Detection of Brain Tumor in Radiographic Images using Neural Network

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ABSTRACT

The brain is a highly specialized organ. It serves as the control center for functions of the body and allows us to cope with our environment. Based on biological theory of human brain, artificial neural network are models that attempt to parallel and simulate the functionality and decision making processes of human brain. In general neural network is referred to as mathematical models of theorized mind and brain activity. Neural network provide significant benefits in medical research. They are actively being used for detecting characteristics in medical emergency and controlling medical devices. In this paper we review application of ANN to brain images to identify tumors in adult. Here we represent different criterion to improve the result. We also compare the performance of our-algorithm applying to various training algorithm.

Keywords

Artificial neural network (ANN), back propagation, gray values, brain tumor.

1. INTRODUCTION

Cancers may be categorized based on the functions/locations of the cells from which they originate. The following terms are commonly used to categorize tumors by their tissue (cell type) of origin Carcinoma- a tumor derived from epithelial cells, those cells that line the surface of our skin and organs. Our digestive tract and airways are also lined with epithelial cells. This is the most common cancer type and represents about 80-90% of all cancer cases reported. Sarcoma-a tumor derived from muscle, bone, cartilage, fat or connective tissues. Leukemia- a cancer derived from white blood cells or their precursors. The cells that form both white and red blood cells are located in the bone marrow Lymphoma- a cancer of bone marrow derived cells that affects the lymphatic system. Myelomas- a cancer involving the white blood cells responsible for the production of antibodies (B lymphocytes or B-cells)."A picture is worth a thousand words" this axiom expresses the essential difference between our ability to perceive linguistic information and visual information. The ultimate aim in large number of image processing applications is to extract important features from image data from which a description, interpretation or understanding for the scene can be provided by a machine. In this project we are using different criteria for classification of medical (brain tumor) images [1]. A neural network is used to classify individual pixels by a convolution operation based on a feature vector. We design right features that characterize the local texture in the neighborhood of a pixel. An analysis of the eight features indicates that the presence of pathology in brain.

2. ARTIFICIAL NEURAL NETWORK FOR MULTISPECTRAL IMAGE CLASSIFIERS

Artificial neural network (ANNs), a brain style computation model, have been used for many years in different application areas such as vector quantization, speech recognition and pattern recognition [2, 3]. Recently there has been a tremendous growth of interest in the field of ANN. ANN can be defined as a "massively parallel distributed processor that has a natural propensity for storing experimental knowledge and making it available for use [4]. In this study, we review applications of ANNs to brain signal analysis, for diagnosis of primary tumors in the adults such as pilocytic astrocytomo, meningioma, oligodendroglioma and meningiom with intra tumoral hemorrhage.

Neural network model have a number of advantages over the serial model. Because its parallel architecture, neural networking may break down some of the computational bottlenecks which limit the performance of serial machines. Since neural networks are trained using example data, they can be made to adapt to changes in the input data by allowing the training to continue during the processing of new data. Another advantage of training is that since data are presented individually, no overhead is required to store the entire training set. This is particularly important when processing very large data sets of which images are an example.

Neural network are trained so that a particular input leads to a specific target output, such a situation is shown in fig. 1.

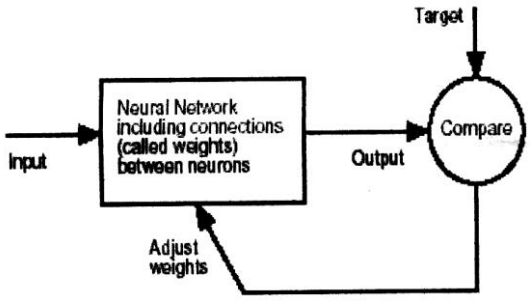

Fig 1

There the network is adjusted based on a comparison of the output and the target, until network output matches the target. Typically many such input / target pairs are used, in this supervised learning is used to train a network. A key benefit of neural networks is that a model of the system on subject can be built just from the data [5].

3. SUPERVISED MODELS

Many adaptive non-parametric neural net classifiers have been proposed for real world problems. These classifiers show that

they are capable of achieving higher classification accuracy thus conventional pixel based classifiers. Feedforward multilayer network, as shown fig. 2 is an interconnected network in which neurons are arranged in multilayer and fully connected.

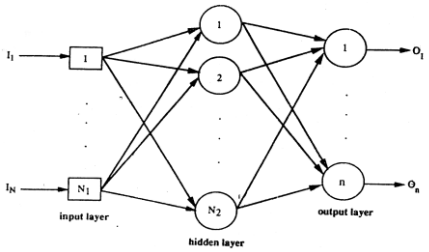

Fig 2

These weights are adjusted using the back propagation algorithm or it variations, which is called training the neural networks. Once the network is well trained, it can be used to perform the image classification.

4. Back propagation algorithm

Tone and texture are always present in an image. They have an inextricable relationship to one another. Texture is characterized by spatial distribution of gray levels in a neighborhood, since texture shows its characteristics by both pixel coordinates and pixel values there are may approaches used for texture classification.

Here we apply a back propagation algorithm for faster training and these training algorithm are variable learning rate (traingda, traingdx) and resilient back propagation (trainrp). As we compare this algorithm we found that result obtained by using resilient back propagation (trainrp) have optimal performance.

5. Experiments

As an application the various images fig. 3, considered from which a portion fig. 4, has been extracted which needs to be classified into different classes considering gray values and textural features.

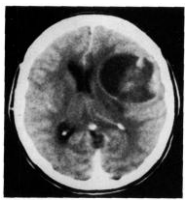

Fig. 3 : Read image for training

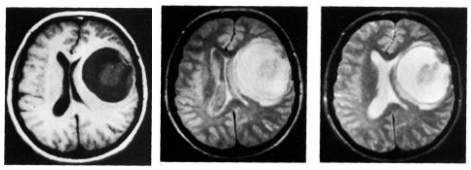

Fig. 4 : Different part in training images

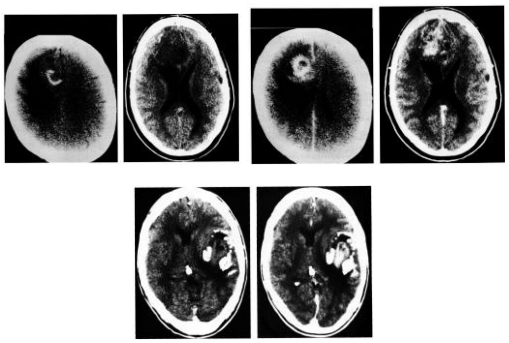

Fig. 5 : Extract features from test image automatically according to training algorithm

6. CONCLUSION

The ANN can provide useful output as a second opinion to improve radiologist's diagnostic performance in the differential diagnosis of intra-axial cerebral tumors. A supervised classification algorithm for various images based on neural network has been descried. The application of this algorithm is to classification brain tumor into various types. After locating exact criteria of patient, i.e. age, side location, age, vascularity, density, calcification, push pathology we identify type of tumor in adult. The variation of images are normally requires the selection of training data for every image. The resilient bp algorithm is faster and give less error and provide optimize result.

7. REFERENCES

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