

Diagnosis System for the Detection of Abnormal Tissues from Brain MRI

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Abstract: The brain tumor is widely disseminating disease all over the world and causing the increasing death rates. If the tumor is diagnosed at early stages, the increasing death rate can be decreased to some extent. Manual segmentation of brain MR images by experts is very expensive, non-repeatable and time consuming task. The computer-aided diagnosis system assists experts to take the opinion to diagnose the disease severity. The diagnosis process can be affected if the images are low contrast or poor quality and wrong diagnoses chances become high. The objective of this paper is to establish an automatic, accurate, fast and reliable diagnosis system which could be able to diagnose the brain tumor and also extract the region of the brain tumor from brain MR images. The median filter is used for enhancing the poor quality image, fuzzy c-means clustering technique for segmentation of images and mathematical morphological operations are performed to extract the abnormal portion from images. The proposed technique is applied on different brain MR images for both visual evaluations and quantitative. Experimental results of the proposed method showed, the proposed approach provides a fast, effective and promising method for the brain tumor extraction from MR images with high accuracy.

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1. Introduction

Image segmentation refers to as partitioning a digital image into significant and non-overlapping regions with respect to a particular problem. There are four regions in the brain image which are gray matter, white matter, cerebrospinal fluid and background. These four regions can also be considered as four different classes in the brain. The input image therefore needs to be partitioned into these four classes. The segmentation of the medical image is an important issue in medical imaging. Segmentation is a primary step for medical image analysis. The human brain is the kernel part of the body and controls the functionality of the overall body. The brain has a very complex structure which contains billions of nerves that can concurrently process information from the body, operate internal organs, generate emotions and thoughts, recall and store memories, and also it controls the movement (<http://www.inborn-talent.in/know-brain>). The brain tumor is rapidly increasing disease in the different countries of the world. The brain can be affected by a problem that cause changes in its normal structure and its normal behavior. This problem is known as the brain tumor. The Brain tumor is the leading cause of solid tumor cancer death in human beings. Nowadays, the death rate is increasing due to the tumor. According to the research of the National Cancer Institute and National Brain Tumor Foundation United State (<http://www.cancer.gov/cancertopics/types/brain/>), almost 42000 people including men and

women in the US suffer from the brain tumor each year. About 29000 people are diagnosed and 13000 die. According to the latest survey of 2013 in the United States, new tumor cases reported are 23130 (including men and women), and deaths reported are 14080 (<http://www.cancer.gov/cancertopics/types/brain/>).

Diagnosis of the brain tumor is a serious task because a wrong diagnosis can lead to severe results. If the tumor is diagnosed at early stages, then life of a person can be saved for some extend. Brain tumor surgery is also a crucial task because the brain has a very complex interrelated structure. Each brain cell is bounded together in a very complex way.

Magnetic Resonance Imaging (MRI) is a medical imaging technique and radiologist used this for the purpose of visualization of the internal structure of the body (Bandhyopadhyay, 2013). MRI is a type of scan that is used mostly to help diagnose health conditions that affect bone, organs and tissue. MRI provides rich information about the human soft tissues anatomy. MRI can also be used to visualize almost all parts of the body, but it is most often used to study the blood and heart vessels, the spinal cord and brain, other internal organs such as liver or lungs, joints, bones and breasts (Aly, 2011).

In the most recent few years, several computer-aided diagnosis (CAD) systems have been developed using different methods and techniques to diagnose the brain tumor which provide the accuracy of correct detection at different accuracy scales.