

A Review on Medical Image Segmentation Using Biogeography Based Optimization

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Abstract:

Image segmentation plays vital role to understand an image. Only proper understanding of an image tells that what it represents and various objects present in the image. In this review paper we have propose a new approach Biogeography based optimization for the segmentation of Medical images. Image segmentation are done with many techniques like PSO, ACO etc. Biogeography Based Optimization approach for image segmentation for partitioning an image into multiple segments.

Keywords: Segmentation, Biogeography based optimization, Region growing.

1. Introduction

In paper we first to give a general presentation of image segmentation. Second, presentation of new optimization method called BBO. Third, presentation role of BBO in image segmentation and medical image.

1.1. Image segmentation

“Segmentation” refers to the process of dividing a digital image into multiple segments such as a sets of pixels, also known as super pixels. The main objective of segmentation is to simplify and change the representation of an image into meaningful image that is more appropriate and easier to analyze. Segmentation is basically a collection of methods that allowing spatttttially partitioning close parts of image as objects[1].

“image segmentation” is an important aspect of digital image processing. Image segmentation may be defined as a process of assigning pixels to homogenous and disjoint regions which form a partition of the image that share certain visual characteristics. Image segmentation is used to locate and find objects and boundaries (lines, curves, etc) in image. It basically aims at dividing an image into subparts based on certain feature. Features could be based on certain boundaries, contour, color, intensity, or texture pattern, geometric shape or any other pattern. It provides an easier way to analyze and represent an image[1].

Region growing is a simple region based image segmentation method. It is also classified as a pixel based image segmentation method since it involves the selection of initial seed point. This approach to segmentation examines neighboring pixel of initial “seed point” and determines whether the pixel neighbors should be added to the region.

1.1(a) Application of Image segmentation:-

Image segmentation is mainly used to locate objects or object boundary, lines etc in an image so it can be used in application which involve a particular kind of object recognition such as:

- Face Recognition
- Fingerprint Recognition
- Locating objects in satellite images

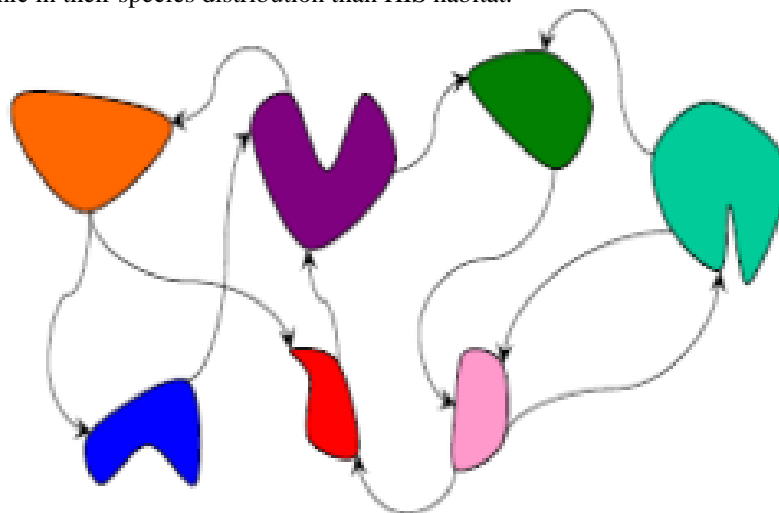
Since it deals with object detection, so it can also be used in application involving objects tracking such as traffic surveillance etc. Some of the practical application of image segmentation are:

- Medical imaging
- Locate tumors and other pathologies
- Measures tissues volume
- Computer guided surgery
- Diagnosis
- Treatment planning
- Study of anatomical structure
- Traffic control system

- Brake light detection
- Machine vision
- Agriculture imaging-crop disease detection

1.2. Biogeography Based Optimization

Biogeography based optimization a type of evolutionary algorithm. As its name implies, BBO is based on mathematical study of biogeography. Biogeography is the study of the distribution study of animals and plants over time and space. BBO is an evolutionary process that achieves information sharing by species migration. It is modelled after the emigration and immigration of species between habitats to achieve information sharing. BBO operates by migrating information between individuals, thus resulting in a modification of existing individual. Individual do not die at the end of generation One characteristic of BBO is that the original population is not discarded after each generation. It is rather modified by migration. BBO is a population based optimization algorithm it does not involve reproduction or the generation of "children". Mathematical equations that govern the distribution of organisms were first discovered and developed during 1960. Mathematical model of biogeography describe how species migrate from one island to another, how species arises, and how species become extinct. Biogeography basically on two criteria-HIS and LIS. Geographical area that are well suited and more compatible residence for biological species are said to have highly suitability index(HSI). Features that correlate with HIS include such factors as rainfall, diversity of vegetation, diversity of topographic features, land, area and temperature. The variables that are characterize habitability are called suitability index variables. Habitat with HSI tend to have large number of species, while those with low HSI have a small number of species. HSI are more static than LSI. LSI have a high species immigration rate because of their sparse population. LSI habitats are more dynamic in their species distribution than HIS habitat.



Migration of species

BBO basically depends upon following theory:

- **Migration:-**

The BBO migration strategy in which many parents can contribute to a single offspring, but it differ in at least one important aspect. BBO migration is used to change existing habitat. Migration in BBO is adaptive process; it is used to modify existing islands. Migration stage arises when LSI occurs. When species are less compatible with their habitat then they migrate.

- **Mutation:-**

Mutation is a probabilistic operator the randomly modifies a solution features. The purpose of mutation is to increase habitat among the population. For low value solution, mutation gives them a change of enhancing the quality of solution, and for high fitness value solution, mutation try to improve the value as compared to the previous value.

1.2(a) Application of Biogeography Based Optimization:-

The interest of scientific community in BBO has risen sharply in recent years. The exploration capability of BBO make it attractive for solving many complex problems in various fields. BBO has been proved to be very efficient in solving many NP hard problems, that is the problems for which event the best known algorithms have exponential time complexity. The major applications of BBO are discussed below

1. **Block based motion estimation in video coding:-** Motion compensation is an algorithmic technique used for video coding. In this technique the every frame is defined with respect to a reference frame. BBO has been used for this

application for the prediction of the current frame. BBO provides competitive performance with reduced computational complexity in solving this problem.

2. **Satellite image classification:**-BBO has proved its efficiency in identifying different features from the satellite images such as water, vegetation, urban, rocky areas etc. The algorithm considers each multispectral band of image as an SIV and standard deviation of pixels as HSI.
3. **Color image quantization:**-BBO is useful in color image quantization. Color image quantization plays an important role in medical imaging. Color image quantization reduces the number of colors in the image preserving the most important colors.
4. **Feature selection:**-Feature selection is another area where BBO has proved its significance. Feature selection is often done as a preprocessing step in many applications in order to reduce the dimensionality of data. BBO has been used in face recognition in order to reduce the dimension of extracted features from images. Another application of BBO is feature selection in DNA microarray data that is used for cancer classification. The relatively large number of genes compared to the number of samples in microarray dataset can lead to over fitting while employing a classifier. This problem which is known as the curse of dimensionality is alleviated using BBO.

1.3 Role of BBO in image segmentation:-The biogeography Based optimization is used in image segmentation to select the accurate segmented area of image.

1.4 Medical image:-Medical imaging is the technique and process used to create images of the human body. Medical imaging techniques produce very large data because of which communication and storage of data is very difficult. The medical images are MRI images, CT-Scan images, Ultrasound images.

Conclusion

In this work, we have provided a survey on medical image segmentation using Biogeography Based Optimization. BBO algorithm have proved their efficiency in various fields. BBO is a biogeography technique used for image segmentation which provided more accurate segmented images as compared to other optimization method. So BBO can be used in MRI image segmentation to detect any disease. BBO is a population based optimization algorithm and it does not involve reproduction or the generation.

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