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Brain Tumor Segmentation Using Biography Based Neural Clustering (BBNC) And Genetic Processing For Medical Images

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***Abstract*—This research shows the segmentation of medical images. The segmentation of the medical images (MRI, CT) or can say for extracting a particular region of tumor in the medical images is a challenging task in medical field. Computed Tomography (CT) and Magnetic Resonance Images (MRI) are the high resolution strategies to locate the brain tumor. That is why to apply the soft computing methods on CT and MRI is complex and time consuming process. This paper presents the survey for different types of segmentation techniques and propos a new technique named biography based neural clustering (BBNC). In the proposed methodology the arrangements of different tissues with high complexity can be observed by applying preprocessing methods and genetic filtering etc. Then it will demonstrate the output of the proposed genetic filtering. By applying the clustering system on the MRI and CT, the mapping of tumor and malefic tissues can be done. This system also can be used for genetic bounding to find the area and pixel based concentration of the required region by applying the biography based neural clustering and genetic processing on that images. This research will presents an extension to the existing segmentation algorithm that modifies the deformable registration of pre operative and post-recurrence brain MRI scans. The new technique handles different sorts of pathology, space-occupying mass tumors based on details varying due to contrast and non-contrast imaging, noisy environment, low quality resonance and sampling effects.**

Keywords—Medical Images,Segmentation Techniques, Image Analysis and preprocessing, genetic processing, neural clustering.

I. INTRODUCTION

Brain tumor is extremely dangerous ailment to people because of which demise may happen. Brain tumor is created by irregularity of cell division in brain. Brain tumors are ordinarily sorted into two type primary brain tumor and secondary brain tumor [1]. When the abnormal growth of cells starts in brain and do not spread into another part of the body is known as primary brain tumor, Primary brain tumor can be benign or malignant. When cancer cells spread to another part of the body they are called secondary tumor or metastases. This type of brain tumor is dangerous and is one of the real reason for death in individuals [2]. In medical field for making easy to detect the tumor accurately there are image segmentation methods. In medical field image segmentation method is very useful to find the exact area of tumor, type of tumor and for more details regarding the tumor region. **Image segmentation** techniques used to subdivides an image into its constituent areas or objects. This technique is also used to collect the pixels together that have comparative properties or have similar attributes [3]. **Biography based neural clustering** (BBNC) is used to get the details of the particular region, extracted from the medical images. BBNC is useful to select the clusters of particular image to detect the tumor based on color efficiency etc. In the first phase, the brain image is acquired from patient's database and in the next phase, clustering is applied along with genetic algorithm with various stages selection. Crossover and mutation are the genetic operations performed on the clustered image to produce required results. The initial population set of brain tumor image is quite large but by applying clustering and genetics, the population set reduced as per iteration. For this purpose MRI's and CT scans (medical images) is used for tumor detection using Genetic Algorithm and Neural clustering (GANC). GANC is used to reduce the selected area of brain where the chances of tumor is more in accurate form. The significance of Image segmentation can't be deserted because it is used in approximately every field of science. For the removal of noise from an image, medicinal images, dependency imaging, machine vision, computer vision, biometrics, and military etc there is different segmentation methods. For Image Retrieval, extract features and recognize substance from the given image there is different methods. This is also very tricky task to find a segmentation technique for exact type of image because a method practical to one image may not remain victorious to other type of images. So, different types of segmentation methods are using for different type of images for better results. **Therefore segmentation method has been separated into three types**:

- Segmentation method based on standard method

- Artificial Intelligence (AI) techniques
- Hybrid techniques

Number of the most well-known image segmentation methodologies are:- The image segmentation methods are mentioned in fig1 like Edge based segmentation, Fuzzy theory based segmentation, Partial Differential Equation based segmentation, Artificial Neural Network bases segmentation, threshold based image segmentation, and Region based image segmentation [5]. It contains significant and illustrious image segmentation method used for the multiple types of images.

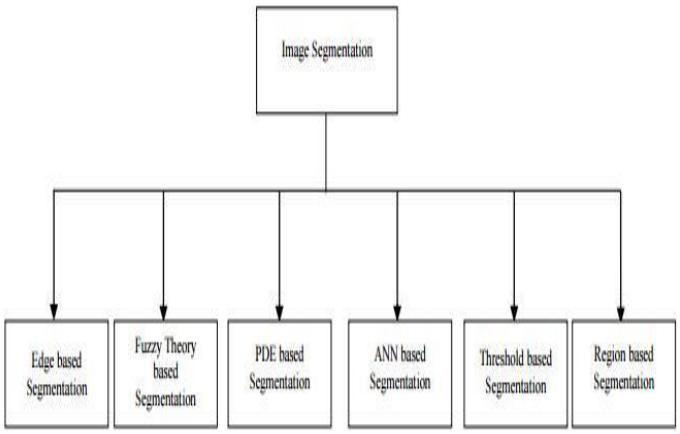

Fig. 1 Types of image segmentation

II. LITERATURE SURVEY

In literature survey the latest study based on medical image segmentation has been reviewed below for enhancement in previous work. Previous methods having some problems with segmentation will resolve in this research.

Waseem Khan et al [2013] This described the Image segmentation is a method used to separate an image into numerous segments. It will make picture flat and easy to assess. Segmentation process also helps to find region of curiosity in the medical image. The chief aim of this research is to extract the required features of the images. Existing segmentation technique can't please all type of images, So this review addressed a variety of image segmentation techniques, evaluate them and present the issue interrelated to those technique [6].

Prof. Dinesh D. Patil et al [2013] This paper described as image segmentation is the most important and vital process for the definition and description of regions of interest in any medical image. The physical segmentation of medical image by the radiologist is not only a deadly and time consuming process, but also not very precise. The growing medical imaging modalities and uncontrollable quantity of medical images that need to be examine also needs enhancement for this work. It becomes therefore essential to review current methodologies of image segmentation using automated algorithms. Automated algorithm use to correct and necessitate the user communication for medical images [7].

Feng Zhao and Xianghua Xie et al [2013] In this paper Image segmentation is define as partition an image into a limited number of semantically non overlapping regions. In medical application, it is a primary process in most of the systems that hold up medical diagnosis, surgical planning and treatment. Normally, this process is done physically by clinicians, which may be time consuming and tedious. This method is also used to lessen the dilemma, a number of interactive segmentation methods are discussed in the literature [8].

P. James et al [2014] This research presents an accurate list of methods and summarize the broad technical challenge faced in the field of medicinal image fusion. This research distinguish the medical image fusion investigation based on the extensively used image fusion methods, imaging modalities, and imaging of organs that are below study. The fusion of medical images has prove to be helpful for advance clinical consistency, medical diagnostics, analysis and technical regulation that has the potential to considerably grow in the impending years [9]. Literature review point to the significance of this research is in the medical services such as diagnosis, monitor and analysis. Although, there has been important progress in the medical image combination research, the application of the general fusion algorithms is limited by the practical experimental implication imposed by the medical experts. The top factors for segmenting the image remains a demanding problem in image processing and processor vision and is still a pending trouble in the world.

PROBLEM FORMULATION

As per the survey of literature and base approach of the main issue in the image segmentation process is the extraction of brain tumor with at most precision when the condition of brain is very critical. When the tumor development is within the soft tissue of the brain, the previous techniques rise to the problem of efficiency for extraction. So in this research the main issue is to extract the region of hard mass from the MRI image of the brain tissue and to segment the medical images accurately.

After combining the image segmentation based on fragmental classification with a genetic process in an artificial environment has been shown to significantly increase in efficiency and reproducibility. By using a differential geometric model of segment portions and image registration to gather initialization of probability density functions of spatial constraints is estimated. A strong spatial processing with thresholding prevents segmentation of areas that are not part of the process. In practical applications, there is need to encounter new objects that cannot be modeled with regional

intensity changes of existing image information that is not known by the model.

OBJECTIVES

- The selection of MRI from the database and implementation of edge distortion filter for all the images.
- The distortion will be removed using diffusion tensor filter. (Usage of filters is to uplift the image details).
- Then extraction of segmented part will be done on the basis of region of interest. (Extracted part will be subjected to parameters, performing pre process and calculation on the images for detail information is known as Biography of images to be processed, so process named as Biography Based Neural Clustering (BBNC)).
- Then there will be initiation of genetic process to make the clusters based on colour and contrast etc. The selection of the initial values for process gene values, propagation values, duplicating gene detection.

METHODOLOGY USED IN RESEARCH:- GENETIC ALGORITHM

The genetic algorithm is a global search method which helps to encounter the required information and analogy the natural biological evolution. Genetic algorithm operates on a population of potential solution by applying the principle of survival of fittest to produce better approximation of solution. . At each generation, a new set of approximation is created by process of selecting individuals according to their level of fitness in the problem domain and breeding them using operators borrowed from natural genetics. This process leads to the evolution of individuals that are better suited to their environment than the individuals that they were created from, just as in natural adaptation. The genetic algorithm solves optimization problems by mimicking the principles of biological evolution, repeatedly modifying a population of individual points using rules on gene combinations in biological reproduction.

Due to its random nature, the genetic algorithm improves the chances of finding a global solution. It helps to solve unconstrained, bound constrained and general optimization problems, and it does not require the functions to be differentiable or continuous.

Formulation of Genetic Method

In the genetic segmentation process the selection of the different energy based area to specify the convergence and growth of the genetic system. The genetic model uses growth propagation in terms defining *F*. [8]

The propagation requires incorporating a regulated energy ("internal") and energy to stop the growth of region at edge points ("external").The curvature plotting function is dependent on speed $F = F(k)$, for example, $F = -k$. To get a **growing force** there is need to add a constant term F_0:

$$F(k) = F_0 - k$$

So this research only concerned with the edges-stopping or terminating.

$$g(x,y) = \frac{1}{1+\left|\nabla G_\sigma * I(x,y)\right|}$$

This function is inverse of a gradient filter. Therefore it approaches zero when it encounters an edge, bringing the growth velocity to a halt. And also smoothing by a Gaussian based filter helps speed up processing by neglecting weak edges. Together there is a incorporating equation:

$$\phi_t + g(x,y)(F_0 - k)\left|\nabla\phi\right| = 0$$

Incorporating the equation for the curvature *k* :

$$k = div\left(\frac{\nabla\phi}{\left|\nabla\phi\right|}\right) = \frac{\phi_{yy}\phi_x^2 - 2\phi_x\phi_y\phi_{xy} + \phi_{xx}\phi_y^2}{(\phi_x^2 + \phi_y^2)^{3/2}}$$

And changing the sign F_0 (which can be positive or negative), the final level of the modeled region growing as a PDE is:

$$\phi_t = g(x,y)\left|\nabla\phi\right|\left(F_0 + div\left(\frac{\nabla\phi}{\left|\nabla\phi\right|}\right)\right)$$

These equations help to find the level of growing region of tumor, and also to encounter an edge based on different parameters.

RESULTS

The extracted region of tumor in the MRI based on genetic processing is very crucial for further processing of image properties. Therefore region of interest is very important step, which made the genetic processing easy and time saving. So, in these results the region of interest plays an important role to enhance the quality of image properties and register that properties for further processing.
In the results given below, the region of tumor area is extracted by applying the pre processing, filtration, thresholding etc.

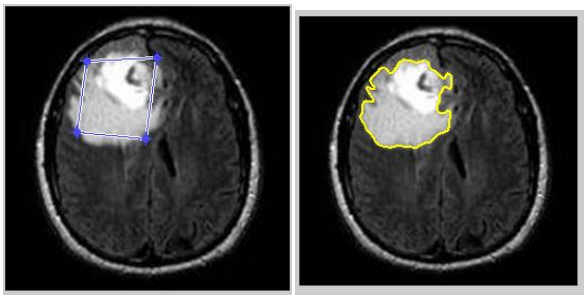

Fig. 2 Results for Base Filter under 100 Genetic Detection Runs

This fig 2 shows the results taken by using the previous Method describe in POTAR. Under the 100 genetic runs as the result shows in base paper. Here, only three parameters have been used to show the difference between base and proposed technique i.e area, no. of iteration and pixel difference value.

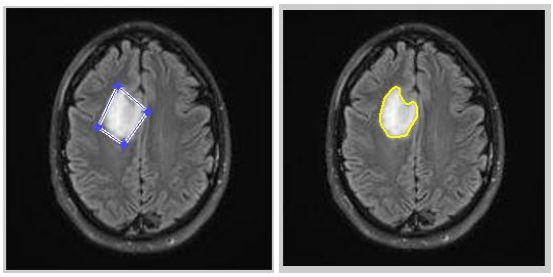

Fig. 3 Results for proposed filter under 100 Genetic detection runs

This fig. 3 shows the results as per requirement of proposed technique. In which the result for 100 genetic runs has been taken on the segmented medical image. As results shows the difference between these two methods is the size of the **area** of segmented part is less as compare to base approach and **pixel difference** between these two methods is varying by applying the equal no. of iterations.

There are three parameters in the table area, no. of iterations and pixel difference are mention in the table. As per requirement to compare the base and proposed technique the no of iteration remain same but the value area and pixel difference is varying. The values are given below in the table.

Results	Area (mm)	No. of Iterations	Pixel Difference
Base	**42.88**	**100**	**4288**
Proposed	**65.55**	**100**	**6555**

Fig 4 Area and Segmented pixel difference

CONCLUSION

The proposed model seems to be a promising and feasible approach to perform the task of detecting arbitrary shapes in the medical images with a minimum prior. The performance for given image samples was satisfying. Traditional models were very easy to use but they did not detect boundaries very accurately. On the other hand proposed algorithm was able to detect boundaries well and will be enhanced with image blending to prove the effectiveness of the technique in real applications.

Further, this work can be stretched out to the more arrangement of medical images in medical field. This procedure may be applied on genuine arrangement of learning which contain high balanced pixel thickness with the help of neural clustering.

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