



UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF POSTGRADUATE STUDIES

Faculty of Engineering, Department of Biomedical Engineering

By

Author

Fatima Mohammed Abd Elglil Mazloum.

A Thesis

Brain Tumor Detection Using Neural Network

Submitted to the Faculty of Postgraduate Studies in Partial
Fulfillment of the Requirement for the Degree of Master of
science in Medical Engineering

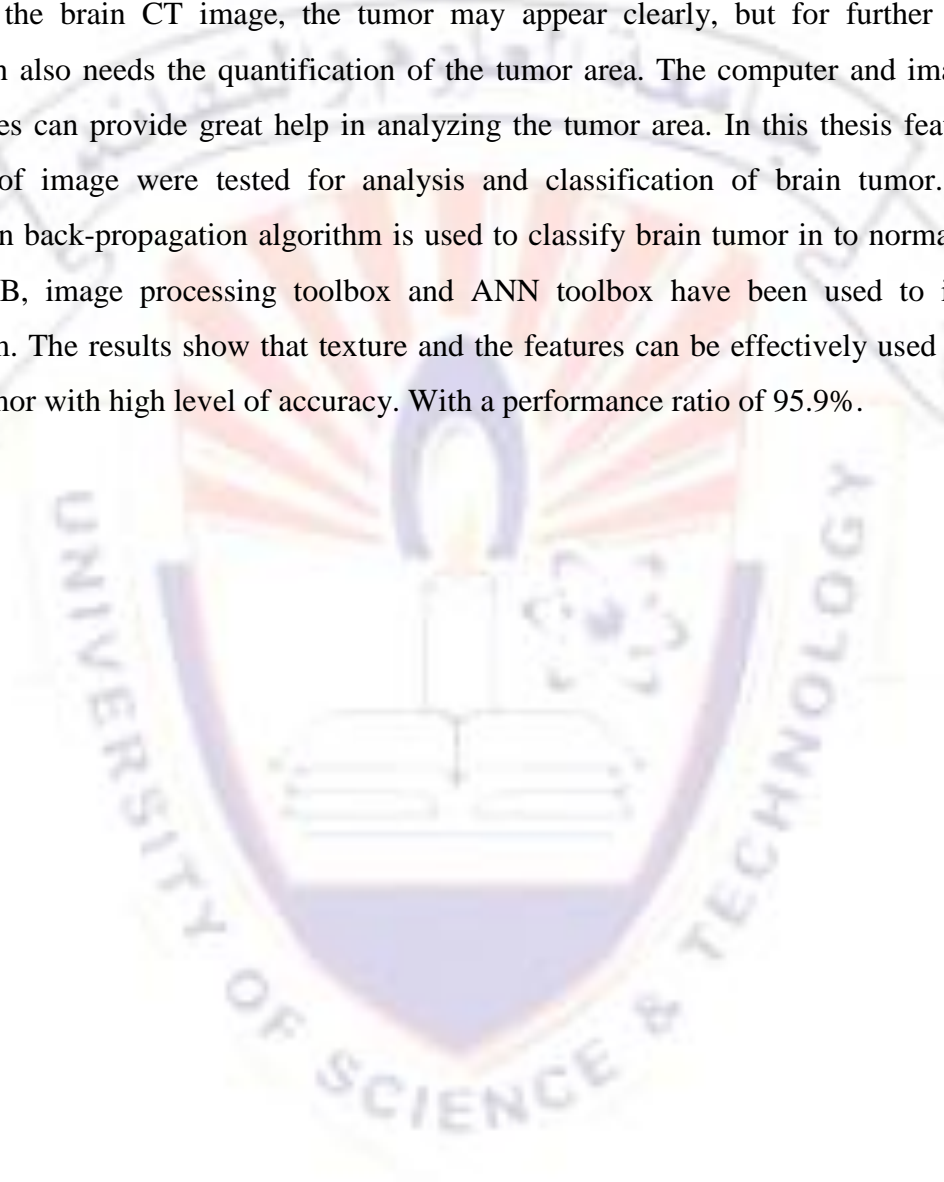
Supervisor

Dr. zeinab Adam Mustafa

June 2015

Abstract

Accuracy and efficiency are two major issues in designing CAD (Computer Aided Diagnosis) systems. Most of CAD systems are dedicated to visual feature extraction because it has been shown that visual information extracted from images can achieve similarity retrievals with high performance of effectiveness of the diagnosis, at the same time reducing the pain of the patients also. In the brain CT image, the tumor may appear clearly, but for further treatment, the physician also needs the quantification of the tumor area. The computer and image processing techniques can provide great help in analyzing the tumor area. In this thesis features based on content of image were tested for analysis and classification of brain tumor. After feature extraction back-propagation algorithm is used to classify brain tumor in to normal & abnormal. MATLAB, image processing toolbox and ANN toolbox have been used to implement the algorithm. The results show that texture and the features can be effectively used for classifying brain tumor with high level of accuracy. With a performance ratio of 95.9%.



المستخلص

ان الحصول علي الدقه العالميه والكفاءه هما أهم مايميز أنظمه التشخيص بمساعدة الحاسوب وتعتمد انظمة التشخيص عن طريق الحاسوب على الخصائص المرئية للصور وهي اهم الاشياء التي تميز انظمة التشخيص بواسطة الحاسوب لأنها تحقق استرجاع التشابه مع أداء عال من التشخيص.

وفي صور الأشعة المقطعية للدماغ ، قد يظهر الورم بشكل واضح ، ولكن لمزيد من العلاج ، الطبيب يحتاج الى المساعدة في معرفة حجم الورم. يمكن للتقنيات المعالجة للحاسوبية للصور تقديم مساعدة كبيرة في تحليل منطقة الورم عن طريق استخراج خصائص الصورة .

هذه الأطروحة تستند الى محتوى الصورة تم اختبار لتحليل وتصنيف الأورام في المخ وذلك بعد استخدام ميزة استخراج خواص الصور لتصنيف الأورام في المخ في وضعها الطبيعي وغير الطبيعي.

طرق معالجة الصور وخوارزميات استخراج خصائص الصور والتصنيف باستخدام الشبكات العصبية الاصطناعية لتنفيذ الخوارزمية .

اظهرت النتائج ان هذه الخوارزمية يمكن استخدامها بشكل فعال لتصنيف الأورام في المخ مع مستوى عال من الدقة ، وحقت نسبة اداء 95.5% .



Introduction

Image processing techniques play an important role in analyzing anatomical structures of the human body. Medical imaging technologies are used to visualize the human body in order to diagnose, monitor, or treat medical conditions. Each type of technology gives different information about the area of the body being studied or treated, related to possible disease, injury, or the effectiveness of medical treatment. [1]

The most common technologies used are X-ray Computed Tomography, also commonly referred to as CAT scan which is a medical imaging method that combines multiple X-ray projections taken from different angles to produce detailed cross sectional images of areas of the body, such as soft tissue, the pelvis, blood vessels, the lungs, the brain, the heart, abdomen and bones. CT is also often the preferred method of diagnosing many cancers, such as liver, lung, pancreatic and brain cancers. [2] The brain is the most important part of the body that controls the daily activities. It controls the spontaneous activities like breathing and directs the activities that need to be done like walking and talking. The brain is the controller of the human system. Human brain is the most complex living organ. Brain cancer can be counted among the most deadly and obstinate diseases. Tumors are defined as the abnormal growth of the tissue. Brain tumors are masses or growths of abnormal cells in the brain. [3] Tumors are defined as the abnormal growth of the tissue. Brain tumor can be detected by the diagnostic imaging modalities such as CT scan and MRI. Both of the modalities have advantages in detecting depending on the location type and the purpose of examination needed. [2]

An artificial neural network (ANN), generally called neural network (NN), is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network contains of an interconnected group of artificial neurons (processing element), working in unison to solve specific problems. The neuron has two modes of operations: The training/learning mode and the using/testing mode. [4]

Back Propagation learning algorithm is a supervised learning algorithm. It is one of the most important developments in neural networks. This learning algorithm is applied to multilayer feed-forward networks consisting of processing elements (neurons) with continuous differentiable activation functions (Tan-sigmoid and log-sigmoid). The networks associated with back-propagation learning algorithm are also called back propagation learning networks (BPNs).

1.1 Objective

The objective of this research was to detect brain tumor from scanned CT images to analyze how the detection operator techniques will detect the size, shape, and boundaries of the brain tumor.

1.2 Problem statement

The early detection of brain tumor is a challenging problem due to the structure of cancer cell; both cancerous and non-cancerous regions appear with little distinction on CT image. Therefore, early and accurate detection of brain tumors is critical to plan appropriate treatment and extending the life of patients.



1.3 Thesis layout

The thesis consists of:

Chapter 1: Provides an introductory view of the research, problem statement, and the concerned objectives.

Chapter 2: Provides some anatomical background, a quick overview of all the concerned topics in relevance to the research and the basic elements for the methodology development.

Chapter 3: Is a brief recollection of the various works exhausted both in the areas of image processing and enhancement and pattern recognition and classification of tumors.

Chapter 4: Includes a detailed assembly of the various algorithms and methodologies that have been manipulated and implemented for the achievement of the research objectives.

Chapter 5: Demonstrates the gathering of results, the respective discussions for the created systems and the evaluation of the efficacy of the results obtained.

Chapter 6: Provides the overall conclusions drawn up from the thesis and some directions that could present as useful suggestions for future work.

