .which is also used for detecting only intensity information .In gray scale conversion the black image is weakest in intensity and white is strongest in intensity .And the second part is trilateral filter.

Segmentation:

After pre-processing the next step is segmentation. In that the Pre-processed image is given to segmentation block the basic Function of image segmentation is partitioning of image into multiple segment. The segmentation is used to simplify or Change the representation of an image into something that are more meaningful and easier to analyze .The segmentation is usually used to locate the object and boundaries of an image. There are two algorithm is used for image segmentation.

Expectation Maximization Algorithm:

This algorithm is mainly used for finding the maximum likelihood estimation for model parameter when your data is incomplete, has missing data point or hidden variable. This algorithm is used for finding gradient magnitude of image. When there is change in intensity occur border is extracted from image. This algorithm is used only when there is small percentage of missing data and dimension of the data is not so big .If the dimension of data is larger the expectation algorithm is very slow. In this algorithm filtering process is used mainly high pass filter is used because the high pass filter is used for border extraction there are various high pass

filter is used such as adaptive filter,LOG,laplacian ,gradient filter , canny edge detection etc .when the border extracted from an image the this is shows that the tumor is detected. Once the tumor is detected the data base is save.

Watershed Algorithm:

The next segmentation algorithm is watershed algorithm. This is very powerful algorithm used for image segmentation .It is region based approach and search for pixel and region similarities. The watershed segmentation is usually applied to gradient of an image rather than the image itself .the main goal of watershed segmentation is to search for region of high frequency gradient that decide neighbour local minima. Steps in watershed Algorithm

1. Read in an image and convert it in gray scale
2. Use the gradient magnitude as the segmentation function
3. Mark the foreground objects
4. Compute the background markers
5. Compute the watershed transform of the segmentation function
6. Visualize the result

In this algorithm for filtering process mainly high pass filter is used because the high pass filter is used for border extraction there are various high pass filter is used such as adaptive filter,LOG,laplacian, gradient filter ,canny edge detection etc. After filtering the thersholding is carried out .Thersholding is mainly used for convert gray scale image into binary image .In which the two level are assigned usually that is the pixel is above or below the specified threshold value .when thersholding is done we come to know about exactly what is losing or what is getting extra from background pixel. Once the thersholding is done watershed segmentation is used to partitioning of digital image into multiple pixel. After this binary masking is used for changing one or more bit from 1 to 0 or from 0 to 1.generally masking is nothing but adding process .masking should be done based on intensity value for background the 0 mask bit is used and for foreground 1 mask bit is used. And finally when border is extracted from the image the tumor is detected.

Combined analysis:

After combining the two algorithm some analysis is made based on the feature, size of tumor cell, colour, level of tumor, density detection etc.

Accuracy detection:

Finally accuracy detection is done based on entropy, change in intensity of image etc.
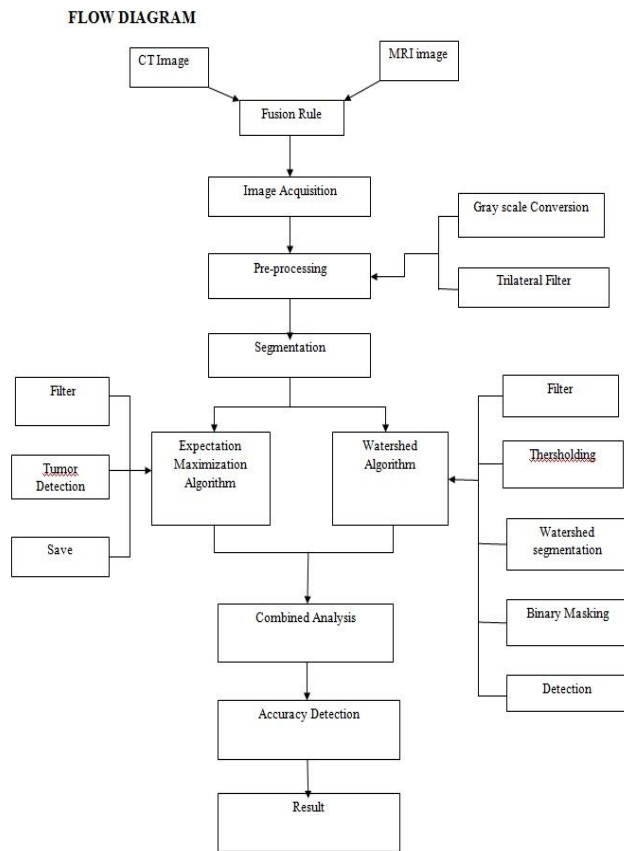
FLOW DIAGRAM

Fig 1: Implementation of Segmentation Algorithms

IV. CONCLUSION

This paper gives brief overview of various method used for detection of brain cancer. But mainly focus on detection of brain cancer through image fusion by using image segmentation. There are two image segmentation algorithm is used such as Expectation Maximization Algorithm and Watershed Algorithm. Both the algorithm is used for finding gradient of an image .The watershed is effective algorithm as it split in the basis of edges .Both the algorithm is very simple. for implementation and it should be done in minimum iterationimportance of the work or suggest applications and extensions.

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