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A NOVEL APPROACH FOR DETECTING TUMORS AND BLOOD CLOTS IN BRAIN

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ABSTRACT

The modern day of the medical research is having more challenges in brain tumor and clot detection within MRI (Magnetic Resonance images). The processing over medical images is being used for identification of the inner part of human body. The existing technique is not completely producing better output over the pathological cases and increasing performance of the tumor detection but not implementing detection system with blood clots. Proposed technique is considering over the identification of brain tumor within the blood clots by using Otsu and cuckoo algorithm used to detect the blood clots and brain tumor. The simulated result is producing better output for demonstrating the efficiency of brain tumor by localizing the tumor identification approach and the motivation towards for extending the tumor identification framework for several types of tumor with medical images.

Keywords: brain tumors, blood clots, cuckoo search (CS) algorithm, OTSU, magnetic resonance images (MRI).

INTRODUCTION

The medical images are being referred over the process and techniques for producing the various segment of human body images over clinical propose. The images quality is also playing a very crucial role in the image processing over medical field. The successful diagnoses of the images are depending upon the segmentation and accuracy algorithm [1]. The MRI has been used over the scanning of images for obtaining the high image quality. The image quality has been considered a important factor over the identification of brain tumor which provides unparalleled view of the human body [2]. The identification of the blood clots and tumors has been located primarily in different organs of the primary tumors. The secondary tumors are processing over the metastatic factor of brains that have been invaded within brain cancer or tumor which is leaking from the primary tumor and blood vessels of the lymphatic system [3]. The circulation processes of the blood vessels are being caused for the abnormal cell formation within brain vessels. The clots of bloods are masses of semi-solid blood. Normally, the flows of bloods are freely moving through arteries and veins [4]. The coagulation and blood clots are necessary for evaluation of different condition depends upon the blood clots type and the clots location. The proposed technique is providing the clot caused and factors which performing the examination over physical standard [5]. The previous techniques are completely not producing better identification of brain tumor and clots; those are based on the computational methods depending upon histogram threshold for segmentation of images for transformation with discrete wavelet by extracting features by PCA (Principal Component Analysis) for reduction of wavelet coefficient dimensionality and feeding over the forward and back propagation over the classification of neural network for identifying abnormal and normal behaviors [6]. The proposed techniques Otsu and Cuckoo Search both algorithm have been proposed for pre-processing, segmentation, filtering. The pre-processing has been used for reducing the noise from MRI images [7]. The technique has been proposed over the tumor detection and clots identification primarily motivated by possible maximum accuracy and efficiency. The process is proposing pre-process, filtering and segmentation within Otsu algorithm and identification section with Cuckoo Search.

2. LITERATURE SURVEY

An automatic detection system and technique for brain tumor by localizing the framework which is localizing and detecting the brain cancer or tumor within MRI was proposed by Ed-Edily Mohd. Azhari1, Muhd. Mudzakkir Mohd. Hatta and Zaw Zaw Htike (2014) [7]. The proposed technique for localization and detection of brain tumor is doing five consecutive comparisons such as pre-processing, acquisition of image, histogram clustering, morphological operations, edge detection and histogram clustering. They had used 50 neuro images for system optimization out of 100 neuro images sample for testing the system. The proposed technique of tumor localization and tumor identification is being found for localization and accurate detection of brain tumor. However the proposed technique is not able to identify the blood clots over the identification of brain tumor.

A technique within the computer operative system, which playing a crucial role for identification of brain tumor and analyzing the various diseases was proposed by Mrs. K. Padmavathi and Ms.C.Megala (2015) [8]. The MRI (Magnetic Resonance Images) is having a important role in any researches over brain tumor identification because of the clarity in images. The processing of the brain tumor has been done for obtaining the filtered images within the pre-processing step and being provided input as on the tumor area. The filtering and segmentation technique is being used for removing the noise for obtaining clear image by Norhashimah Mohd Saada, Syed Abdul Rahman Syed Abu Bakarb, Ahmad Sobri Mudac and Musa Mohd Mokjib (2015) [10].

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However, the proposed system is not able to produce better result by just filtering process of the input image. The input image is not being filter before or in the pre-processing step.

An image segmentation technique that playing a crucial role over the facility of medical image and region of interest was proposed by Mrs. V. Hemalatha and Poojya P M (2014) [9]. The proposed objective of the segmented project is being considered within the matter of gray and white within MRI brain images.

A diagnosis process for identification of brain tumor, cancer and lesions as infection, tumors and stroke was proposed by Norhashimah Mohd Saada, Syed Abdul Rahman Syed Abu Bakarb, Ahmad Sobri Mudac, and Musa Mohd Mokjib (2015) [10]. The (DWI) Diffusion-Weighted imaging with magnetic Resonance Images are being recommended clinically differential diagnosis and detection of lesion and different brain diseases.

3. PROPOSED WORK

The algorithm nature enthused has been used for optimization with more potential, the proposed algorithm CS (Cuckoo Search) is providing the efficient solution for several issues. The Cuckoo Search and the application of Cuckoo Search are segmenting the brain tumor within MRI (Magnetic Resonance Images). If brain images are having any region of tumor then that particular region need to be processed. The detection of brain tumor, an algorithm has been applied for better filtering accuracy that is median filtering for identifying the brain tumor. The median or neighborhood filtering process is identifying the centre point and performing an operation within the predetermined pixel value. The proposed technique cuckoo search is defining or exploring the profound study performance for discovering the efficient detection of brain tumors.

3.1 Overall architecture

Input image with noise is sent for preprocessing step helps in reducing the noise by median filter. The blurs are removed by smoothing. The segmentation process is done by Otsu threshold algorithm. By cuckoo algorithm the brain tumor and clots are detected in the system. This is further finds whether the segmented image is clot or cancer. Figure1 shows the overall process involved in detection of cancer/cancer-less clots.

3.2 MRI Images and pre-processing

The processed project is proposing the concept for detection of blood clots and brain tumors that absent or present in the given clots of blood and brain tumors. The MRI images are being processed within the proposed technique cuckoo search within the several processes such as clustering with histogram, image segmentation and filtering. The MRI images are has been taken as an input of the process for segmentation over blood clots and tumor. The MRI images are dark in nature, so making it clear need to do preprocessing function. The preprocessing function is converting the images in to smooth format and enhanced for the further process.

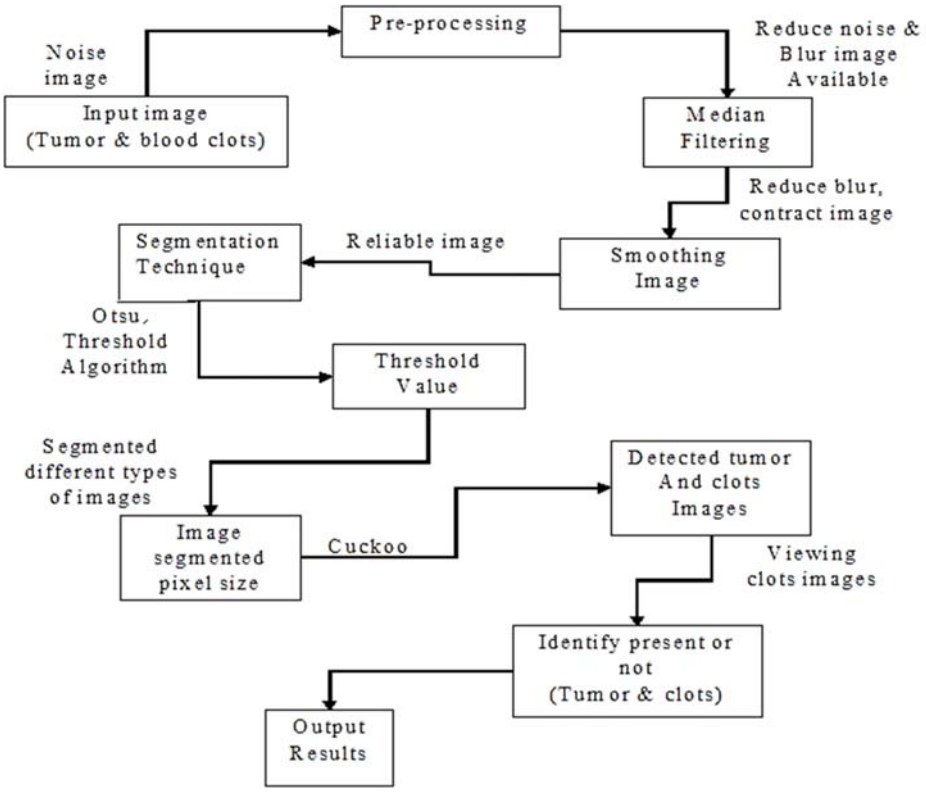

Figure-1. Overall architecture.

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3.3 Median filter and smoothing image

The proposed technique median filter is proposing the high frequency MRI components; the median filter is proposing the better filtering process by removing the noise from image without disturbing surface and edges and producing the filtered smooth images. The median filter processing is highly reliable for converting image and getting the smooth image and fixed pixel size images and avoiding different issues such as construction, light effect, blurriness and etc. the medial filter is cleaning the background pixel of the images and improving image quality for detecting the clot and tumor from input images.

3.4 Otsu algorithm

IDK = otsu(A)
IDK = otsu(A,B)
[IDK,ijk] = otsu (...)
Step1: IDK = otsu(A,B) array segmentation A in class B within N-thresholding of Otsu's technique.
Step2: Otsu's returns array IDK that contains indices cluster for every point.
Step3: The value zero being assigned for non-finite pixel.
Step4: IDK = otsu(A) is using B = 2.
Step5: [IDK,ijk] = otsu(...) is returning the (ijk) value for separability criteria [0,1].
Step6: The Zero could be obtained within less than N array value.

3.5 Cuckoo algorithm

The proposed CUCKOO Algorithm has been proposed and their steps are mentioned below:

1. The CUCKOO nest is representing ψ and β. Both the factor belongs to two different dimension (*d=2*).
2. ψ and β parameter range has been assigned within interval [*0,2*].
3. Total nest number = 10
4. Image_Enhancement ∀ nest //Enhance image with every nest//
5. Determine ∀ nest fitness
6. Generate new nest //according to previous iteration of fittest nest//
7. Contain max_iteration;
8. stop
9. determine global optimal solution
10. identify *g*ψ and *g*β value

The CUCKOO algorithm is being used at the final stage of brain clots and tumor identification. CUCKOO Search algorithm is testing several images and containing value of every image to measure the performance value. It's improving the image value and implementing a detection operation.

3.6 Identify Tumors and blood clots

The segment and analysis of digital image is being partitioned into several regions by the segmentation process for the given workspace or object. The process of segmentation is doing image partition within several non-intersecting parts. Blood clots and brain tumor from images are playing a crucial role for tumor identification of tumor from Magnetic Resonance Image (MRI).

4. RESULTS AND DISCUSSIONS

The proposed techniques are being implemented on the MATLAB, which is very high performed computed technical language. The computation programming and visualization integration are for easiest environment over the problems for getting a solution with familiar notation of mathematics.

Figure-2 shows the processed image within segmentation, filtering the tumor and clot region identified portion. The processed image is being identified within the several MRI images and proposed technique Otsu and Cuckoo Search algorithm.

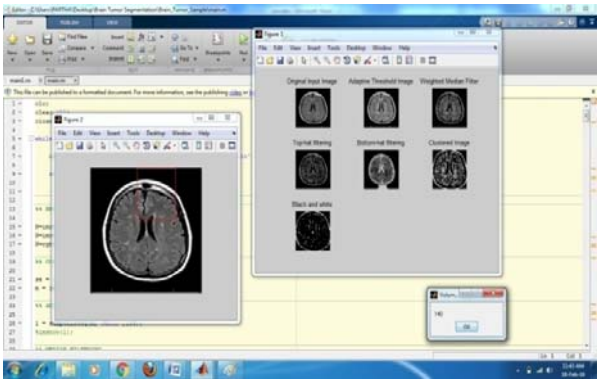

Figure-2. Processed image.

Figure-3 is presenting the segmentation, filtering and identifying the tumor region. It also generates the volume of tumor.

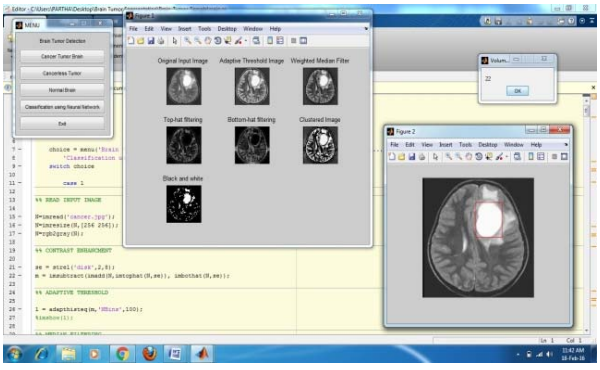

Figure-3. Tumor segmented image.

The above mentioned Figure-4 is presenting the segmentation, filtering and the clot region is identified along with volume. The below mentioned Figure-5 is proposing an efficient and enhanced result over the classification and filtering technique.

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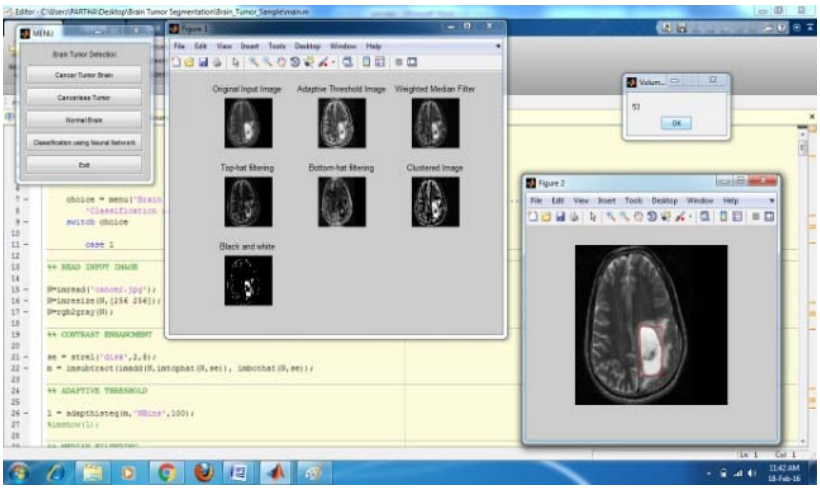

Figure-4. Clot segmented Image.

Figure-5 producing the comparison result of existing and proposed, where proposed system is producing better result over the existing system.

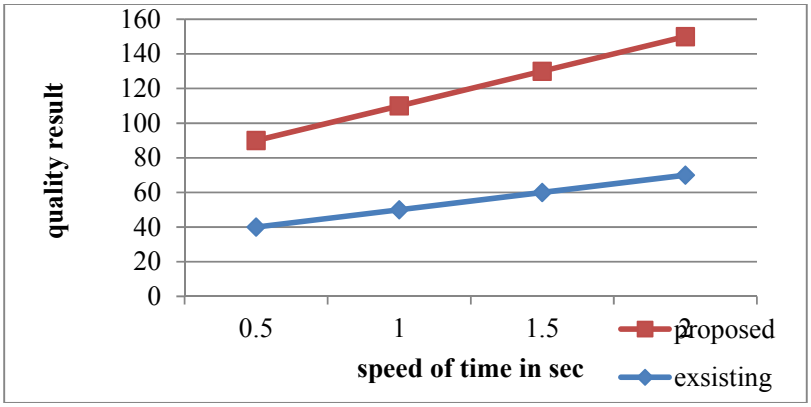

Figure-5. Compare between existing and proposed filtering and preprocessing result in time and quality.

This Table-1 considers existing and proposed techniques for pre-processing and filtering technique. It compared the existing and proposed and then producing a better simulative result for proposed system.

Table-1. Pre-Processing and median filtering quality.

S. N.	Time	existing	proposed	Existing percentage	Proposed percentage	Proposed quality percentage
1	0.5 to 2 (sec)	Pre-processing	Pre-processing	60	130	93%
2	0.5 to 2 (sec)	Spatial Filtering	Median filtering	70	150	95%

Figure-6 shows the comparison result of existing and proposed system within execution of pre-processing, filtering and segmentation process.

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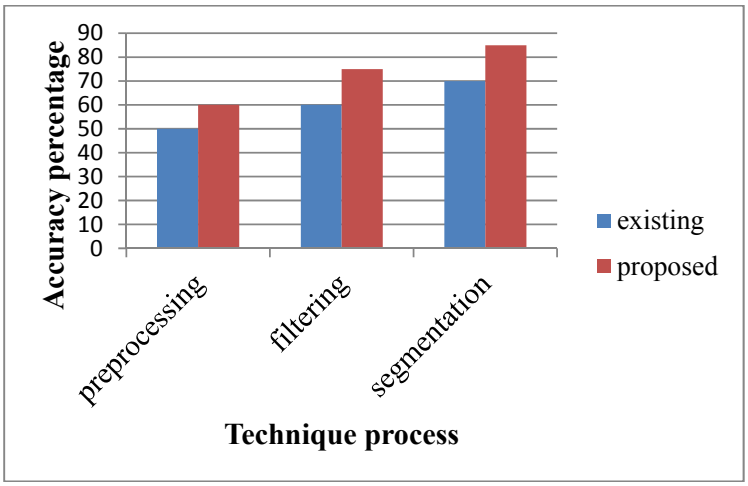

Figure-6. Comparing between existing and proposed technique result in accuracy percentage.

The above mentioned Table-2 is presenting the overall comparison between existing and proposed system for filtering process of spatial filtering and median filtering as well segmentation. Proposed system generate higher percentage than existing system.

Table-2. Compare overall technique result between existing and proposed system.

Techniques	**Pre-processing** (%)	**Filtering** (%)	**Segmentation** (%)	**Over all accuracy percentage** (%)
Existing system	80%	82% (Spatial filtering)	86%	89%
Proposed system	85%	90% (Median Filtering)	92%	95%

5. CONCLUSIONS

The proposed algorithm Cuckoo Search and Otsu are presenting a better enhancement over the brain clots and tumor detection within the Magnetic Resonance Images (MRI) and producing tumor detection by implementing information of blood clots. Several techniques have been proposed for identifying the blood tumor and blood clots but not providing better result over the blood clots and brain tumor identification with MRI (Magnetic Resonance Images). The MRI images have been preprocessed for obtaining the clear and sharp image of the brain tumor and blood clots. The spatial filtering technique being used for smoothing the images by filtering process and the Cuckoo Search and Otsu algorithm have been implemented over the identification of brain tumor within blood clots. The Otsu algorithm for thresholding has been used based on the pixel value of the images. The proposed Cuckoo algorithm is finally identifying the segmented pixel value of MRI images and tumor clots. The future enhancement would be for improvement of different tumor and clots identification with more efficiency and accuracy.

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