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Hybrid Approach for Brain Tumour Detection in Image Segmentation

Sandeep[1], Jyoti Kataria[2]

[1]M Tech Scholar, [2]Asistant Professor,
[1,2]Department of Computer Science & Engineering,
[1,2]Manav Institute of Technology and Management, Jevra, Haryana, India

ABSTRACT

In this paper we have considered illustrating a few techniques. But the numbers of techniques are so large they cannot be all addressed. Image segmentation forms the basics of pattern recognition and scene analysis problems. The segmentation techniques are numerous in number but the choice of one technique over the other depends only on the application or requirements of the problem that is being considered. Analysis of cluster is a descriptive assignment that perceive homogenous group of objects and it is also one of the fundamental analytical method in facts mining. The main idea of this is to present facts about brain tumour detection system and various data mining methods used in this system. This is focuses on scalable data systems, which include a set of tools and mechanisms to load, extract, and improve disparate data power to perform complex transformations and analysis will be measured between the way of measuring the Furrier and Wavelet Transform distance.

KEYWORDS: *Big Data, Furrier Clustering, IT, WT, imply, etc*

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1. INTRODUCTION

Data Image segmentation is the division of an image into regions or categories, which correspond to different objects or parts of objects. Every pixel in an image is allocated to one of a number of these categories. Segmentation is a process of that divides the images into its regions or objects that have similar features or characteristics. In this we use some of the methods for determining the discontinuity will be discussed and also other segmentation methods will be attempted. Three basic techniques for detecting the gray level discontinuities in a digital images points, lines and edges.

Segmentation on the third property is region processing. In this method an attempt is made to partition or group regions according to common image properties. These image properties consist of Intensity values from the original image, texture that are unique to each type of region and spectral profiles that provide multidimensional image data. The other segmentation technique is the thresh holding. It is based on the fact that different types of functions can be classified by using a range functions applied to the intensity value of image pixels. The main assumption of this technique is that different objects will have distinct frequency distribution and can be discriminated on the basis of the mean and standard deviation of each distribution.

Segmentation Techniques

Several techniques for detecting the three basic gray level discontinuities in a digital image are points, lines and edges. The most common way to look for discontinuities is by spatial filtering methods. Point detection idea is to isolate a point which has gray level significantly different form its background.

Line detection is next level of complexity to point detection and the lines could be vertical, horizontal or at +/- 45 degree angle.

Edge detection is a regarded as the boundary between two objects (two dissimilar regions) or perhaps a boundary between light and shadow falling on a single surface. To find the differences in pixel values between regions can be computed by considering gradients.

Determining zero crossings is the method of determining zero crossings with some desired threshold is to pass a 3 x 3 window across the image determining the maximum and minimum values within that window. If the difference between the maximum and minimum value exceed the predetermined threshold, an edge is present. Notice the larger number of edges with the smaller threshold.

Thresh holding Thresh holding is based on the assumption that the histogram is has two dominant modes, like for example light objects and dark background. The method to extract the objects will be to select a threshold F(x,y)= T such that it separates the two modes. Depending on the kind of problem to be solved we could also have multilevel thresh holding. Based on the region of thresh holding we could have global thresh holding and local thresh holding.

Splitting and merging the basic idea of splitting is, as the name implies, to break the image into many disjoint regions which are coherent within themselves. Take into consideration the entire image and then group the pixels in a region if they satisfy some kind of similarity constraint. This is like a divide and conquers method. Merging is a process used when after the split the adjacent regions merge if necessary. Algorithms of thisnature are called split and merge algorithms.

2. BRAIN TUMOUR DETECTION SYSTEM

Brain tumour detection system is one of the health care applications and it is essential for early stage detection of tumour. It is a software based application and it is used for better decision making in health care industry. Brain tumour detection system will make an early diagnosis of the disease based on several methods like data mining, machine learning etc. Most of the existing system consists of training part and testing part for detecting the disease. And it uses scanned brain MRI images as input data and train data. The system may consist of pre-processing stage and diagnosis stage. In pre-processing stage the training and testing MRI images are subjected to various image processing techniques for enhancing their quality. After that this enhanced images are subjected to feature extraction and diagnosis. The diagnosis part is done based on the extracted feature. Such system provides powerful decision making and doctors can use it as a second opinion to detect the disease.

Hybrid Techniques

Several hybrid neuro-fuzzy approaches for MRI brain image analysis are reported in the iterature. A combinational approach of SOM, SVM and fuzzy theory implemented by [Juang*et al.* (2007)] performed superiorly when compared with other segmentation techniques. The SOM is combined with FCM for brain image segmentation [Rajamani*et al.* (2007)] but this technique is not suitable for tumours of varying size and convergence rate is also very low. A hybrid approach such as combination of wavelets and support vector machine (SVM) for classifying theabnormal and the normal images is used by [Chaplot*et al.* (2006)]. This report revealed that the hybrid SVM is better than the kohonen neural networks interms of performance measures. But, the major drawback of this system is the small size of the dataset used for implementation and the classification accuracy results may reduce when the size of the dataset is increased.

Fourier series

Fourier series are a powerful tool in applied mathematics; indeed, their importance is twofold since Fourier series are used to represent both periodic real functions aswell as solutions dmitted by linear partial differential equations with assigned initial and boundary conditions. The idea inspiring the introduction of Fourier series is to approximate a regular periodic function, of period T, via a linear superposition of trigonometric functions of the same period T; thus, Fourier polynomials are constructed. They play, in the case of regular periodic real functions, a role analogue to that one of Taylor polynomials when smooth real functions are considered.

The idea of representation of a periodic function via a linear superposition of trigonometric functions finds, according to [1, 2], its seminal origins back in Babylonian mathematics referring to celestial mechanics. Then, the idea was forgotten for centuries; thus, only in the eighteenth century, looking for solutions of the wave equation referring to a string with fixed extreme, introduce sums of trigonometric functions.

However, a systematic study is due to Fourier who is the first to write a 2p-periodic function as the sum of a series of trigonometric functions. Specifically, trigonometric polynomials are introduced as a tool to provide an approximation of a periodic function. Historical notes on the subject are comprised in [3] where the influence of Fourier series, whose introduction forced mathematicians to find an answer to many new questions, is pointed out emphasizing their relevance in the progress of Mathematics. Since the fundamental work by Fourier [4], Fourier series became a very well known and widely used mathematical tool when representation of periodic functions is concerned. The aim of this section is to provide a concise introduction on the subject aiming to summarize those properties of Fourier series which are crucial under the applicative viewpoint.

Indeed, the aim is to provide those notions which are required to apply Fourier series representation of periodic functions throughout the volume when needed. The interested reader is referred to specialized texts on the subject, such as [5–7] to name a few of them. Accordingly, the Fourier theorem is stated with no proof. Conversely, its meaning is illustrated with some examples, and formulae are given to write explicitly the related Fourier series. Finally, Fourier series are shown to be connected to solution of linear partial differential equations when initial boundary value problems are assigned. In the same framework, a two dimensional Fourier series is mentioned.

Discrete Wavelet Transform

We begin by defining the wavelet series expansion of function $f(x) \in L^2(\mathbf{R})$ relative to wavelet $\psi(x)$ and scaling function $\phi(x)$. We can write

$$f(x) = \sum_k c_{j_0}(k)\phi_{j_0,k}(x) + \sum_{j=j_0}^{\infty}\sum_k d_j(k)\psi_{j,k}(x)$$

where j_0 is an arbitrary starting scale and the $c_{j_0}(k)$'s are normally called the approximation or scaling coefficients, the $d_j(k)$'s are called the detail or wavelet coefficients. The expansion coefficients are calculated as

$$c_{j_0}(k) = \left\langle f(x), \tilde{\phi}_{j_0,k}(x) \right\rangle = \int f(x)\tilde{\phi}_{j_0,k}(x)dx$$

$$d_j(k) = \left\langle f(x), \tilde{\psi}_{j,k}(x) \right\rangle = \int f(x)\tilde{\psi}_{j,k}(x)dx$$

If the function being expanded is a sequence of numbers, like samples of a continuous function $f(x)$. The resulting coefficients are called the discrete wavelet transform (DWT) of $f(x)$. Then the series expansion defined in Eqs. and becomes the DWT transform pair

$$W_\phi(j_0,k)=\frac{1}{\sqrt{M}}\sum_{x=0}^{M-1} f(x)\tilde{\phi}_{j_0,k}(x)$$

$$W_\psi(j,k)=\frac{1}{\sqrt{M}}\sum_{x=0}^{M-1} f(x)\tilde{\psi}_{j,k}(x)$$

for $j \geq j_0$ and

$$f(x)=\frac{1}{\sqrt{M}}\sum_{k} W_\phi(j_0,k)\phi_{j_0,k}(x)+\frac{1}{\sqrt{M}}\sum_{j=j_0}^{\infty}\sum_{k} W_\psi(j,k)\psi_{j,k}(x)$$

where $f(x)$, $\phi_{j_0,k}(x)$, and $\psi_{j,k}(x)$ are functions of discrete variable x = 0, 1, 2, ... , M – 1.

The Fast Wavelet Transform

The fast wavelet transform (FWT) is a computationally efficient implementation of the discrete wavelet transform (DWT) that exploits the relationship between the coefficients of the DWT at adjacent scales. It also called Mallet's herringbone algorithm. The FWT resembles the two band sub band coding scheme of.

Consider again the multi resolution equation

$$\phi(x)=\sum_{n} h_\phi(n)\sqrt{2}\phi(2x-n)$$

If function $f(x)$ is sampled above the Nyquist rate, its samples are good approximations of the scaling coefficients and can be used as the starting high-resolution scaling coefficient inputs. Therefore, no wavelet or detail coefficients are needed at the sampling scale.

The inverse fast wavelet transform (FWT^{-1}) uses the level j approximation and detail coefficients, to generate the level j + 1 approximation coefficients. Noting the similarity between the FWT analysis. Bysubband coding theorem of section 1, perfect reconstrucion for two-band orthonormal filters requires $g_i(n)=h_i(-n)$ for i = {0, 1}. That is, the synthesis and analysis filters must be time-reversed versions of one another. Since the FWT analysis filter are $h_0(n)=h_\phi(-n)$ and $h_1(n)=h_\psi(-n)$, the required FWT^{-1} synthesis filters are $g_0(n)=h_0(-n)=h_\phi(n)$ and $g_1(n)=h_1(-n)=h_\psi(n)$.

3. RESULTS AND ANALYSIS

We have two types of code without furrier and wavelet transformation or simple code and with furrier and wavelet transformation matlab code.

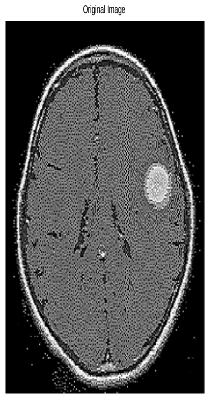

Fig. 1 Original Single MRI Tumor Image

The above figure we precede the original image in Matlab code, the image is not clear.

Fig 2 Segmented Single Tumor Image

After use the furrier and wavelet transformation algorithms can be segmented with matlab code, the image is clearer than before in above figure.

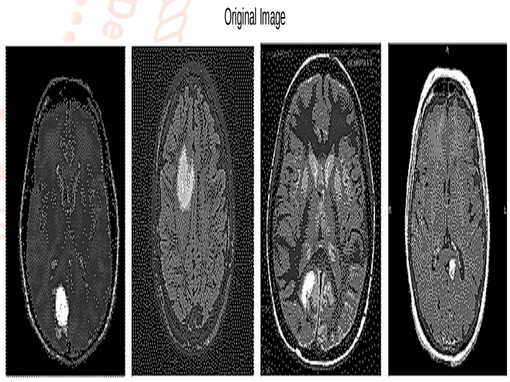

Fig. 3 Original MRI Small Group of Tumor Image

We precede the original small group of images in above figure on matlab code, the image is not clear.

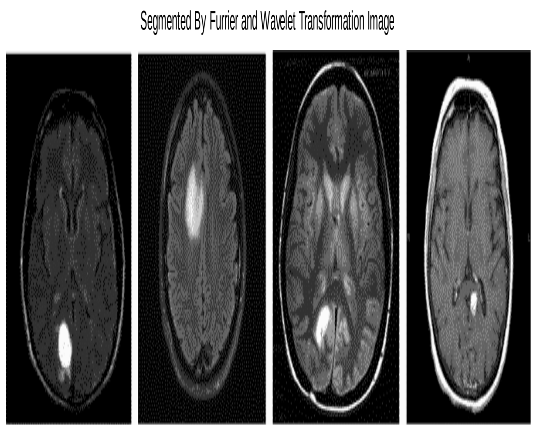

Fig 4 Segmented Small Group of Tumor Image

After use the furrier and wavelet transformation algorithms can be segmented with matlab code the small group of images is more clear than before in above diagram.

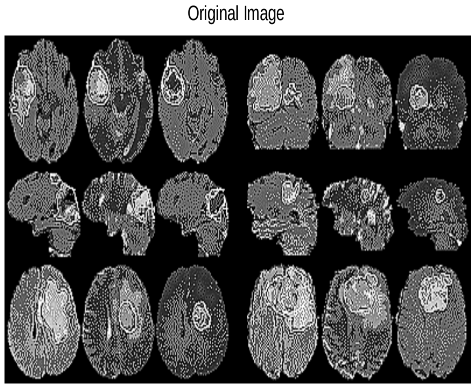

Fig. 5 Original MRI Large Group of Tumor Image

We precede the original large group of images in matlabcode, the image is not clear in above figure.

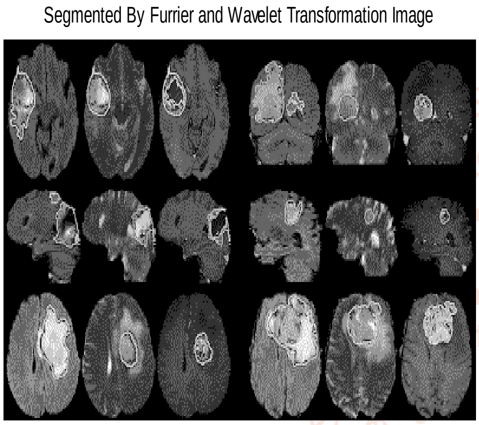

Fig 6 Segmented Large Group of Tumor Image

After use the furrier and wavelet transformation algorithms can be segmented with Matlab code the large group of images is more clear than before in above figure.

CONCLUSION

In this paper we can analyze the performance of Furrier and Wavelet transformation. There is no doubt that "Segmentation" analytics is still in the middle stage of development, since existing "Segmentation" techniques and tools are very limited to solve the real "Data Analytical" problems completely, in which some of them even cannot be viewed as. Therefore, more scientific investments from both governments and enterprises should be poured into this scientific paradigm to capture huge values. The challenges include not just the obvious issues of scale, but also heterogeneity, lack of structure, error-handling, privacy, timeliness, provenance, and visualization, at all stages of the analysis pipeline from data acquisition to result interpretation.

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