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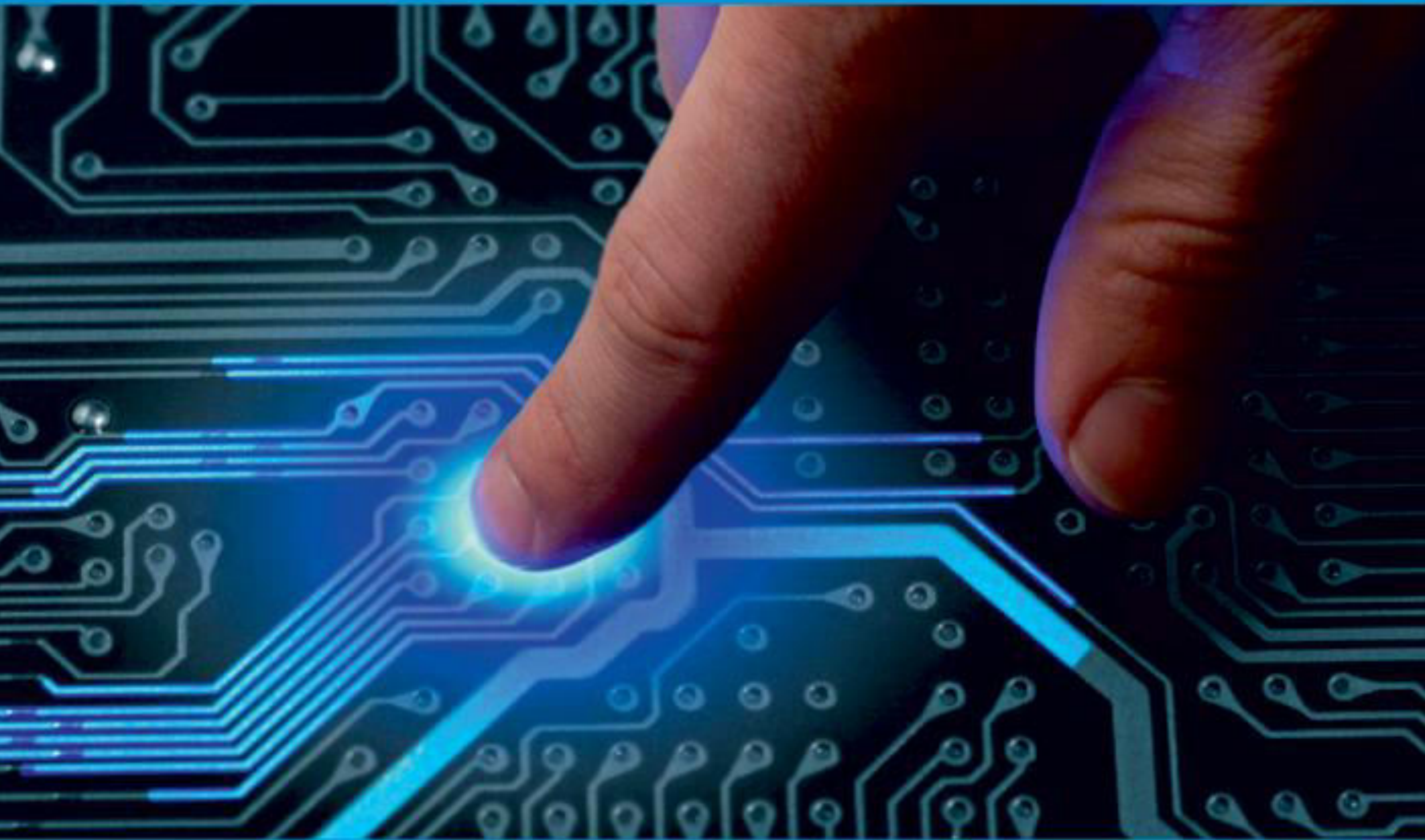

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Survey Towards Detection of Alzheimer's Disease using Structural Images

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ABSTRACT: Early detection of Alzheimer's disease (AD) is important so that preventative measures can be taken. Current techniques for detecting AD rely on cognitive impairment testing which unfortunately does not yield accurate diagnoses until the patient has progressed beyond a moderate AD. Alzheimer's disease considered being one of the acute diseases that cause the human death especially in people above 60years old. Many computer-aided diagnosis systems are now widely spread to aid in Alzheimer diagnosis. Therefore, an automated and reliable computer-aided diagnostic system for diagnosing and classifying the brain diseases has been proposed. MRI (Magnetic resonance Imaging) is one source of brain diseases detection tools, but using MRI in Alzheimer classification is considered to be difficult process according to the variance and complexity of brain tissue. This project presents a survey of the most famous techniques used for the classification of brain diseases based on MRI. The Alzheimer detection and classification systems consist of four stages, namely, MRI pre-processing, Segmentation, Feature extraction, and Classification respectively. In the first stage, the main task is to eliminate the medical resonance images (MRI) noise which may cause due to light reactions or any inaccuracies in the imaging medium. The second stage, which is the stage where the region of interest is extracted (Alzheimer region). In the third stage, the features related to MRI images will be obtained and stored in an image vector to be ready for the classification process and finally the fourth stages, where classier will take place to specify the Alzheimer kind Image segmentation is a significant research field in medical engineering. Segmented brain images are used to visualize volume and quantitatively analyze anatomical and cortical structures. Segmented brain tissues provide an anatomical frame work for visualization which has a potential use in neuroscience research and neurosurgical planning owing to advances in Magnetic Resonance Imaging (MRI). Segmentation refers to the labeling of pixels into different regions.

KEYWORDS: Brain segmentation, skull stripping, threshold, Seed region growing.

I. INTRODUCTION

This Early detection of Alzheimer's disease (AD) is important so that preventative measures can be taken. Current techniques for detecting AD rely on cognitive impairment testing which unfortunately does not yield accurate diagnoses until the patient has progressed beyond a moderate AD. Alzheimer's disease considered being one of the acute diseases that cause the human death especially in people above 60years old.Many computer-aided diagnosis systems are now widely spread to aid in Alzheimer diagnosis.Therefore, an automated and reliable computer-aided diagnostic system for diagnosing and classifying the brain diseases has been proposed. MRI (Magnetic resonance Imaging) is one source of brain diseases detection tools, but using MRI in Alzheimer classification is considered to be difficult process according to the variance and complexity of brain tissue.At present, machine learning and pattern classification methods have been widely utilized in developing a computer-aided brain disease diagnosis system with neuroimages such as Magnetic Resonance Imaging (MRI) , Positron Emission Tomography (PET), functional MRI (fMRI), and Diffusion Tensor Imaging (DTI). Studies have shown that structural MRI is the most standardized imaging modality in clinical practice and it is also useful to track different clinical phases of AD. Therefore, our method is evaluated on structural MR images.

II. RELATED WORK

A. Detection of Alzheimer's Disease with Shape Analysis of MRI Images

Using a combination of several descriptors as features, the authors performed classification using a support vector machine. The results revealed classification accuracy of 87.5%, which was superior to the accuracy achieved using volume ratio to intracranial volume (81.5%), which is widely used for conventional evaluation of

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morphological changes. The current findings suggest that shape information may be more useful in diagnosis, compared with conventional volume ratio.

B. Alzheimers Disease And Dementia Detection From 3D Brain MRI Data Using Deep Convolutional Neural Networks.

In this paper an alternative approach has been discussed, that is fast, costs less and more reliable. Deep Learning represents the true bleeding edge of Machine Intelligence. Convolutional Neural Networks are biologically inspired Multilayer perceptron specially capable of image processing. In this paper we present a state of the art Deep Convolutional Neural Network to detect Alzheimer's Disease and Dementia from 3D MRI image.

C. Alzheimer's Disease Diagnosis Model Based on Three-dimensional Full Convolutional DenseNet Convolutional DenseNet.

This paper proposes a increment method of dataset by weighted combination of positive and negative samples and a learning method for small number of samples, and establishes a 3D full convolutional DenseNet classification model, which can not only obtain better image feature information, but also improve the generalization ability of the model.

D. An Optimal Decisional Space for the Classification of Alzheimers Disease and Mild Cognitive Impairment.

This paper proposes to combine MRI data with a neuropsychological test, Mini-Mental State Examination (MMSE), as input to a multi-dimensional space for the classification of Alzheimers Disease (AD) and its prodromal stages mild cognitive impairment (MCI) including amnestic MCI (aMCI) and nonamnestic MCI (naMCI). The decisional space is constructed using those features deemed statistically significant through an elaborate feature selection and ranking mechanism. FreeSurfer was used to calculate 55 volumetric variables,which were then adjusted for intracranial volume (ICV), age and education.The classification results obtained using support vector machines (SVM) are based on two-fold cross validation of 50 independent and randomized runs. The study included 59 AD, 67 aMCI, 56 naMCI and 127 cognitively normal (CN) subjects.

E. Classification of Patients with Alzheimers Disease and Healthy Subjects from MRI Brain Images Using the Existence Probability of Tissue Types.

In the current study, we examined the effectiveness of classification of patients with Alzheimer's disease (AD) and healthy subjects (HS) based on brain magnetic resonance imaging (MRI) using the existence probability of various tissue types. This method quantitatively evaluates brain structural changes between two time points using existence probabilities obtained by image segmentation of brain images into four region types: gray matter (GM), white matter (WM), cerebrospinal fluid (CSF) and background. Assuming a linear relationship between the probabilities at two points, we obtained a 44 matrix including 16 coefficients reflecting probability changes (CPCs). We performed classification of 10 AD patients and 10 HS using CPCs as features. We tested three kinds of features, excluding the CPCs that corresponded to background: all nine CPCs, diagonal CPCs reflecting structural preservation, and six non-diagonal CPCs showing structural changes, such as atrophy. Although nine CPCs showed the best performance in terms of average accuracy (77percent), the maximum accuracy was 95 percent when non-diagonal CPCs were used as features and images at the first and last time points were compared.

F. Detection of Alzheimers Disease with Shape Analysis of MRI Images.

n the current study, we tested the effectiveness of a method using brain shape information for classification of healthy subjects and Alzheimer's disease patients. A P-type Fourier descriptor was used as shape information, and the lateral ventricle excluding the septum lucidum was analyzed. Using a combination of several descriptors as features, we performed classification using a support vector machine. The results revealed classification accuracy of 87.5%, which was superior to the accuracy achieved using volume ratio to intracranial volume (81.5%), which is widely used for conventional evaluation of morphological changes.

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III. METHODOLOGY

System Architecture

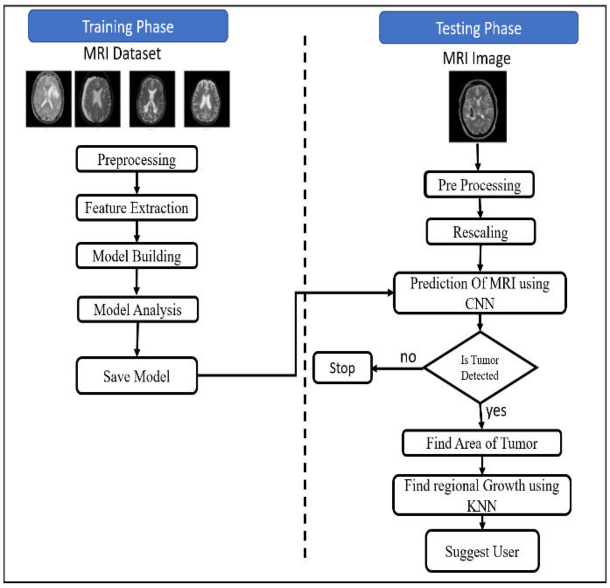

Fig1: System Architecture

Modules

- Testing :Magnetic Resonance Imaging (MRI) MRI scans are used as raw input imagewhich can be used to produce activation maps that shows which parts of thebrain are affected. It detects changes in blood oxygenation and flow that occursin response in the neural activity [3].
- Pre-processing : Image pre-processing is used to perform operation on imagesat the lowest level whose aim is to enhance image features that suppress theundesired distortions and does not increase image information content. Inpre-processing image resizing, image conversion and intensity adjustment isdone [5].
- Prediction of Alzheimer's disease: This is done with help of CNN algorithm.After segmenting the volumes of overall brain, white and gray matter is obtained. By calculating the ratio of gray to white matter Alzheimer's disease is predicted.
- Region Of Growth : After detecting location of tumour, the overall area of tumour is detected with help of KNN algorithm
- The algorithm for region based segmentation is composed of following steps:
  1. Selection of a set of seed points which is based on some user criterion.
  2. The regions are grown from the seed points which are adjacent depending upon the region membership criterion.
  3. To determine a suitable threshold value, the regions are grown based on these criteria.
  4. Calculation of Brain volume.

IV. CONCLUSION

In this system we have implemented Alzheimer’s disease identification system which will use python programming language and developed as a windows application. This system demonstrates the use of image processing techniques in health care. This system can not only merely help in the personal healthcare system, but also improve the goodwill of the society. In future we will make use of PCA, FLDA technique to obtain virtual frontal image for Dimensionality

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reduction and Presentation respectively. LLR technique to obtain virtual frontal image and we appoint DCT for illumination normalization. We also intended to introduce a new algorithm which is more efficient.

REFERENCES

[1] M. Prince, E. Albanese, and M. Guerchet, World Alzheimer report, 2014.
[2] K. Blennow, Alzheimers disease, Lancet, vol. 368, no. 9533, pp. 387403,2006.
[3] Alzheimers association, 2014 Alzheimers disease facts and figures, Alzheimers and Dementia, vol. 10, no. 2, 2014.
[4] K. G. Yiannopoulou and S. G. Papageorgiou, Current and future treatments for Alzheimers disease, Therapeutic Advances in Neurological Disorders, vol. 6, no. 1, pp. 1933, 2013.
[5] D. Zhang and D. Shen, Predicting future clinical changes of MCI patients using longitudinal and multimodal biomarkers, PLoS ONE, vol. 7, no. 3,Article ID e33182, 2012.
[6] A. Nordberg, J. O. Rinne, A. Kadir, and B. Langstrom, The use of PET in Alzheimer disease, Nature Reviews Neurology, vol. 6, no. 2, pp. 7887, 2010.
[7] H.-I. Suk, C.-Y.Wee, andD. Shen, Discriminative group sparse representation for mild cognitive impairment classification, in Machine Learning in Medical Imaging, pp. 131138, Springer, 2013.
[8] S. Keihaninejad, H. Zhang, N. S. Ryan et al., An unbiased longitudinal analysis framework for tracking white matter changes using diffusion tensor imaging with application to Alzheimers diseas, NeuroImage, vol. 72, pp. 153163, 2013.
[9] T. Tong, R. Wolz, Q. Gao, R. Guerrero, J. V. Hajnal, and D. Rueckert, Multiple instance learning for classification of dementia in brain MRI, Medical Image Analysis, vol. 18, no. 5, pp. 808818, 2014.

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