MAPLE TREE PUBLISHING HOUSE

INTERNATIONAL RESEARCH JOURNAL OF MULTIDISCIPLINARY TECHNOVATION (IRJMT)

http://www.mapletreejournals.com/index.php/IRJMT
Received 20 March 2019 ISSN 2582-1040
Accepted 23 March 2019 2019; 1(2); 51-56
Published online 25 March 2019

An Intelligent System for Accurate Prediction and Detection of Alzheimer's Disease

Anusha Nambirajam K[1*], Siva Subramanian T[2*], Priyadharshini R [3]

[1]UG Scholar, Department of Information Technology, National Engineering College, Kovilpatti, TN, India
[2]UG Scholar, Department of Information Technology, National Engineering College, Kovilpatti, TN, India
[3]Assistant Profeessor, Department of Information Technology, National Engineering College, Kovilpatti, TN, India

**Corresponding author E-Mail ID: anushakannan1997@gmail.com , sivamaddy22@gmail.com*

Mobile: +91 9791847284, +91 8838606091
DOI: https://doi.org/10.34256/irjmt1926

ABSTRACT

Image processing is a process of converting an image into digital form and achieve some maneuvers on it, in order to get an enhanced image or to mine some useful information from it. It is a type of signal dispensation in which the input is image, like video frame or photograph and output may be image along with its characteristics and features associated with that image. An image is defined as a two-dimensional function F(x,y), where x and y are spatial coordinates, and the amplitude of F at any pair of coordinates (x,y) is called the intensity of that image at that point. When x, y, and amplitude values of F are finite, we call it a digital image. Image processing mainly consists of the three basic steps. They are as follows: Initially the image will be imported by using optical scanner or by high-digital photography. Then the captured image will be subjected to analayzation and manipulation process. These process also includes compression of data, enhancement of the image and spotting the patterns that are not visible to human eyes like satellite photography. Finally, output will be obtained as an alternative image or any other essential feature extraction of the pre-processed image. Image Processing consists of two major types. They are: Analog Image Processing and Digital Image Processing. Digital Image Processing is a process in which digital system is developed for processing a digital image and extracting feature form of results. Digital Image Processing works on the basics of any algorithm. An Intelligent System for Accurate Detection and Prediction of Alzheimer's Disease mainly uses k-nearest neighbor algorithm. Alzheimer's Disease is a type of disease in which the brain cells tend to die away and cause memory loss. In our proposed model we predict the accuracy of the amount of memory loss occurred in an affected brain. This system is mainly developed for helping the doctors and psychologists to obtain maximum level of accuracy of the patient's affected brain.

Keywords: Image, Image Processing, Digital Image Processing, Alzheimer Disease, Pre-Processing, Analyzation, Manipulation, Wavelet Transformation, KNN Algorithm, Feature Extraction, Accuracy.

1. INTRODUCTION

Digital image processing is used in many aspects of today's technological world. It's main aim is to digitalize a system and perform some process in a digital image using any algorithms like KNN algorithm etc., To digitally process an image initially it is necessary to reduce the pixel size of the image by that can be manipulated by a computer. There are three types of images in digital image processing. They are binary image, gray scale image and colour image. Initially manual analysis was used in the classification phase of the Alzheimer disease prediction. It produced inaccurate results and consumed lot of time. Several popular methods are used in the medical industry which includes the maximum entropy method, Otsu's method (maximum variance), and Doppler effect. An intelligent system for detection and prediction of Alzheimer disease is mainly designed for providing accurate diagnosis for the Alzheimer disease. To give fully automatic image analysis method and attempts an approach for classification of brain images to find out pathology and normal part of brain. We use the k-Nearest Neighbors Algorithm for classification and regression. The naive version of the algorithm is easy to implement by computing the distances from the test example to all stored examples. Finally the feature is extracted and the percentage of memory loss is calculated.

2. LITERATURE SURVEY

Probabilistic Neural Networks for Classification[1]using nonlinear decision boundaries has been proposed by Specht and Donald(1989).In this system the researchers proposed a system neural networks are formed with exponential function instead of sigmoid function which computes non-linear decision boundaries. However results where not so much accurate. **Input Feature Selection by Mutual Information[2]** has been developed by Nojun and Chong(2002),Mutual information is a good indicator of relevance between variables, and have been used as a measure in several feature selection algorithms. However, calculating the mutual information is difficult, and the performance of a feature selection algorithm depends on the accuracy of the mutual information. **Prodromal Alzheimer Disease Via Pattern Classification[2]** has been proposed by Christos Et al.(2009),In which Computer-based high-dimensional pattern classification of MRI detects patterns of brain structure often a prodromal phase of Alzheimer's Disease (AD).This system is capable of bringing highly accurate results for Alzheimer Disease but the setup is highly costly and not affordable.

3. EXPERIMENTAL SETUP

3.1. Block Diagram

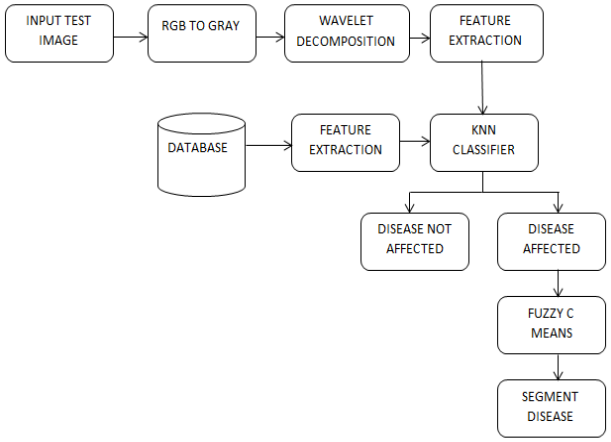

Fig 1: Block Diagram of the proposed system

3.2. Proposed System

An intelligent system for accurate prediction and detection is mainly designed for providing an early diagnosis for neurogenerative diseases in human brain. Existing studies suggest neuroimaging may become a valuable tool in the early diagnosis of neurodegenerative diseases by extracting anatomical patterns and revealing hidden relations from structural Magnetic Resonance (MR) images. The value of neuroimaging against clinical, neuropsychological, and biochemical analysis remains to be demonstrated in large representative populations, yet there exists sufficient evidence in small series of patients with different states of neurodegenerative disorders. This work gives fully automatic image analysis method and attempts an approach for classification of brain images to find out pathology and normality part of brain by extracting salient features of input brain image and the region of interest is identified using kernel k-means algorithm. A large number of image file formats are available for storing graphical data, and, consequently, there are a number of issues associated with converting from one image format to another, most notably loss of image detail. When converting an RGB image to grayscale, we have to take the RGB values for each pixel and make as output a single value reflecting the brightness of that pixel.

A Discrete Wavelet Transform it captures both frequency and location information (location in time). After wavelet decomposition, feature extraction process is done. In the feature extraction process main features like energy, contrast, correlation, homogeneity and entropy are extracted. A well nourished brain image without memory loss is taken for comparison. The features of that brain is compared with the brain of other affected brain samples. Further classification process is done. The classification process is the most important steps of the image processing. In pattern recognition, the k-Nearest Neighbors algorithm (or k-NN for short) is used. It is a non-parametric method used for classification and regression

In both cases, the input consists of the k closest training examples in the feature space. The output depends on whether k-NN is used for classification or regression. The kNN algorithm is used for producing more accurate results and the naive version of the algorithm is easy to implement by computing the distances from the test example to all stored examples. Finally

segmentation process is done. In the segmentation process a digital image is partitioned into multiple segments as set of pixels known as super pixels. The main goal of segmentation is to simplify or change the representation of an image into something that is more meaningful and easier to analyze. Finally comes the process of performance analysis. Performance analysis is based on accuracy, sensitivity and specificity is done. This metrics are based on True Positive(TP),True Negative(TN),False Positive(FP),False Negative(FN). Finally the proposed system gives more accuracy than the existing system. Thus final result will be displayed in graphical format along with disease affected or disease not affected caption. In future fuzzy c-means logic can be used for identifying the type of Alzheimer disease.

3.3. Performance Analysis

Parameters	Accuracy	Sensitivity	Specificity	Balanced Accuracy	F measure
Existing System	80.16	75	81.63	78.32	62.29
Proposed System	85.72	88.89	80	84.45	89

Table 1. Compared to Existing system, Proposed system has better results. Accuracy is 5% increased compared to existing. Sensitivity is 14% increased compared to exiting system. And also Balanced Accuracy is 6% increased. F-measure is increased by 27%

4. EXPERIMENTAL SETUP

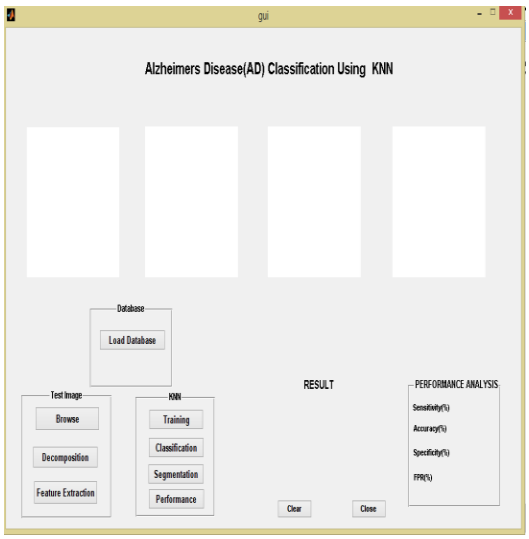

Fig 2: Output Layout Form

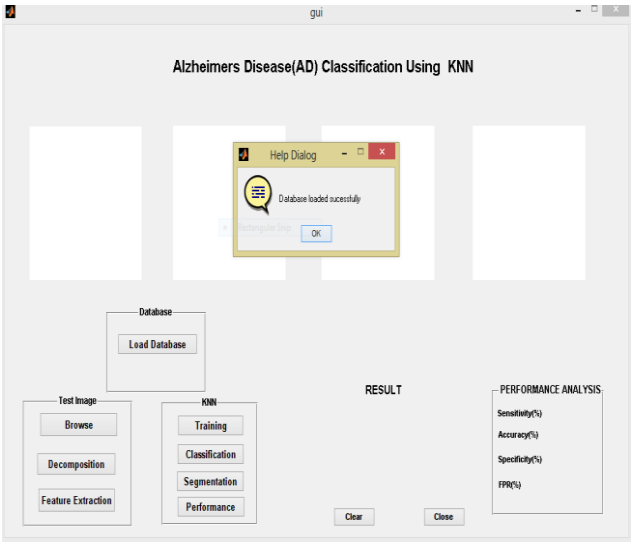

Fig 3: Load Database

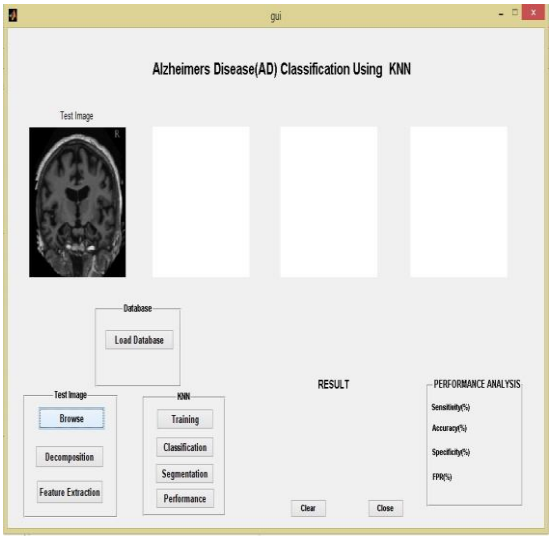

Fig 4: Test Image Selection

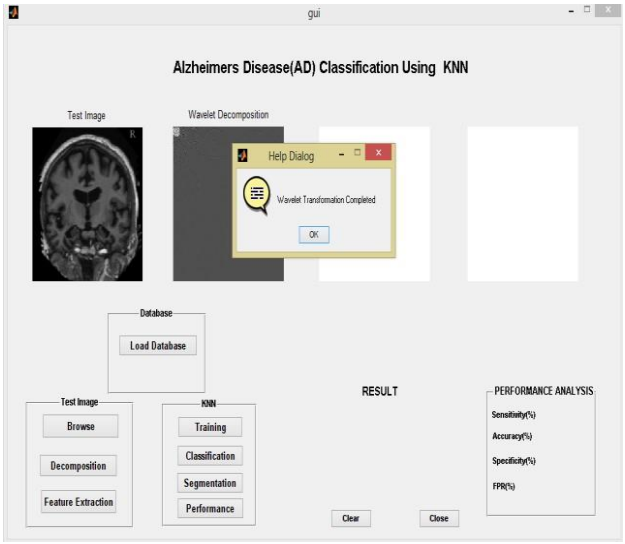

Fig 5: Wavelet Transformation

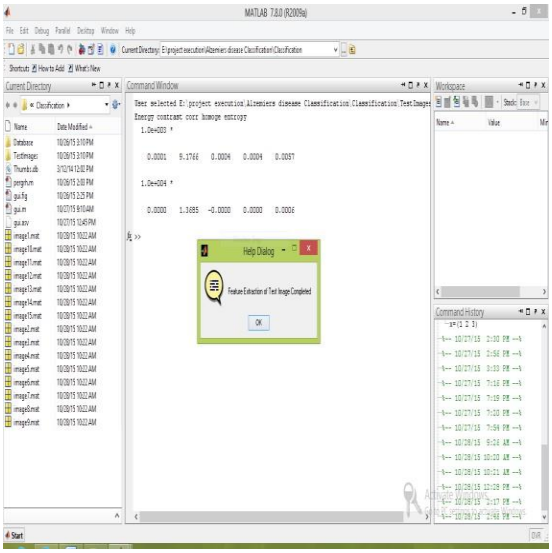

Fig 8: Feature Extraction

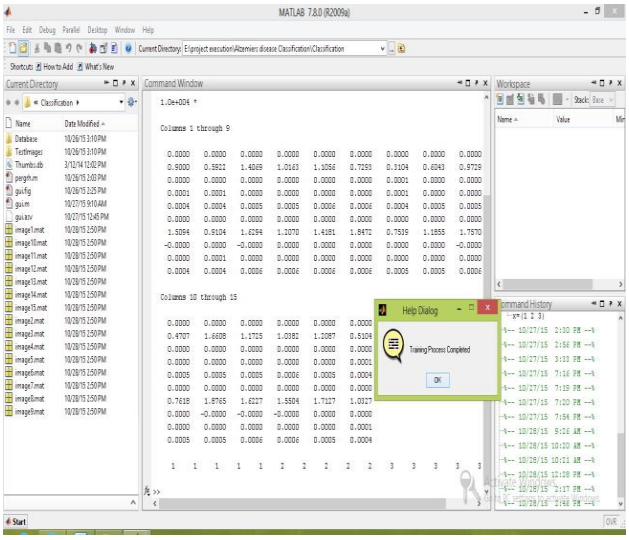

Fig 9: Training Process

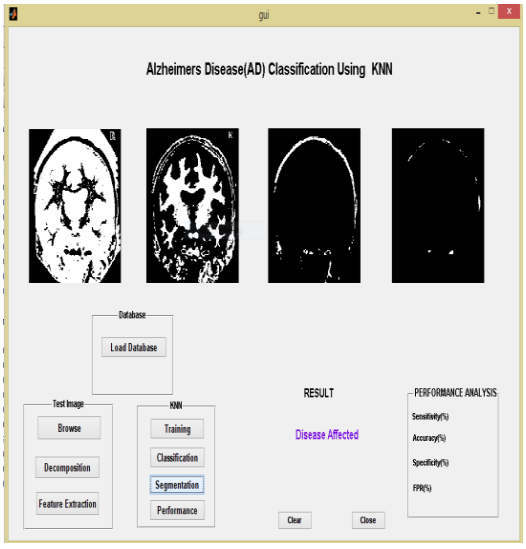

Fig 10: Classification & Segmentation

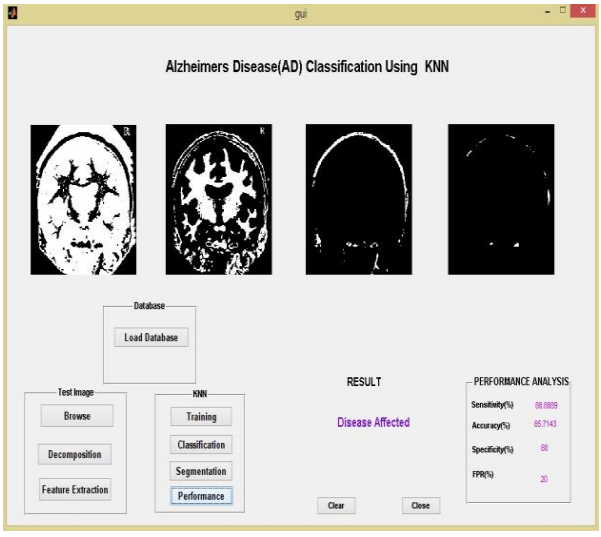

Fig 11: Performance Analysis

5. CONCLUSION

Thus a proposed system is a system it is possible to find the discriminant patterns that an expert clinician might discover in similar images. This is accomplished using a KNN that mixes together with Fuzzy C Means, achieving accurate classifications of probable.AD patients or healthy controls. Different stages of Alzheimer disease can be easily identified. In future the same system can be extended for lung diseases, different types of cancer identification etc.

REFERENCES

[1] Andrea Rueda, Fabio A. González and Eduardo Romero,(2014)' Extracting Salient Brain Patterns for Imaging-Based Classification of Neurodegenerative Diseases',IEEE Transactions On Medical Imaging, No. 6, Vol. 33

[2] Guler I, Ubeyli E.D.(2005) 'Feature Extraction from Doppler Ultrasound Signals for Automated Diagnostic Systems' Computers in Biology and Medicine;.35(9): 735–764

[3] Georgiadis,Cavouras D, Kalatzis I, Daskalakis A, Kagadis G.C, Sifaki K, Malamas M, Nikiforidis G, Solomou E.(2008)' Improving brain tumor characterization on MRI by probabilistic neural networks and non-linear transformation of textural features',Computer Methods and program in biomedicine, vol 89, pp24-32.

[4] Tejal A. Fuse1 ,Nikita D. Jayasignpure and Prof. Pragati D. Pawar,(2014),'Nmf-Svm Based Cad Tool For The Diagnosis Of Alzheimer's Disease ',Volume 3, Issue 12, December.

[5] Zhang D, Wang Y, Zhou L, Yuan H,(2011),' Multimodal Classification Of Alzheimer's Disease And Mild CognitiveImpairment'.Neuroimage.,Apr 1;55(3):856-67.

[6] For Classification Problems By Mutual Information Based On Parzen Window', IEEE Transactions on Neural Networks, 13(1), 143–159.

[7] Kwak, Nojun,(2002)'Input Feature Selection For Classification Problems',IEEE Transactions on Neural Networks, 13(1), 143–159.

Conflict of Interest

None of the authors have any conflicts of interest to declare.