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CLASSIFICATION OF NEURODEGENERATIVE DISEASES FROM EXTRACTION OF SALIENT BRAIN PATTERNS

Mr. Chetan. R. Patil[1]. Prof. Dr. K. V. Kulhalli[2].
[1].D.Y. Patil College of Engg and Technology, Kolhapur, Maharashtra.
[2].Vice Principal, D.Y.Patil College of Engg and Technology, Kolhapur, Maharashtra.
E-mail: 1.chetanrpatil.54@gmail.com ,2. kvkulhalli@gmail.com

Abstract
Neurodegenerative diseases causes a wide variety of mental symptoms whose evolution is not directly related to the analysis made by radiologists on basis of images, who can hardly quantify systematic differences. This paper presents a new automatic (Based on software program) image analysis method that reveals different brain patterns associated to the presence of neurodegenerative diseases, finding systematic differences and therefore grading objectively any neurological disorder. An accurate solution can be provided by using Alzheimer's diseases based on saliency map characterization is carried out on database images. This paper gives automatic image analysis method and attempts an approach for classification of brain images to search for 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 support vector machine (SVM) a supervised learning process is used for classification of AD, which is recognized on basis of blue color is normal brain part and red color is pathology related.

I. INTRODUCTION

Neurodegenerative diseases affect central nervous system. Neurodegenerative is mixture of two words those are Neuro means "nerve cell" and Degeneration means "progressive losses". Overall definition of Neurodegenerative diseases is progressive loss of memory that involves loss of neurons and death of neurons intern that leads to loss of constitution of nerve and functions of nerve. An Alzheimer's diseases start as small or mild and progressively it will get worse. The symptom of this disease includes loss of thinking skills, memory and behavioral changes. It starts in late middle age around 45 to 65 age groups or in old age and even it can affect any age group as well. In medical field, generally single magnetic resonance image are taken with consideration for disease analysis. While analyzing structural brain MR images, a main intention is to find anatomical changes related to functional disturbances. Single magnetic resonance may not show all the required parameters, so there is need of another modality image to diagnose better. By using anatomical interpretation we can combine relevant parameters of different modalities in a single image which will very helpful to physician. Anatomical interpretation is a process of combining the relevant information from a set of images of the same scene into a single image and the resultant fused image will be more informative and complete than any of the input images. Input images could be multi sensor, multimodal, multi focus or multi temporal. The fused image should preserve all relevant information from the input images. Image fusion algorithms can be on a feature levels. Feature level fusion algorithms operate on features extracted from the source images. Saliency map images are used to find particular patterns among the anatomical areas in the structural brain Magnetic Resonance (MRI) image typically used in identifying Alzheimer's diseases. Fused images can be performed with multiple images which of the same certain type of the information. So this combined information can be more helpful to diagnose the disease to doctor.

II. Previous Work

A. Padilla .P, Lopez .M, et.al[2012]

Authors have proposed a computer-aided diagnosis (CAD) technique for diagnosis of Alzheimer's diseases based on nonnegative matrix Factorization (NMF) and support vector machine. The CAD tool is designed for the study and classification of functional brain images. For this purpose two different data sets are selected: a single photon emission computed tomography (SPECT) and positron emission tomography images. These datasets are analyzed by applying the Fisher discriminate ratio and NMF function for feature selection and extraction of most relevant features. The resulting NMF-transformed sets of data are classified by means of SVM-based classifier.

B. MARCUS. D, WANG. T, ET.AL[2007]

Authors have proposed that the open access series of imaging studies is a series of magnetic resonance imaging data sets that is available easily on the internet for study and analysis. The initial data set

consists of cross- sectional collection of certain subjects of typically aged. For each subject, three or four individual T-1 weighted magnetic resonance imaging scans obtained in single imaging sessions are included. Multiple within-session acquisitions provide extremely high ratio contrast- to-noise ratio, making the data amenable to a wide range of analytic approaches including automated computational analysis.

C. Anna Wang, et.al[2006]

Authors have proposed that the wavelet transform method for fusion of images. Wavelet transform, is an effective approach in image fusion area. In this paper the authors have discussed work to improve the image content by fusing images like computer tomography and magnetic resonance images, so as to provide more information to the medical practitioner and clinical treatment planning system. This paper aims to demonstrate the application of wavelet transformation to multi-modality medical image fusion. This work covers the selection of wavelet function, the application of wavelet based fusion algorithms on medical image fusion of CT and MRI

III. PROPOSED WORK:

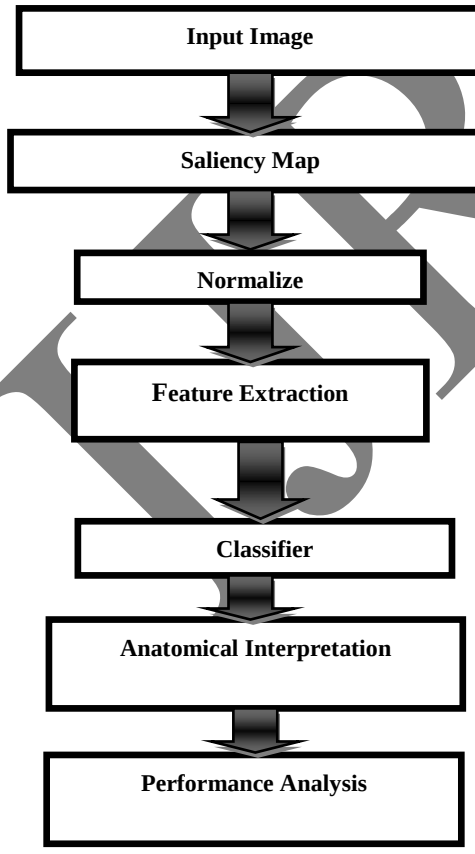


Figure 1: Flow chart for implemented system

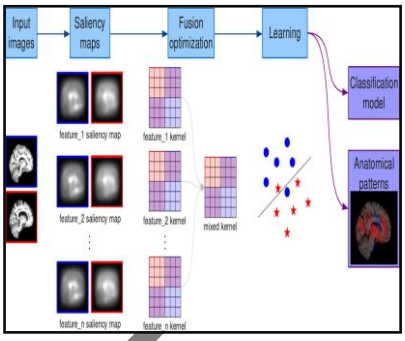


Figure 2: Graphical overview of the proposed method

Fig. 1 and 2 shows Block diagram and Graphical overview of the proposed method. Different feature-scale saliency map extracted, then a learning algorithm fuses optimally this information to feed SVM classifier, to produce both a classification model as well as maps of applicable anatomical regions.

In this method implementation of the kernel function for feature extraction to identify the neurodegenerative Alzheimer disease in Brain Image. The input Brain image is converted to gray image and processed and saliency map image. After getting the saliency map image normalization of the saliency map is done and applying the kernel fusion to the normalize image to extract the feature of the image. Finally by using the SVM classifier to classify the feature value and identify the anatomical regions present in the brain image.

This work is carried out in following steps:

- **SALIENCY MAP**

This module gives the saliency map of given input image that correlates (maps) the each feature into its neighboring pixel feature. For calculation of degree of difference Euclidian function is used. Each feature maps into a finish measure using saliency map that combines related information from single information into a global measure. Saliency typically calculated from contrasts between the given location and their neighborhood.

- **NORMALIZATION**

Means changing the Intensity, Coordinates values, etc…., it is a process of changing the pixel intensity values. It is also called stretching of contrast or histogram stretching. In normalization process same constant dimensions are identified and distinguished, so that it is used to produce anatomical regions.

- **KERNEL FEATURE EXTRACTION**

Due to the increased popularity of the learning method which is known as Support Vector

Machines uses kernel method for extraction of feature. It is calculated in terms of kernel k-means method so that features can be extracted.

- **SVM CLASSIFIERS**

Support vector machines are supervised learning model that are mainly associated with learning algorithms that used for analysis of the data and for identification of patterns which is used for classification process and map the trained data to classify accurately.

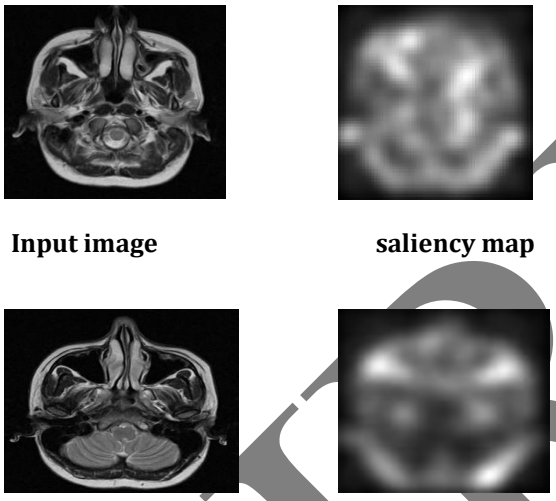
- **ANATOMICAL INTERPRETATION**

Red regions are separated pathology and blue regions are marked for normality In this way anatomical interpretation is done.

- **PERFORMANCE ANALYSIS**

Performance analysis is based on sensitivity, accuracy and specificity is done.

IV. RESULT:



Input image **saliency map**

Figure 3: indicates input query image and its saliency map

V. CONCLUSION:

In this paper the accuracy is achieved using saliency map characterization and kernel k-means method is adapted which is very useful in differentiation of Neuro degeneration diseases with better accuracy. This paper has also given fully developed automatic technique that reveals structural brain pattern coupled to the occurrence of the Alzheimer's disease in a public dataset of brain MR images.

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