

A Survey of Computer-aided diagnosis of MRI-Based Brain Tumor Detection and Classification

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Abstract— A Brain tumor is very meticulous diseases in the field of medical science that may leads to the deaths of affected person when it is not properly diagnosed at early stage. Detection and classification of brain tumor at right time enhances the probability of diagnostic method and treatment. As per the census, 1 out of every 1000 persons in India is subjected to have brain tumor. Brain tumors are formed due to the abnormal development of tissues inside the brain. The detection and Classification of tumor affected region of brain has been one of the most tedious process for the radiologists or clinical supervisors. Thus medical image processing approaches along with machine learning methodologies aids in diagnosis, pre-post surgical process include Computer-aided detection/diagnosis (CAD) systems to overcome the problem faced by the clinical diagnosing by enhancing the process for accurate detection and classification approaches. Magnetic Resonance Imaging (MRI), the most prudential and useful method for diagnosing the tumor. Good segmentation of brain MRI, have to provide a complete information about tumor and also classification from malignant to benign, which may be difficult due to its variation of gray intensities in tumor tissue. In order to solve the above stated problem, this review paper examines current practices, problems, and prospects of computer-aided detection and classification techniques for Brain tumor. The reason for studies on brain tumor not only helps for diagnosis purpose, also to provide a new avenue for explaining the strength and limitations of previously proposed classification techniques. The main aim of this survey paper is to clearly provide all current developments in the field of computer-aided diagnosis system for diagnosing the brain tumor and summarization of latest classification approaches and the techniques used for improving classification accuracy.

Keywords—Magnetic Resonance Imaging (MRI), Feature extraction, Segmentation, Classification.


I. INTRODUCTION

A Brain tumor is one of the major causes for the increase in death among children and adults around the world. Brain tumor is a group of unnecessary and abnormal cells that grows inside of the brain which may be occupies within the skull as an intracranial lesion causes intracranial pressure [1]. Brain tumors are mainly classified as Benign (noncancerous) and Malignant (cancerous). The location of tumor can be diagnosed by means of imaging techniques used in medical field such as Computed Tomography (CT), Single-Photon Emission Computed Tomography (SPECT), Magnetic Resonance Imaging (MRI) and Magnetic Resonance Spectroscopy (MRS) which may provide a particulars about shape, size, location and gray level of brain tumors. Among various methods of diagnosis, most commonly available method is MRI, is a non-invasive in vivo imaging technique that uses radio frequency signals to focus the tissues that are affected under the view of magnetic field.

Magnetic Resonance Imaging (MRI) is based on emission of radio wave energy and magnet that will create an image that traces the structure, size of brain tumor and helps in treatment process accordingly [2]. In MRI image analysis of brain, the feature extraction must be done in order to reduce the dataset volume. Segmentation is a process of splitting an image into sub images or blocks which may be similar in terms of colour, contrast, brightness, and gray level. In MRI or other medical imaging techniques, the Brain tumor segmentation is used for separation of the tumor tissues namely as edema and necrosis from other region brain of tissues, such as gray matter (GM), white matter (WM), and cerebrospinal fluid (CSF) [3–7].

Many researches proposed various feature extraction and classification method for detecting and diagnosing brain tumor which will be depicted in the further topics. This paper outlines the various techniques which are used for detection and classification of MRI scanned images of brain tumor. Various performance comparisons of the classification of brain tumor based on MRI are also reviewed.




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