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Tumor Detection Based On Symmetry Information

Krunal J Pimple, Asst. Prof. Prateek Nahar, Dr. Sanjay Thakur, Rajesh Patil

Abstract
Various subjects that are paired usually are not identically the same, asymmetry is perfectly normal but sometimes asymmetry can benoticeable too much. Structural and functional asymmetry in the human brain and nervous system is reviewed in a historical perspective. Brainasymmetry is one of such examples, which is a difference in size or shape, or both. Asymmetry analysis of brain has great importance because itis not only indicator for brain cancer but also predict future potential risk for the same. In our work, we have concentrated to segment theanatomical regions of brain, isolate the two halves of brain and to investigate each half for the presence of asymmetry of anatomical regions inMRI.
Keywords: MRI, Asymmetry Relation, Region of Interest

I. Introduction

Medical images are usually obtained by X-rays and recent years by Magnetic Resonance (MR) imaging. Magnetic Resonance Imaging (MRI) is used as a valuable tool in the clinical and surgical environment because of its characteristics like superior soft tissue differentiation, high spatial resolution and contrast. The field of medical imaging gains its importance with increase in the need of automated and efficient diagnosis in a short period of time. Computer and Information Technology are very much useful in medical image processing, medical analysis and classification.Recognition of brain tumors by MR imaging is based primarily on mass effect and signal alteration. Most tumors have prolonged T1 and T2 relaxation times and thus appear hyperintense to normal brain on T2-weighted images (T2WI) but hypointense on T1-weighted images(T1WI); on proton-density-weighted images(PDWI) most tumors are slightly hyperintense. The infrequent fat-containing tumors appear hyperintense on T1WI and have relatively low signal on T2WI. Some tumors, generally extra-axial ones, appear more or less isointense with brain tissue in all sequences. To detect them, focal mass effect, effects on adjacent bone, and perifocal soft tissue changes must be determined. Somesmall tumors may go unnoticed, however, if paramagnetic contrast material enhancement is not used to highlight them. Secondary tumor effects, such as necrosis, hemorrhage, or cyst formation, modulate the MR appearance of brain tumors, generally by making them more conspicuous but at the same time more likely to be mistaken for a nonneoplastic lesion. If standard imaging sequences are used along with intravenous contrast enhancement, brain tumordetection is almost 100%

II. Literature Survey

The human left and right cerebral hemispheres perform different functions is widely accepted. There is little evidence of whether or not similar functional asymmetries exist in non-human vertebrates. Rodents, cats, at least one species of marsupial, and macaque monkeys have consistent hand preferences for food reaching. These may result from constitutional factors, but in every species studied the distribution of preferences is unskewed. Canaries appear to have left-hemisphere dominance of vocal production, and there is limited support for the conjecture that macaque monkeys have left-hemisphere dominance for reception of species-specific cries and/or for short-term auditory memory. Left and right unilateral hemispheric damage may have appreciably different effects on emotionality in rats, sound localization in cats, and tactile discrimination in monkeys, although the available evidence is equivocal. It seems possible that asymmetries of cerebral function are widespread in vertebrates. In particular, left hemisphere dominance of species-specific communication might be common in birds and primates: left-hemisphere dominance of human speech may be an example of a general vertebrate tendency towards unilateral control of vocalization.As we know, symmetry is an important clue in image perception. If a group of objects exhibit symmetry, it is more likely that they are related in some degree. So, many researchers have been done on the detection of symmetries in images and shapes.
I developed an algorithm based on bilateral symmetry information of brain MRI. Our purpose is to detect the tumor of brain automatically. Compared with other automatic segmentation methods, more effective the system model was constructed and less time was consumed.

III. Problem Statement

Brain tumors are a heterogeneous group of central nervous system neoplasms that arise within or adjacent to the brain. Moreover, the location of the tumor within the brain has a profound effect on the patient's symptoms, surgical therapeutic options, and the likelihood of obtaining a definitive diagnosis. The location of the tumor in the brain also markedly alters the risk of neurological toxicities that alter the patient's quality of life.

At present, brain tumors are detected by imaging only after the onset of neurological symptoms. No early detection strategies are in use, even in individuals known to be at risk for specific types of brain tumors by virtue of their genetic makeup. Current histopathological classification systems, which are based on the tumor's presumed cell of origin, have been in place for nearly a century and were updated by the World Health Organization in 1999. Although satisfactory in many respects, they do not allow accurate prediction of tumorbehaviour in the individual patient, nor do they guide therapeutic decision-making as precisely as patients and physicians would hope and need. Current imaging techniques provide meticulous anatomical delineation and are the principal tools for establishing that neurological symptoms are the consequence of a brain tumor. There are many techniques for brain tumor detection. I have used edge detection technique for brain tumor detection.

IV. The Proposed Mechanism

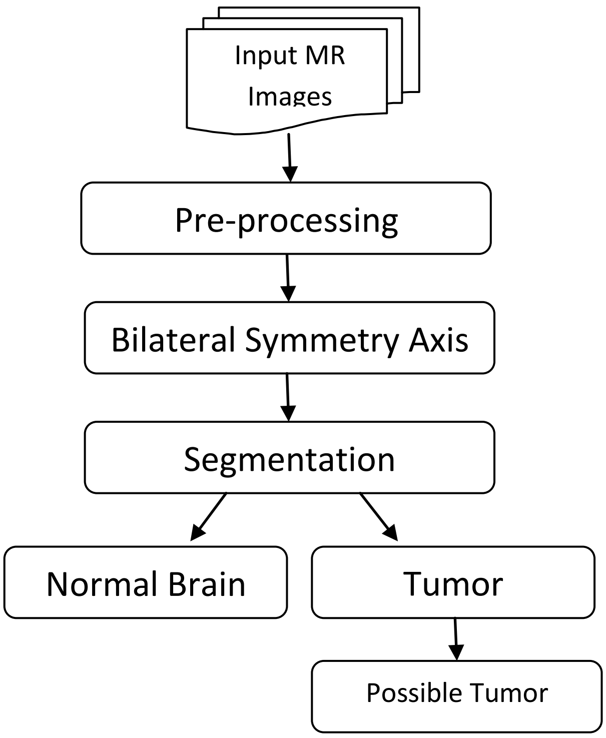


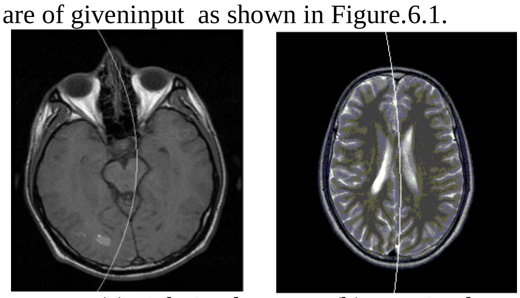
figure 4.1:Proposed Model

V. Methodology Used

There are many techniques for brain tumor detection. I have used edge detection technique for brain tumor detection. Edge-based method is by far the most common method of detecting boundaries and discontinuities in an image. The parts on which immediate changes in grey tones occur in the images are called edges. Edge detection techniques transform images to edge images benefiting from the changes of grey tones in the images.

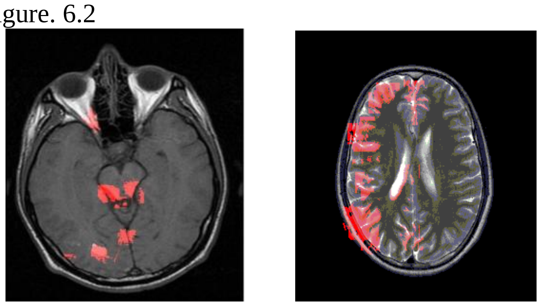
VI. Performance Evaluation

The curve fitting method is to fit the curve of the measuring data. Sometimes, the chosen curve passes through the data points, but on other points, the curve closes to them rather than passing through them. In most cases, we choose the curve to make the square error of the data points minimum, which is called the least square curve fitting. The bilateral axis images are of giveninput as shown in Figure.6.1.



(a)High Grade (b)Low Grade
Figure 6.1: Bilateral Axis

Now to detect the position and boundary of tumors automatically based on the symmetry information of given input. The more symmetrical the two regions have, the more the edges are weakened. At the same time, the edges not symmetrical are enhanced. In the end, according to the enhancing effect, the unsymmetrical regions can be detected, which is caused by brain tumor. The possible tumor area is of given input as shown in Figure. 6.2



(a)High Grade (b) Low Grade
Figure 6.2: Possible tumor area

Table 6.1 shows the area of abnormal mass of segmented MRI images. The results are MRI images identified tumors of 435 to 4315 pixels or 1.74 to 17.26% of the areas in percentage. The average pixel value of brain region present in 256x256 image is considered as 25000 pixels. In the brain tumor, a lesion, most the bigger area of a tumor is identified in left frontal/ high parietal and left temporal lobe for Table 6.1

Table 6.1: Areas of tumor

Patient ID	Volume of tumor areas (Pixels)	% of Damage areas
1	4315	17.26
2	1068	4.27
3	435	1.74
4	1776	7.10
5	1060	4.24
6	3824	15.30

VII. Conclusion

A new system that can be used as a second decision for the surgeons and radiologists is proposed. It determines whether an input MRI brain image represents a healthy brain or tumor brain. At first, MRI of health brain has an obviously character almost bilateral symmetrical. However, if there is macroscopic tumor, the symmetry characteristic will be weakened. According to the influence on the symmetry by the tumor, we develop a segment algorithm to detect the tumor region automatically.

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