Soft Computing Image Segmentation Technique for Image Processing

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Abstract

This paper presents analysis of soft computing technique for image processing. Soft computing techniques are combination of Genetic algorithms, neural networks and fuzzy logic. For wide application soft computing technique is used image segmentation, image enhancement etc. This paper represents the different segmentation techniques by using soft computing technique. The main aim of the paper is to improve the quality of image by using soft computing technique.

Keywords

Image processing, Image segmentation, soft computing technique

Introduction

The process of grouping or separating an image into multiple regions is known as image segmentation. There are many different ways of performing image segmentation, so as the representation 0f an image easier to recognize and more meaningful. In image analysis segmentation is first step. Sometime to avoid false contour selection image de noising is first step for medical diagnosing. Finger print Recognition, Face Recognition, medical applications etc. are practical application of segmentation technique. The characteristics and particular type of image decided the level of segmentation technique and the choice of segmentation over another.

Generally, two techniques are used:

- Hard computing
- Soft computing

Hard computing technique deals with precise model where accurate solution achieved quickly.

Soft computing method:

Neural Network approach, Fuzzy based approach and Genetic Algorithm based approach are most frequently used for image segmentation soft computing technique.

Edge-based segmentation: For depicting the discontinuities Edge-based segmentation is used. By detecting the edges 0r pixels between different regions this method used t0 res0lve image segmentation. Edge based technique have rapid transition in intensity. Edge based segmentation is less immune to noise. This method doesn't produce close boundary or curve.

Region Based Segmentation Methods: Region based segmentation is more immune to noise and relatively simple segmentation algorithms as compare to edge-based segmentation. Growing Region and Region splitting and merging is segmentation algorithm based on region. They are more immune to noise than above detection approach. These are expensive in computational time and nature sequential.

Fuzzy based approach: Fuzzy based system accepting uncertain or imprecise data and providing suitable decision. The segmentation technique based on fuzzy approaches is Fuzzy Clustering Algorithms, Fuzzy integral, Fuzzy Rule-Based approach, Measures of Fuzziness and Fuzzy Geometry. The determination of fuzzy membership is not a trivial job. Fuzzy membership approach can be representing degree of some properties.

Genetic Algorithm Approach: Genetic algorithm based on ideas of genetics and natural selection. GAs does not break easily like older algorithm system even if presence of reasonable noise or input is changed slightly. GA more significant benefits than other optimization techniques (heuristic, depth-first, linear programming, breath-first and praxis). Genetic algorithm approach is used to feature selection, image segmentation, object recognition and image matching.

Neural Network: Image processing using neuronal networks has been mainly used in geotechnics, mechanics, civil engineering, Image preprocessing, defense department, industrial surveillance, segmentation and recognition, automatics and transport, date reduction and segmentation etc. The main objective of neural network images preprocessing consists in rebuilding, improving or rebuilding images. Neural network consists of hidden layer, input layer and output layer. In image processing neural network result is affected by initialization. Neural network utilizes parallel nature.

LITERATURE REVIEW:

R. Rajesh and N. Senthilkumaran: have discussed A Survey of Image Segmentation Soft Computing Approaches. In this work various soft computing technique image segmentation techniques have been implemented.

Franklin et al. proposed suitable technique to morphological object segmentation process in image sequence. For the evaluation to image sequence this technique gives new benchmark.

Soumen Banerjee, Aayush Sah: have proposed Image Enhancement of Bio Medical using Hybrid Metaheuristic coupled Soft Computing Tools. In this work, different hybrid metaheuristic-based methods and methods based on soft computing for enhance biomedical image have been studied.

Zhi Liu et al proposed salient object extraction by using unsupervised image segmentation process. It starts result of color image and region segmentation is done. Binary partition tree is used. This method gives better segmentation performance.

Ashram A. Aly *et al.* Proposed Review Research for Digital Image Segmentation Techniques. In this paper various current segmentation process with their application field, principle ideas, advantages and disadvantages of each method are discussed.

Lu ming has proposed Image Segmentation Algorithm Improvement and Research. This method proposes improvement for genetic algorithm applies this improved approach in image segmentation process.

Payman moallem and Navid Razmjooy: have proposed A Multi-Layer Perceptron Neural Network Trained by Invasive Weed Optimization for Potato Color Image Segmentation. This potato detection approach given its satisfactory result. MLPIWO method improves the performance of traditional learning of multi-layer perceptron significantly.

Comparison

Segmentation technique	advantages	Disadvantage
EDGE BASED	Work well for image have good contrast between object	Not suitable for wrong detection or too many edges
REGION BASED	More immune to noise.	Expensive segmentation method in terms of memory or time.
Fuzzy technique	Used to perform approximate inference.	Computation involved in fuzzy technique could be intensive.
Genetic Algorithm	Do not use deterministic rule, use for solve optimization problem.	Hard to choose parameters like number of generations, population size etc.
Neural network	No need to write complex program, real time operation	Training time is long

Conclusions:

In this paper main image segmentation techniques have been used. Different techniques like region based, edge based, fuzzy based approach, genetic algorithm-based approach etc. are used in image segmentation processing. These algorithms analyze or provide better results for image segmentation processing. The major aim of image segmentation technique is to provide the accuracy in segmented image. Homogeneity of images, image content, texture, spatial characteristics of the image continuity are the main factors which are affecting on image segmentation. This paper performs different type of image segmentation technique, from these techniques we can find which one is better than other.

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