BRAIN TUMOR MRI IMAGE SEGMENTATION AND DETECTION IN IMAGE PROCESSING

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Abstract: Magnetic resonance imaging is one of the best technologies currently being used for detecting brain tumor at both early and advanced stages. Brain tumor is diagnosed at advanced stages with the help of MRI image. Segmentation is an important process to extract suspicious region from complex medical images. Automatic detection of brain tumor through MRI can provide the valuable outlook and accuracy of earlier brain tumor detection. In this paper an intelligent system is designed to diagnose brain tumor through MRI using image processing, LBP algorithm. It has been found that local binary pattern (LBP) is a powerful feature for texture classification. It has been further determined that. When LBP is combined with Histogram along with of descriptor it improves the detection performance considerably on some datasets.
Index terms: MRI Image, Segmentation, Local Binary Patten and Morphological Filtering.

I. Introduction

Brain tumor is one of the prime causes behind the increase in mortality among people. A tumor is an abnormal growth caused by cells reproducing themselves in an uncontrolled manner. Tumors can directly destroy all healthy brain cells by crowding other parts of brain and causing inflammation, brain swelling and pressure within the skull. Matter of hope is that regardless of the type of tumor whether it is benign or malignant, primary or metaheuristic all brain tumor are treatable but there is a big 'if'.IT is the tumor must be detected in early stages of formation with all essential information of size, location ,shape. Then surgeons and physicians can curtail this brain anomaly and cure the patient permanently. At present with the involvement of high resolution diagnostic techniques like Magnetic Resonance Imaging(MRI),computed tomography(CT),functioned MRI(FMRI),Positron emission tomography(PET),single photon emission computed tomography(SPECT) in medical imaging we have gained more knowledge about brain tumor than last Hundred year. Imaging facilitates secondary prevention by offering the detection of tumor in developing

II.Methods of DIP: The major DIP techniques are

1. Pre- Processing
2. Image Compression
3. Edge Detection
4. Segmentation

1. Pre-Processing: Preprocessing of image commonly involves removing low frequency background noise, normalizing the intensity of the individual particle image, removing or enhancing data image prior to computational processing. Medical image pre-processing is an important step in medical image segmentation. Salt and pepper noise were more prevalent in Medical images. The conventional methods were not effective in filtering salt and pepper noise. Morphological erosion s the best filter for removing salt and pepper noise.

2. Image compression: Image compression is an application of data compression that encodes the original image with few bits. The objective of image compression is to reduce the redundancy of image and to store or transmit data in an efficient form. The main goal is to reduce the storage quantity as much as possible and the decoded image displayed in the monitor can be similar to the original as much as can be.

In medical image compression using integer multi wavelets transform for telemedicine application is an efficient compression and encoding performance based on integer multi wavelet transform of medical application. The algorithm results in better quality image. The work focused of the implementation of lossless image data.

3. Edge Detection: Edge detection is the name for a set of mathematical method which aim at identifying points in a digital

The two techniques of segmentation algorithm such as Canny edge detection and Otsu thresholding.The effectiveness of their algorithm was evaluated for medical and non-medical images. Canny segmentation is more suitable than Otsu to the tested endoscopic images because there is no clear distinction of the depicted object or feature of interest. Meaningful segmentation is the first step from low level image processing transforming a greyscale or color image into one or more other images to a high level image description in terms of feature object and scenes. The success of image analysis depends on reliability of segmentation, but an accurate partitioning of an image is generally a very challenging problem. Segmentation techniques are either contextual or non-contextual. The later take no account of spatial relationship between features in an image and group pixels together on the basis of some global attribute, e.g. grey level or color contextual technique additionally exploit their relationships, eg group together pixels with similar grey levels and close spatial location.

III.Magnetic Resonance imaging

MRI is a noninvasive imaging technology that produces three dimensional details, anatomical details without the use of damaging radiation. It is often used for disease detection diagnosis and treatment monitoring. It is based on sophisticated technology that excites and detects the change in direction of the rotational axis of protons found in water that makes up living tissue.

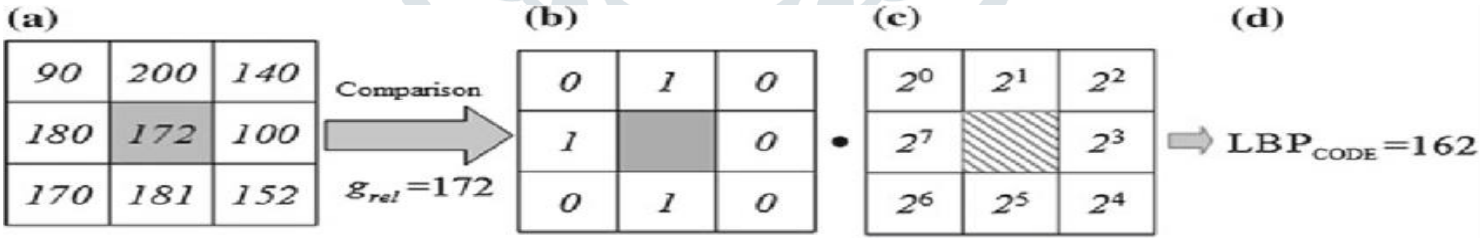
Working of MRI-MRI an employ powerful magnet which produces a strong magnetic field that forces proton in the body to align with that field. When a radiofrequency current is then pulsed through the patient, the protons are stimulated and spin out of equilibrium straining against the pull of the magnetic field. When the radiofrequency field is turned off, the MRI sensors are able to detect the energy released as the protons realigns with the magnetic field. The time it takes for the proton to realign with the magnetic field as well as the amount of energy released changes depends on the environment and the chemical nature of the molecule. To obtain an MRI image a patient is placed inside a large magnet and must remain very still during the image process in order not to blur the image. Contrast agents (often containing the element Gadolinium may be given to the patient intravenously before or during the MRI to increase the speed at which the proton realign with the magnetic field. The faster the proton realign the brighter the image.

What is MRI used for- MRI scanner are particularly well suited to image the non-bony parts or soft tissue of the body. They differ from computer tomography (CT) in that they do not use the damaging ionizing radiation of X-rays. The brain, spinal cord and nerves as well as muscles, ligaments and tendons are seen much more clearly with MRI then with regular X-ray and CT for this reason MRI is often used to image knee and shoulder injuries. In brain MRI can differentiate between white matter and grey matter and can also be used to diagnose aneurysms and tumor.

IV.Local Binary pattern

Local binary pattern (LBP) is a type of visual descriptor used for classification in computer vision.LBP is the particular case of the texture spectrum model proposed in 1990.LBP was first described in 1994 It has since then found to be a powerful feature for texture classification. It has further been determined that when LBP is combined with the Histogram of oriented gradient (HOG) descriptor it improves the detection performance considerably on some datasets. The original LBP operator replaces the value of the pixel of an image with decimal number which is called as LBP or LBP codes that encodes the local structure around each pixel. Each central pixel is compared with its eight neighbors. The neighbor having smaller value than that of central pixel will have the bit '0' and the other neighbor having smaller value than that of central pixel will have the bit '1'.For each given central pixel one can generate a binary number which is obtained by concatening all these binary bits in clockwise manner, which starts from one of its top left neighbor. The resulting decimal value of generated binary number replaces the central pixel value. The histogram of LBP labels(The frequency of occurrence of each code) calculated over a region or an image can be used as a texture descriptor of that image.

Example of local binary pattern calculation for a 3 by 3 Matrix

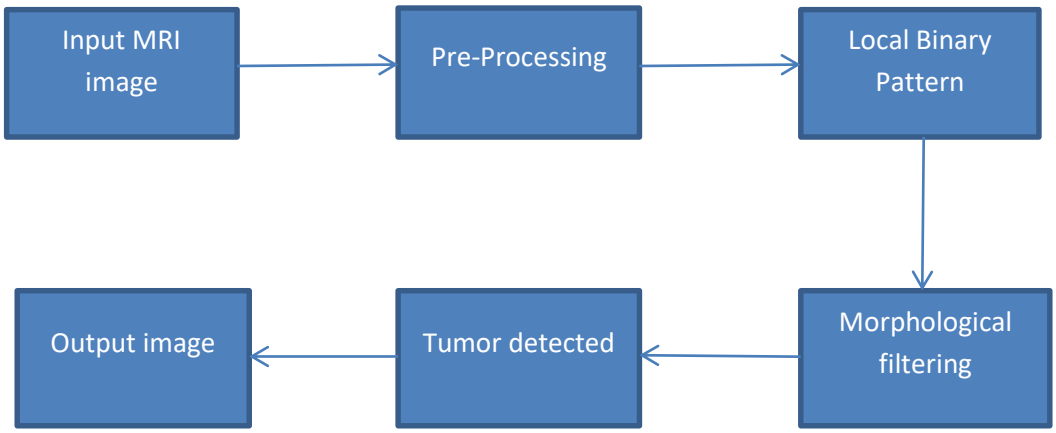


Gray scale pixel value Binary pattern Weight Table LBP code

V.Morphological Filtering

Morphology is the study of shapes and structure from a scientific perspective. Morphological operation requires a structuring element. Morphological operation operates on two image structuring element and input image. Structuring element are small images that are used to probe an input image for properties of interest. Origin of structuring element is defined by the center pixel of the structuring element. In morphology the structuring element defined will pass over a section of the input image where this section is defined by the neighborhood window of the structuring element and the structuring elements either fits or not fit the input image. Where ever the fit takes place, corresponding image that represents the input image structure is got and suppression of the geometric feature of the input image that doesn't fit the structuring element neighborhood takes place.

VI.Proposed System



Why use LBP?

Local binary pattern is a type of visual descriptor used for classification of in computer vision.LBP is particular case of the texture spectrum model proposed in 1990.LBP is powerful feature for texture classification. It has further been determined that when LBP is combined with histogram, it improves the detection performance considerable on some database.

VII.Result

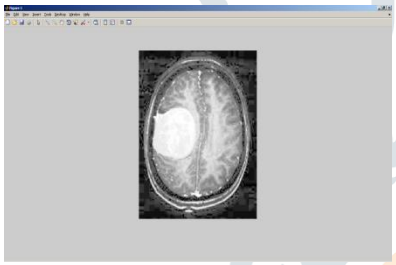


Fig a. Unfiltered LBP image

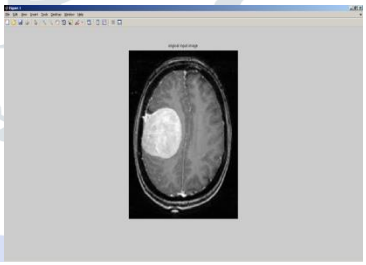


Fig b. filtered LBP image

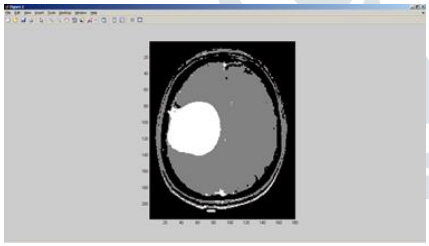


Fig c. Output LBP image

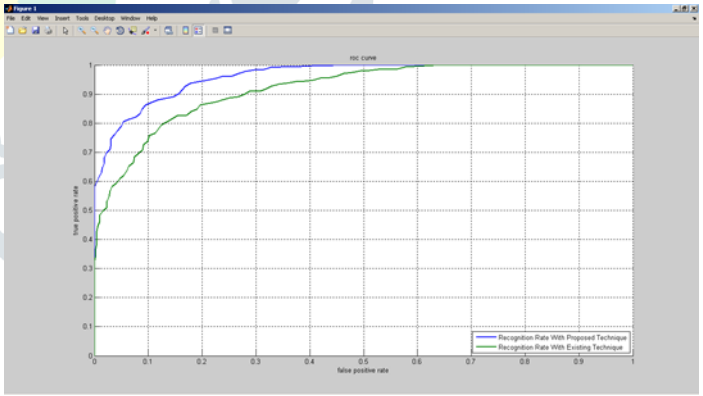


Fig d. ROC curve

VIII. Table of Comparison

Paper	Accuracy
[1]	83.33%
[2]	74%
[3]	88.80%
[4]	74.60%
This work	90%

[1] Detection of Brain Tumor in MRI Images, using Combination of Fuzzy C-Means and SVM 2015 2nd International Conference on Signal Processing and Integrated Networks (SPIN)

[2] MRI Brain Cancer Classification Using Support Vector Machine 2014 IEEE Students' Conference on Electrical, Electronics and Computer Science

[3] Brain Tumor Detection in MRI: Technique and Statistical Validation IEEE 2006

[4] Diagnose Brain Tumor Through MRI Using Image Processing Clustering Algorithms Such As Fuzzy C Means Along With Intelligent Optimization Techniques 2010 IEEE

VIII.Conclusion and Future scope

- This paper proposes a work on Brain tumor detection system using segmentation, Local binary pattern using MATLAB simulator.
- Median filter is used in preprocessing stage which changes the intensity of corrupted pixels on the damaged image in order to preserve the local details of the image.
- Segmentation separates an image into its component region or objects. Image segmentation is needed to segment the object from the background to read the image properly and classify the contents of the image carefully.
- Local binary pattern is used to detect tumor and along withLBPH (local binary pattern histogram) the image is classified as whether tumor is present or tumor is absent.
- The classification level of the proposed work can be increased by using some more appropriate classifier algorithm which gives more details about the tumor i.e. the tumor which is detected in image is malignant or benign.

IX.References

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