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Identification and Classification of Tumors

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Abstract: **The abnormal growth of cells uncontrollably leads to the accumulation of the dead and damaged cells. This leads to swelling in body parts, known as tumors. All tumors are not cancerous and life-threatening, if they are identified at an early stage. Therefore, identification of the tumors and its classification at an early stage is very significant toward its cure. This is a review paper, about the existing methods in the identification of tumors, and its classification methods. The proposed system can be used to assist doctors in the clinical diagnosis of brain tumors.**

Keywords: **Central Nervous System (CNS), Positron Emission Tomography (PET scan), Classification of Tumors.**

1. INTRODUCTION

The tumors are of various types like the lung cancer which begins in the lungs, the colon/ rectum cancer occurring in the rectum, the leukemia occurring in the blood-forming tissues and affecting the body's ability to fight infection, the melanoma which is a serious type of skin cancer, the breast cancer and the most serious type the brain cancer affecting the mass of supportive tissues and nerve cells forming the Central Nervous System (CNS). All the basic body functions like breathe, heartbeat, movement, coordination, the senses – vision, hearing, and even our personality is controlled by this system. Now, when these cells grow old or are damaged, they are replaced by the new cells. Sometimes, this process of cell division goes wrong and abnormal multiplication of cells takes place leading to tumor within the area. Thus, tumor can be defined as an abnormal mass of tissue that grows uncontrollably within the brain and interfering with the normal brain activity. Again each tumor can be classified mainly into benign tumors and malignant tumors – the former originates within the well-defined boundary with no cancer cells and the latter contains cancer cell, spreads rapidly to other body parts.

The signs and symptoms of brain tumors may occur gradually like a headache, nausea, blurred vision, balance problem or a seizure. Diagnosis methods include imaging techniques like computed tomography (CT or CAT scan) and magnetic resonance imaging (MRI). Magnetic Resonance Spectroscopy (MRS) to examine the tumor's chemical profile. Positron Emission Tomography (PET scan) to detect recurring brain tumors. Once tumor is detected it is treated with surgery, radiation, and/or chemotherapy — alone or in various combinations.

In this proposed paper, research about the existing methods in the identification of tumors, and its classification methods. The proposed system can be used to assist doctors in the clinical diagnosis of brain tumors.

2. LITERATURE SURVEY

Kailash D. Kharat presented work on brain tumor classification using neural network in which DWT used for feature extraction, dimensionality reduction using PCA and a combination of two classifiers feed forward and back propagation neural networks were used for classification of tumor type with MRI and MRS data as input [1].

Asst. Prof. V. S. Kolge, worked on an automated classification of brain tumor using PCA for feature extraction and classification done using PNN [2].

A novel approach in brain tumor classification using artificial neural networks was presented by Madhusudhanareddy P in which image processing techniques were used for detection of tumour and back propagation method used for classification [3].

In the paper, ―Binary Classification of Brain Tumours Using a Discrete Wavelet Transform and Energy Criterial, by Carlos Arizmendi, Alfredo Vellido, Enrique Romero, published in ©2011 IEEE, provides a combination of the Discrete Wavelet Transform (DWT) for signal decomposition and an energy criterion for signal reconstruction to pre-process the Magnetic Resonance Spectroscopy (MRS) data prior to feature selection and classification with Bayesian Neural Networks [4].

The main work lies in the preprocessing and noise removal from the image so, that the tumor area can be segmented properly for the correct identification of the tumor. They have used the segment thresholding and the watershed segmentation method. This is the work of Neha Baraiya and Hardik Modi in the paper Comparative Study of different methods for brain tumor extraction from MRI images using image processing [5].

Classification of Human Brain Tumors from MRI Using K-NN Algorithm, is a research work by Sunita Singh, which deals with the new approaches for brain Tumor detection using K-NN Algorithm as a classifier and K- means clustering as segmentation. It aims to develop an effective algorithm for the segmentation of Brain MRI images. The imaging modalities most often used for diagnosis of brain diseases is magnetic resonance imaging (MRI) and computerized tomography (CT) [6].

In the paper, Classification of brain MRI images using support vector machine with various Kernels by M. Madheswaran and D. Anto Sahaya Dhas, an enhanced classification system for classification of brain tumor from MRI images using association of kernels with support vector machine is developed and presented in this paper. Oriented Rician Noise Reduction Anisotropic Diffusion filter is used for image denoising. A modified fuzzy c-means algorithm termed as Penalized fuzzy c-means algorithm is used for image segmentation. The texture and Tamura features are extracted using GSDM and Tamura method. Genetic algorithm with Joint entropy is adopted for feature selection [7].

Flow Chart of existing methods:

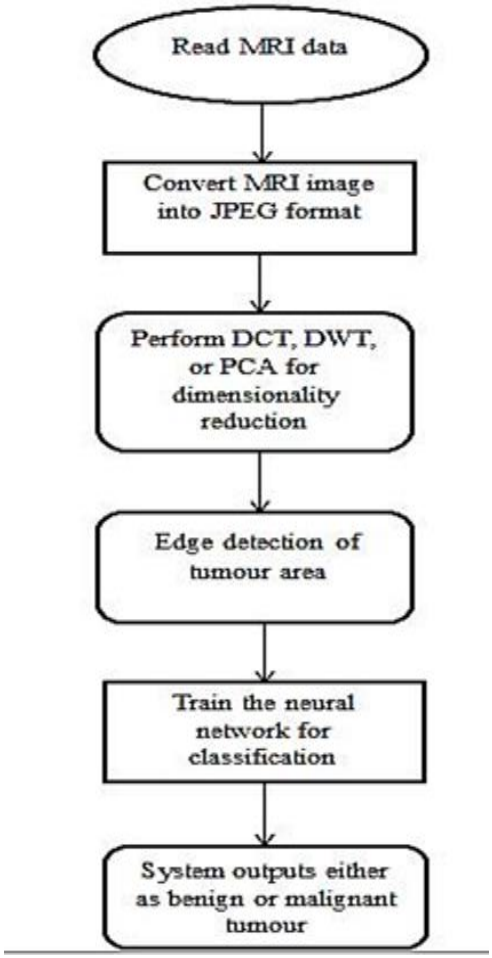

Fig. 1: Flow chart of the proposed system

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Discrete Cosine Transform: The Discrete Cosine Transform (DCT) helps separate the image into parts or spectral sub-bands of differing importance with respect to the image's visual quality. It transforms the image from spatial domain to frequency domain. The general equation for 2D (N by M image) DCT is defined by the equation :

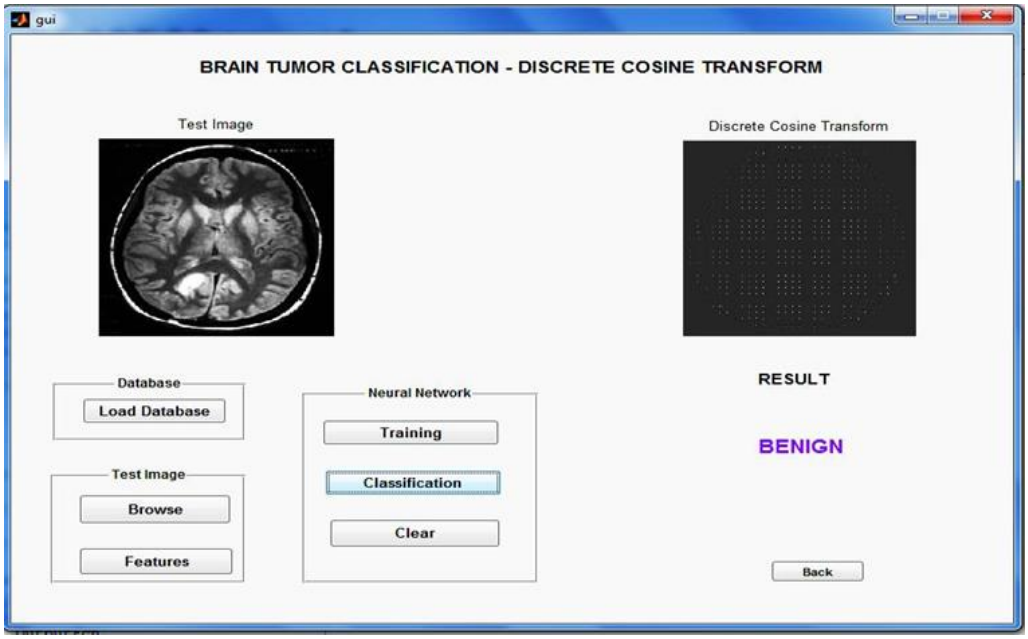

Fig. 2 Brain tumor detection using Discrete Cosine Transform

Discrete Wavelet Transform: Wavelet transform performs multi–resolution of images that is simultaneous representation of images on different resolution levels. The wavelet compression techniques uses wavelet filters for decomposition into sub-images. First, filter is applied along the rows, then along the columns thus resulting in four sub-bands that is low-low, low-high, high-low and high- high. Hence, M x N image is filtered and then down sampled into N x M/2 images. Then each column is filtered and down sampled into N/2 x M/2 images.

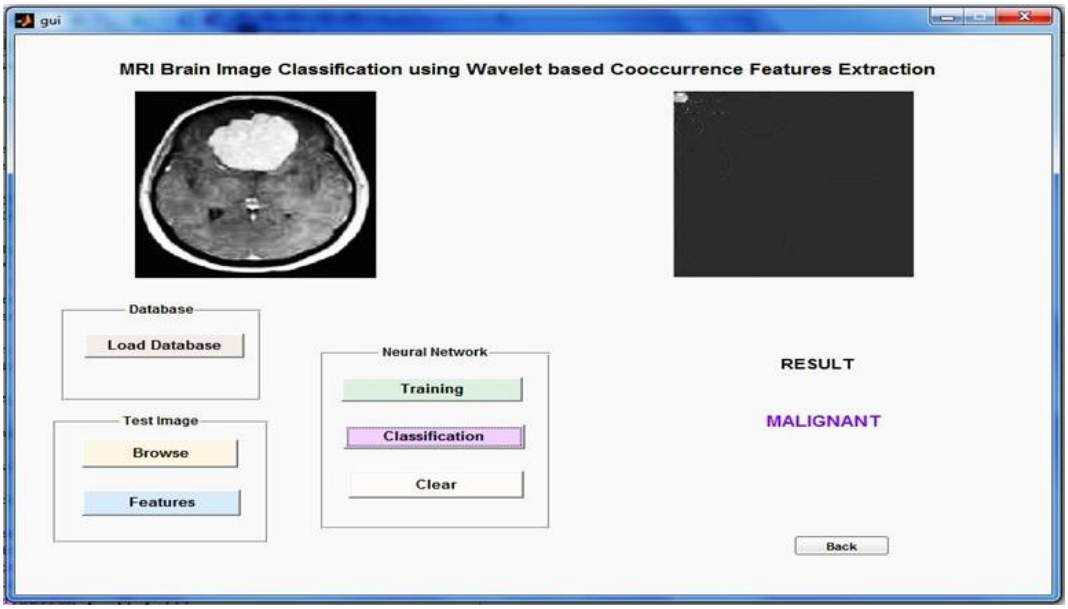

Fig 3: Malignant tumors detected using Discrete Wavelet Transform

Probabilistic Neural Network: The Probabilistic Neural Network (PNN) is a Radial Basis Function suitable for pattern classification whose fundamental architecture has three layers – an input layer, a pattern layer and an output layer. The pattern layer constitutes a neural implementation of a Bayes classifier, where the class dependent Probability Density Function (PDF) are approximated using estimator.

3. CONCLUSION

The activities done so far have concentrated mainly on the MRI images for the classification and identification of brain tumor. But, the major challenge lies in the identification of malignant tumors, which is not concentrated and has spread to other parts.

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