Brain Image Segmentation Methods using Image Processing Techniques to Analysis ADHD

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Abstract - Attention Deficit Hyperactivity Disorder (ADHD) is a neurological state that involves problems in inattention, hyperactivity and impulsivity that are developed inconsistent with the age. ADHD may occur due to brain disorder namely Brain injury, Brain damage and Brain abnormalities. Brain injury is a more expressive term than "Head Injury" in which Caudate nucleus will be affected. The abnormality of Caudate nucleus is to be found by its size and volume. The grey and white matter of brain also is abnormal due to brain damage. The main aim to detect and diagnose ADHD depends on the parts of the brain. By means of efficient Brain segmentation techniques, it can be easily identified. So, in this paper, to extract the brain parts various brain segmentation techniques are surveyed and discussed. A simple thresholding technique is proposed to extract Gray and white matter as well as "Active contour with region based Techniques" is implemented to extract the Caudate nucleus portion. The experimental results of various images are examined and discussed.

Keywords: Attention deficit hyperactivity disorder (ADHD) , Caudate nucleus, Active contour

I. INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) a turmoil that affects behavior. A late national study reported 11% of school matured kids are influenced by ADHD. ADHD is a non-prejudicial confusion exasperating individuals of each age, sex, IQ, and religious and financial foundation Three principle side effects characterize ADHD including inattention, hyperactivity, and impulsivity. The indications are influencing the kid's exercises in social circumstance and at school. Scottish –born doctor and writer (1763-1856) Already in 1798 Sir Alexander Crichton portrayed a mental state with all the crucial components of the negligent subtype of ADHD, the fretfulness, issues with consideration, the early onset and how it can influence the capacity to perform in school. An English specialist, Dr. Still, archived instances of indiscreet conduct. He gave the turmoil its first name, "Imperfection of Moral Control". More indications were perceived to oblige hyperactivity. These included lack of caution, absence of center, wandering off in fantasy land, and other absence of center sort indications. "Lack of caution" as a classification was isolated into three subtypes: verbal, intellectual, and engine lack of caution. In 1998, the American Medical Association expressed that ADHD was a standout amongst the most looked into scatters, regardless of the way that its reason is obscure. In 2011, 6.4 million kids aged 4-17 years (11%) had a parent's report of an ADHD diagnosis by medicinal services supplier. ADHD is recognized as the mental disorder and it treated psychologically which makes change in millions of people and their lives especially in children.

Attention Deficit Hyperactivity Disorder (ADHD) is subjective by a brain issue which has been embraced utilizing a three equipped approach, such as,

- Brain Injury
- Brain damage
- Brain abnormality

ADHD issue might be cause by brain damage. In this way, we are examined about the brain injury and their types

Brain Injury: Injury to brain those results in impedances in physical, subjective, discourse/dialect and behavioral working. The damage might be brought on by an outer physical power, inadequate blood supply, deadly substance, threat, and disease producing creatures, inborn disorders, birth trauma or degenerative procedures.

TYPES OF BRAIN INJURY
- Acquired Brain Injury(ABI)
- Traumatic cerebrum damage (TBI)

Acquired brain injury: An acquired Brain Injury (ABI) is problem affects to the brain since birth. There are numerous conceivable causes, including a fall, a road accident, tumor and stroke

Traumatic brain injury: Traumatic Brain Injury (TBI) is damage to the brain brought on by an injury to the head (head damage). There are numerous conceivable reasons, including street car crashes, ambushes, falls and mischance at home or at work. The impacts of a traumatic brain damage can be far reaching, and depend on various components, for example, the type, position and harshness of damage. In the brain injury the caudate nucleus is affected.

Each of the brain's hemispheres has a caudate nucleus, and both are found centrally and close to the basal ganglia. They are additionally arranged close to the thalamus, which is somewhere deep in the cerebrum, near the midbrain. The caudate nucleus core assumes an indispensable part in how the brain learns particularly the storing and preparing of recollections. It works as an input processor, which implies it utilizes data from past experience to impact future activities and choices. This is vital to the improvement and utilization of language. Expressly, communication skills are thought to be controlled generally by the left caudate and the thalamus. Cerebrum locales and structures (pre-frontal cortex, striatum, basal ganglia, and cerebellum) have a tendency to be littler. General cerebrum size is by and large 5% littler in influenced

kids than kids without ADHD. The paper is organized as follows. Section II presents the comparison of different processing techniques, Section III presents proposed work section IV deals with result and discussion and Section V concludes the paper.

II. COMPARISON OF DIFFERENT PROCESSING TECHNIQUES

There are many segmentation techniques are used to segment the brain that is discussed below:
- Edge based Techniques
- Region based Techniques
- Graph cut techniques
- Watershed Techniques
- SVM Techniques
- Thresholding techniques
- Active contour with region based Techniques

A. Edge based Techniques

Image Segmentation is the procedure of segment and digital image into various area sets of pixels. The edge representation of an image impressively decreases the amount of information to be handled, yet it holds key data with respect to the states of items in the scene. Edge discovery is a key instrument for picture division. Edge detection strategies transform original images into edge images profits by the progressions of dark tones in the images. In an image, edge stand for object limits and therefore helps in recognition and splitting of objects in an image Edge detection alludes to calculations which attempt to distinguish focuses in an advanced picture where there is a change in image brightness or there is a distinction in intensities. These focuses are then connected together to frame closed object boundaries. The result of splitting utilizing edge recognition is a binary image.

B. Region based Techniques:

Region based technique in image processing is one of the segmentation technique. Region based technique segments particular area or object. Region growing in region based techniques iteratively operates on image with seed. Seed point is pixel in a specific grayscale range. Region growing needs some initialization seeds to find object in an image. Finally, region growing technique can accurately isolate the regions that have the same properties.

C. Graph cut techniques

An image segmentation issue can be translated as dividing the image components (pixels/voxels) into various classes. A Cut of a graphics a segment of the vertices in the diagram into two disjoints subsets. Building a graph with a picture, we can explain the segmentation issue using method for graph cuts as a part of diagram hypothesis. Coordinated Graph is characterized as an arrangement of nodes (vertices V) and an arrangement of requested arrangement of vertices or coordinated edges E that associate the nodes.

D. Watershed Techniques

Watershed refers to an edge that partitions zones drained by various waterway frameworks. Image processing a watershed of a grayscale image is relating to the idea of a catchment bowl of a tallness map. So, a drop of water taking after the angle of an image streams along a way to at long last achieve a local minimum. Instinctually, the watershed of alleviation compares to the points of confinement of the contiguous catchment bowls of the drops of water. There are diverse specialized meanings of a watershed. In diagrams, watershed lines might be characterized on the nodes, on the edges, on the other hand cross breed lines on both nodes and edges. Watersheds might likewise be characterized in the continuous domain. There are additionally a wide range of calculations to process watersheds. Watershed calculation is utilized as a part of picture handling basically for segmentation purposes.

F. SVM Techniques:

In supervised learning model, Support Vector Machine (SVM) performs non-linear image classification. SVM depend on the idea of decision planes that characterize decision limits. A choice plane is one that isolates between arrangements of objects having dissimilar class memberships.
The goal SVM is to predict region in an image using feature.

G. Active contour with region based Techniques:

Active contour model, likewise called snakes, is a structure in computer vision for portraying an item plot from a perhaps loud 2D image. The snakes model is well known in computer vision, and snakes are extraordinarily utilized as a part of uses such as object tracking, shape detection, division, edge recognition and stereo coordinating.

H. Thresholding techniques:

For image segmentation this is one of the most seasoned techniques. The division is finished by gathering all pixels with force between two such limits into one class. This examination work thresholding calculation is utilized to locate the white matter of the brain. In this paper using threshold value to find the white matter of each brain.

III. PROPOSED WORK

In proposed work we use efficient threshold segmentation algorithm to extract white matter from brain. Using region growing with active contour segmentation the brain caudate nucleus is extracted.

A) THRESHOLDING:

Thresholding is a method of converting a grayscale input image to a bi-level image by using a certain threshold. The purpose of thresholding is to extract those pixels from some image which represent an object. In this proposed work thresholding techniques is used to extract the grey and white matter in certain threshold value. Initially, the MRI brain image (figure 1a) is taken as input. Gray threshold technique followed by binary image conversion is used to extracting white matter from brain.

B) ACTIVE CONTOUR SEGMENTATION:

The proposed work of caudte nucleus extraction is describe in flow chat in figure 2, Active contour segmentation is applied to find the mask. Mask is a binary image that denotes the initial state of the active contour. Boundaries of the object area in mask define the initial contour location used for contour growth to segment the image. Active contour based segmentation is used to segments the grayscale image into foreground (object) and background regions. The Propose of

active contours is to detect objects in a given image. Figure 3. The grayscale image is taken as an input. The contour can be initialized by a set of seed points are automatically chosen at the brightest location in the MRI image. Fixed the time iteration to segment the caudate nucleus. To get the caudate nucleus part the iteration is set as 200.Curve superimposed used to start the iteration for segmenting an image. Finally, Caudate nucleus part is segmented.

IV. RESULT AND DISCUSSION

Our proposed work involves two methods such as thresholding and active contour segmentation. In brain, using thresholding segmentation method, the white matter is separated. Using active contour segmentation, only the caudate nucleus part is extracted.

V. CONCLUSION

Attention deficit hyperactivity disorder is a neurodevelpmental issue, primarily this confusion influenced in kids. Many kids are influenced by this confusion. ADHD side effects of inattention, hyperactivity, and impulsivity are not special to ADHD. Also, there is a surprising cover of these ADHD indications with those of comorbid mental health conditions or instruction issues. Image processing methods are utilized and discover the brain development. Separation of utilized top discovers the cerebrum white matter, Gary matter and caudate nucleus size. At long last, Normal caudate nucleus and Attention deficit hyperactivity issue influenced caudate nucleus level is computed.

References

[1] Evelin sujji[1], Y.V.S.Lakshmi[2], G.Wiselin Jiji[3], "MRI Brain image segmentation based on thresholding" International Journal of Advanced Computer Research (ISSN (print): 2249-7277 ISSN (online): 2277-7970) Volume-3 Number-1 Issue-8 March-2013.

[2] E. A. Zanaty* , "Determination of Gray matter (GM) and White matter (WM) volume in Brain Resonance Images" International Journal of Computer Applications (0975 – 8887) Volume 45– No.3, May 2012

[3] M.Anitha[1], Prof.P.Tamije Selvy[2] and Dr.V.palanisamy[3], "Automated Detection of White matter Lessions in MRI Brain images Using Spatio Fuzzy and Spatio Possibility Clustering models" Computer Science & Engineering: An International Journal (CSEIJ), Vol.2, No.2, April 2012

[4] Anamika Ahirwar, "Study of Techniques for medical image segmentation and Computaiton of Statistical Test for Rgion Classification of Brain MRI" I.J. Information Technology and Computer Science, 2013, 05, 44-53 Published Online April 2013 in MECS (http://www.mecs-press.org/) DOI: 10.5815/ijitcs.2013.05.06

[5] Ahmed KHARRAT[1],*, Karim GASMI[1], Mohamed BEN MESSAOUD[2], Nacéra BENAMRANE[3] and Mohamed ABID[1], "A Hybrid Approach for Automatic classification of Brain MRI Using Genetic Algorithm and Support Vector Machine 2010" Leonardo Journal of Sciences Issue 17, July-December 2010 ISSN 1583-0233 p. 71-82

[6] Zhongyuan Cui[1], Feng Wang[1] and Jin Wang[2], " An image segmentation Method based on Non-local MRF" International Journal of Signal Processing, Image Processing and Pattern Recognition Vol.7, No.5 (2014), pp.197-206 http://dx.doi.org/10.14257/ijsip.2014.7.5.17.

[7] Miriam Cooper • Anita Thapar • Derek K. Jones "White Matter Microstructure Predicts Autistic Traits in Attention-Deficit/Hyperactivity Disorder" The Author(s) 2014. This article is published with open access at Springerlink.com

[8] Chiao-Min Chen[1] • Chih-Cheng Chen[2] • Ming-Chi Wu[3] • Gwoboa Horng[2] • Hsien-Chu Wu • Shih-Hua Hsueh • His-Yun Ho, "Automatic Contrast Enhancement of Brain MR Images Using Hierarchical Correlation Histogram Analysis" Received: 29 April 2015 / Accepted: 27 August 2015 / Published online: 21 November 2015 ©The Author(s) 2015. This article is published with open access at Springerlink.com

[9] Abdulfattah A. Aboaba1[1], Shihab A. Hameed[2], Othman O. Khalifa[2], Aisha H. Abdalla[2], "Region and Active Contour-Based Segmentation Technique for Medical and Weak-Edged Images" Computational and Applied Mathematics Journal 2015; 1(3): 72-78 Published online April 30, 2015 (http://www.aascit.org/journal/camj)

[10] N.Senthilkumaran[1] and C.Kirubakaran[2], "Edge Detection Techniques for MRI Brain Image Segmentation" DOI: 03.AETS.2014.5.341 © Association of Computer Electronics and Electrical Engineers, 2014

[11] Deepa V, Benson C. C, Lajish V. L, "Gray Matter and White Matter Segmentation from MRI Brain Images Using Clustering Methods" Internation Research Journal of Engineering and Technology (IRJET) volume: 02 Issue: 08 | Nov-2015

Figure 1:
a. Original Image
b. White matter of image using threshold value

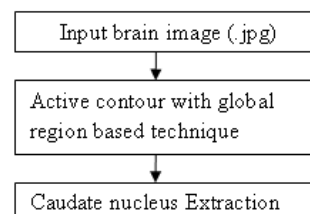Caudate nucleus Extraction

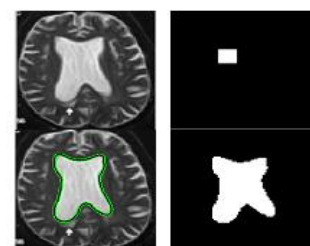Figure 2. Flow chart to extract Caudate nucleus

Figure 3: a) Input image b) Initialization c) 200 Iteration d) Region based segmentation