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CT and MRI Neuroimages for Assorted Brain Diseases

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Abstract: ***In medial analysis, Neuroimages take part in a very imperative role for diagnosing the various Brain disorders. This paper focuses on various Neuroimages such as CT, MRI, of Brain which are used as focal point for range of brain diseases and it is valuable for the early detection of brain diseases. This review enlightens the researcher to identify the symptom's of brain disorder from Neuroimages. Also, this survey is a platform for the researcher to begin the work in the area of Neuroimages disease solutions. Till date, the research has been done on any one type of Neuroimages and their various methodologies. Significance of this work is to focus the collection of various brain diseases information. This paper covers the discussion and methodologies implemented in recent research in neuro diseases. It focus towards the identification neuro diseases in the field of medical image analysis.***

Keywords: *CT, MRI, Brain Disorder, Neuroimage.*

I. INTRODUCTION

There are number of brain diseases such as Alzhemiers, Brain Tumor, Parkinson, Epilepsy, Mental Disorders, Movement Disorders, Stroke and Transient Ischemic Attack, Traumatic Brain Injury, Autoimmune diseases etc., The objective of this paper is to provide an extensive review identification of various brain disorder with slight touch of soft computing technique with CT and MRI Neuroimages. The comparative review can provide an insight for the researcher as well as medical analyst for the early detection and state of brain diseases. The proposed review is with high accuracy concluding the assurance that CT Neuroimages have the advantages sensitive to patient motion during the examination, calcification and metal foreign bodies etc., and MRI have the benefit soft tissue contrast, have a considerably smaller risk of causing potentially lethal allergic reaction etc., which are useful for the medical analyst and researcher to suggest the brain imaging technique.

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II. METHODOLOGY

Hari Babu Nandpuru et al. [1] focused on the Cancer brain images classification using vector machine which classify the result into normal and abnormal MRI Images.
Support Vector Machine algorithm which gives superior result as compare to other. Jeena R S et al. [2] focused on the issue of Stroke Diagnosis with a comparative analysis of CT and MRI Brain images. Initially preprocessing done in which using the Median filter noise get removed. For texture segmentation Gabor filter was used. By Seeded region growing algorithm comparable data can be identify from the neuroimage. The author concluded from his research work that, CT imaging is best for the diagnosing ischemic stroke.
Abhilash Panda et al [3] proposed a method for the Brain tumor detection using the MRI Images, for which model levels are identification of super pixel zone of brain tissues, Clustering, Feature extraction, ADBRF classifier. This proposed method train on BrainWeb MRI Dataset and achieved 100% accuracy. Researcher can apply Deep learning algorithm to further extend the work.
Rupal Snehkunj et al [4] presented the Feature extraction technique for the brain abnormalities, Tumor and Hemorrhage. Steps followed for the feature extraction algorithm is Load image in a appropriate format, Merging of brain image slices, Pre-processing of brain image, Segmentation etc.,
Hayder Saad Abdulbaqi et al [5] proposed a T2-weighted MRI images using hidden Markov random fields (HMRF) and threshold method which consume less time to diagnose brain tumor. In first stage HMRF-EM algorithm gives the segmented image framework with the validation of ROC method which gives 94% accuracy. In second stage Threshold method is applied to compute the T value for the image. Finally results are compared between the proposed method and Mango software.
B.R.Pushpa et al [6] proposed a method for diagnosing the Alzamier disease. Steps followed for the diagnosing are Image acquisition, Image enhancement, segmentation as region based and voxel based, feature extraction and then classification. Modality used in proposed method is MRI and the authors achieved an accuracy of 88.89 %. Scope for the researchers is improvement in accuracy by different imaging technique PET, f MRI.
Jacob J. Roelofs et al [7] discussed the issue about the movement disorder. fMRI and PET imaging techniques used for the FMDs model to observe the movement disorder.

Amira Ben Rabeh et al [8] proposed a technique for diagnosing Alzheimer Disease from the modality MRI Images. The proposed method is divided into two stages as segmentation and classification. The experiment is done by taking the MRI images two times and observed the result weather the patient is under normal category or Alzheimer diseases.

The authors used Support vector machine classification method and OASIS (Open Access Series of Imaging Studies) database of MRI images. Scope for the researcher is to improve the accuracy of result by preferring better algorithm Biju K.S. et al[9] provided software base Alzheimer detection solution which could be affordable and easy to handle.

The methodology followed are Image Registration, Scaling and shifting using Wavelet transform. The parameters analyzed were abnormal volume, grey matter, cortex area, cavity area and brain density. The author concluded that the brain abnormality is present when the ratio of grey matter to white matter volume is high.The researcher can explore the detection of different stages of Alzamier disease.

Aikaterini Fitsiori et al [10] focussed the epilepsy issue in children and adult. The authors discussed the causes of epilepsy. Hippocampal Sclerosis (HS) originates at temporal lobe epilepsy, it is developed in older children and young adult. Focal Cortical Dysplasia (FCD) originates at extra temporal focal epilepsy, it is developed immediately after birth. Neurocutaneous Syndromes (TSC) involves brain lesion cortical tubers. There are some tumors which cause the epilepsy, gangliogliomas, dysembryoblastic neuroepithelial tumors (DNET), this occur in older women. Vascular Malformations (VM) types are cerebral cavernous malformations and arteriovenous malformations (AVM).

Cavernomas are present in children between 1-3 year age group and age of 15 between 1-3 years of age. Author concluded that Neuroimages and EEG are the powerful tool to diagnose brain disorder epilepsy and the work for the researcher is to find the correlation between EEG and Neuroimages.

Joyjit Chatterjee et al [11] proposed an image processing algorithm to diagnose the Parkinson disease. Modality used for the diagnosis of Parkinson disease is CT Images. The database of the CT images are taken from Open Source University of California (UCI), Irvine-Machine Learning Repository. The image is converted into Gray image, for removing the unwanted distortion. Then anisotropic filtering applied for improving the quality of image that eliminates the aliasing effects. Further image segmentation was performed for the identification of the Parkinson affected area. Then bounding box for defining the rectangular boundaries of Parkinson disease. Precision of the proposed algorithm is more than 85% and it is affordable as compare to biomedical equipment test.

Swati Gupta et al [12] given review about the significance of Artificial Intelligence in Stroke disorder in brain where CT and MRI neuroimages play a unique role. Artificial Intelligence is powerful tool for stroke analysis.

Francisco Estella et al [13] proven that Deep Brain Stimulation method minimizes the medication for the Parkinson's Disease. The author suggested attaching stereotactic frame on the patients head to find the location for deep brain simulation as pre operative procedure. They compared MRI captured and CT images and concluded that CT images are giving better results for Deep Brain Stimulation.

Parasuraman Kumar et al [14] proposed a methodology which is divided into four stages, Median filter is used for the pre processing, Fuzzy C-means Clustering Algorithm for the segmentation, GLCM for the feature extraction, Classification using neural network. They discussed various classification techniques such as Feed forward Artificial Neural Network, Extreme Learning Machine , Support Vector Machine , Ensemble Classifier and compared the methods with accuracy, precision, sensitivity. They compared MRI images with other images and inferred MRI provides better result for identification of cancer tissues.

Ghazal Sahebzamani et al [15] discussed the Epilepsy disorder. The methodology includes unified tissue segmentation approach followed by first-order statistical and volumetric gray-level cooccurrence matrix (GLCM) texture features and SVM classifiers. The accuracy obtained 94%. The researcher can extend the work to detect the level and severity of epilepsy.

Latha Manohar et al [16] proposed a system for diagnosing Schizophrenia Disorder. The methodology includes skull stripping as pre processing, feature extraction and BPSO based classification. The classifier used are SVM and fuzzy SVM.The author used National Alliance for Medical Image Computing (NAMIC) database of MRI images.The Accuracy obtained is 0.98, sensitivity - 0.93 , specificity - 0.96 and F-score - 0.96 for the skull stripping method .

S. Naganandhini et al [17] performed Threshold and Morphological Operations based Segmentation (TMOS) for Alzheimer disease. TMOS performs opening and closing operation. Resultant image can be used for the higher degree of image processing. The author used MIRIAD data set of MRI Images.

Nagaveni B Sangolgi [18] author propose OECM methodology for the tumor detection. Processing was done on BraTS image dataset. Further the research can be extend for label of segmented tumor.

Zhe Zhao et al [19] propose a method for glioma detection. Methodology propose by author is sperpixel segmentation, constructed MRF, constructing CRF, feature extraction, feature learning, objective function optimization. Proposed system is tested on BRATS 2013 clinical data set and BRATS 2015 clinical dataset. This method reduced the computational cost. V. Sowjanya et al[20] proposed a segmentation based tumor detection system. Methodology suggested as features extracted from image, classification followed by SVM classifier.

III. RESULT AND DISCUSSION

In this research various brain disorder discussed with their modality used for the analysis. As per this survey already much work has been carried out in the field, but still more research work is required to be performed on mainly upgrading accuracy and work on different methodologies for the betterment of analysis.

Table I shows a variety of brain disorder with various methodologies adopted such as segmentation, support vector machine etc., and suitable modality for the same. Figure 1 shows the various brain image of different brain disorder which presents the behavior of respective brain disorders.

Table- I: Details of Disorder, Methodology, Modality

Sr. No.	Author	Disorder	Methodology	Modality
1	Hari Babu Nandpuru et al. [1]	Brian Cancer	Support vector machine	MRI
2	Jeena R S et al. [2]	Stroke	Seeded region growing algorithm,	CT,MRI
3	Abhilash Panda et al[3]	Brain Tumor	ADBRF classifier	MRI
4	Rupal Snehkunj et al [4]	Brain Tumor Hemorrhage	Image Transformation, Segmentation, Feature extraction	MRI
5	Hayder Saad Abdulbaqi et al [5]	Brain Tumor	Hidden Markov random fields	MRI
6	B.R.Pushpa et al[6]	Alzheimer	Enhancement, Segmentation, Feature extraction, Classification	MRI
7	Jacob J. Roelofs [7]	Movement Disorder	Segmentation	fMRI ,PET
8	Amira Ben Rabeh et al [8]	Alzheimer	Segmentation, SVM	
9	Biju K.S. et al[9]	Alzheimer	Wavelet transform,3D reconstruction, Segmentation	CT,MRI
10	Aikaterini Fitsiori et al [10]	Epilepsy	Machine analysis	MRI
11	Joyjit Chatterjee et al [11]	Parkinson's Disease	Grey scale conversion, Anisotropic filtering, Segmentation	CT
12	Swati Gupta et al[12]	Stroke	Artificial Intelligence	CT
13	Francisco Estella et al.[13]	Parkinson's Disease	Deep Brain Simulation	CT
14	Parasuraman Kumar et al[14]	Brain Tumor	GLCM	MRI
15	Latha Manohar et al [16]	Schizophrenia	BPSO Based Feature Selection with Fuzzy SVM	MRI
16	S. Naganandhini et al[17]	Alzheimer	Threshold and Morphological Operations based Segmentation, (TMOS)	MRI
17	Nagaveni B Sangolgi et al [18]	Tumor	Optimize Evidential C-Means	MRI
18	Zhe Zhao et al [19]	Glioma detection	Segmentation using graphical model	MRI
19	V.Sowjanya et al [20]	Tumor	Segmentation	CT, MRI

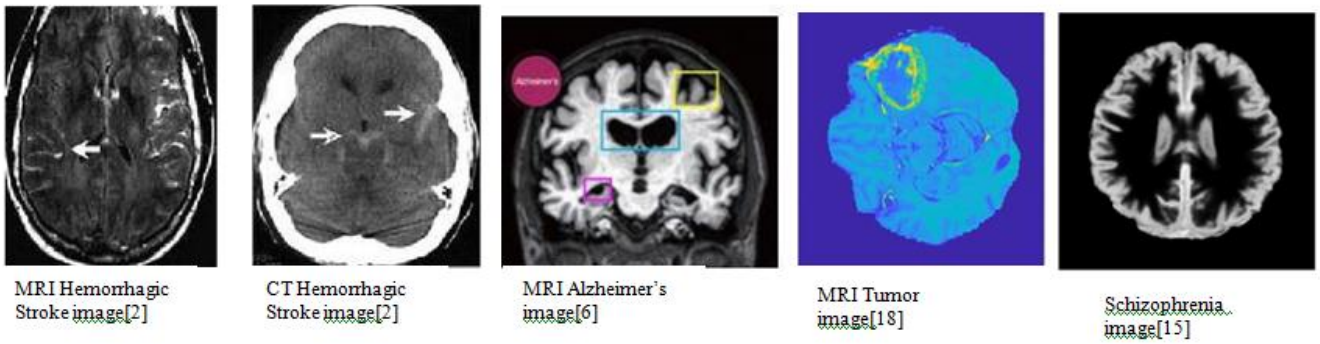

Figure 1: Neuroimages of various Brain disorder

IV. CONCLUSION

In this research work the state-of-the-art neuro diseases prediction methodologies are discussed. This paper is focussed towards the review of the literatures which covers almost all type brain disorder. The modality best suited for various disorders are discussed in this paper which will help the researchers to take up their research in diagnosing the brain disorders. In this study methodology, algorithms introduced are compared. In addition, this study has given the availability of dataset for neuro images such as OASIS, NAMIC, BraTS etc. The different modality and methodologies for neuro image analysis are summarized. Brain tumor [3,4,5,18] analysis done by Seeded region growing algorithm, ADBRF classifier, Hidden Markov random fields, these methodologies applied with the MRI modality. Alzheimer [6,9,17] analysis done by Enhancement, Segmentation, Wavelet transform, Optimize Evidential C-Means these methodoloes applied with MRO modality, likewise Schizophrenia, Epilepsy movement disorder, Glioma detection, Parkinson's Disease theses neuro diseases are summarized in Table-I. This work can be extended as detailed comparison of all brain disorders and with comparative survey of Computational techniques.

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