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Evolutionary Based Segmentation in Image Mining

M.S.Makesar, Dr.N.A.Koli, R.N.Khobragade

Research Scholar, Sant Gadge Baba Amravati University, Amravati, Maharashtra, India

Centre Head, Sant Gadge Baba Amravati University, Amravati, Maharashtra, India

Assistant Professor, Sant Gadge Baba Amravati University, Amravati, Maharashtra, India

Abstract: Segmentation is the process of partitioning a digital image into multiple segments (sets of pixels). The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. Segmentation decides the success of image mining. Genetic algorithms are defined as stochastic optimization method based on the principles of natural selection and evolution. In accordance with Darwin's theory of evolution, evolution in genetic algorithms proceeds by promoting the survival of the fittest.

KEYWORDS: Segmentation, Image mining, Genetic algorithm

I.INTRODUCTION

Segmentation is one of the important process in image processing. Segmentation is the process of partitioning a digital image into multiple segments (sets of pixels).Several algorithms have been developed for segmentation. Since there is no general solution to the image segmentation problem, these techniques often have to be combined with domain knowledge in order to effectively solve an image segmentation problem for a problem domain. The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. Image segmentation aims at domain-independent partition of the image into a set of visually distinct and homogeneous regions with respect to certain properties**.** Image segmentation has a promising future as the universal segmentation algorithm. However, in spite of several decades of research, there is no universally accepted method for image segmentation, as the result of image segmentation is affected by lots of factors, such as: spatial characteristics of the image continuity, homogeneity of images, texture, image content.

II.GENETIC ALGORITHM

Genetic Algorithm is an adaptive heuristic search algorithm and optimization technique based on evolutionary algorithms of natural selection and genetics. It is based on the principle of Darwin's theory of evolution-"Survival of the fittest" which states "select best discard rest". The genetic algorithm is based on an analogy with the genetic structure and behavior of chromosomes within the population of individuals. An evolutionary based algorithm has been successively used in a wide range of applications: optimization task, image analysis, and data mining.

Genetic algorithm is mainly by performing operations such as selection, crossover and mutation to attain the goal of optimization. In this algorithm, the new generation of inherited the merits of the parent population, so that the individual is always in the direction of the better evolution in the whole process. The genetic algorithm is used to solve the optimal parameter values and to improve the calculation speed in complex image segmentation

Basic steps

1. Generation of a population of solution
2. Finding the objective function (which is to be maximized or minimized) and fitness function

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3. Application of genetic operator:
4. *Selection*: This operator selects chromosomes in the population for reproduction. The fitter the chromosome, better the chances to be selected to reproduce again and again.
5. *Crossover*: This operator randomly chooses a locus and exchanges the subsequences previous and next to that locus between two chromosomes to create two offspring.
6. *Mutation*: This operator randomly flips some of the bits in a chromosome.

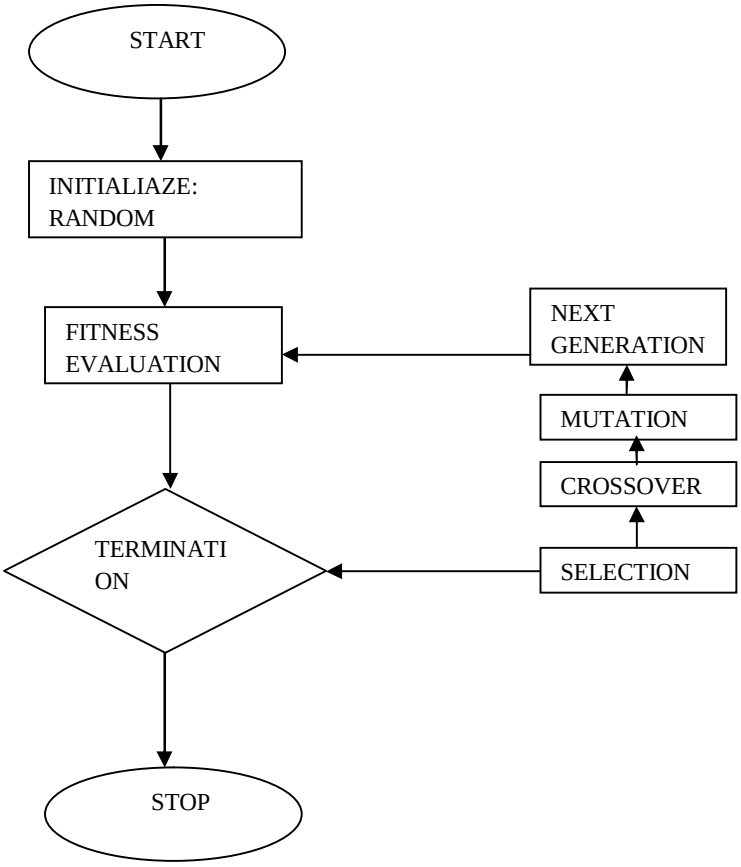

Fig.1 Flowchart for genetic algorithm

III. SEGMENTATION USING GENETIC ALGORITHM

Image segmentation is the basis of image analysis. It is a process of partitioning a digital image into multiple sets of pixels. Each of the pixels in a region is similar with respect to some characteristic or computed property, such as color, intensity or texture. Segmentation facilitates the manipulation and visualization of the data with computer. The genetic algorithm is used to solve the optimal parameter values and to improve the calculation speed in complex image segmentation. The genetic algorithm is used for parameter settings. The genetic algorithm effectively improves segmentation speed. The population is composed of 100 individuals. We used *roulette wheel selection*, which is stochastic in nature. A two point crossover operator was selected as the operator to implement crossover. In other words, once two parents have been chosen, their children will grow initially as replicas of their parents and will only crossover with a probability fixed by the user. When recombination takes place the two point crossover process selects two points at random within the chromosome, based on which sequences of bits in each offspring are interchanged so as to produce new individuals. The RGB image is first converted to grey image. The various stochastic operators like selection, crossover, and mutation are applied for implementing the Genetic Algorithm. Initial population is initialized,

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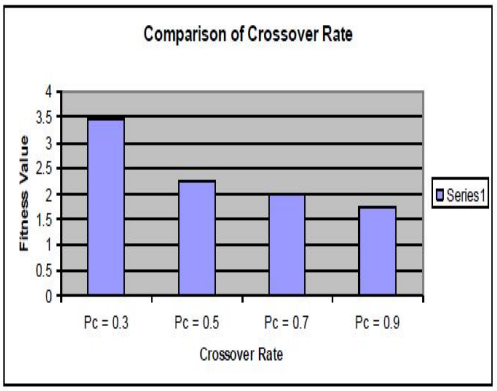
fitness values are evaluated, and then the mechanisms namely crossover and mutation are applied to generate the offspring's. Selection is applied to choose better individuals. For the stopping criteria, maximum number of generations is initialized. When the generation is ended, it will calculate fitness individual. The fittest individuals are allowed to breed only. In computer world, genetic material is replaced by strings of bits and natural selection replaced by fitness function. Matting of parents is represented by cross-over and mutation operations.

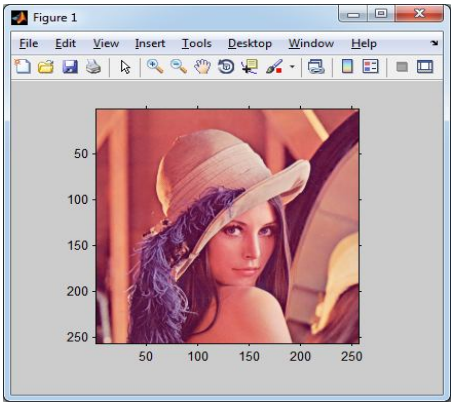
IV. EXPERIMENTAL RESULTS

Table : Different crossover rate

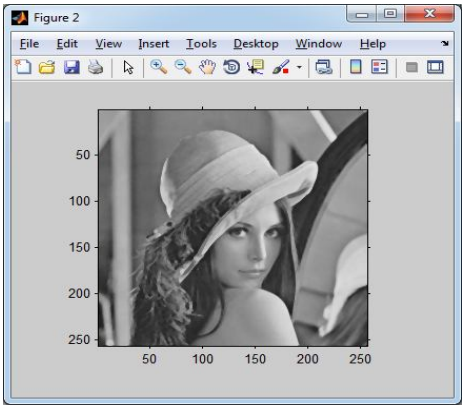
Image	**Pc = 0.3**	**Pc = 0.5**	**Pc = 0.7**	**Pc = 0.9**
lenna	3.4505	2.2576	1.9915	1.7444



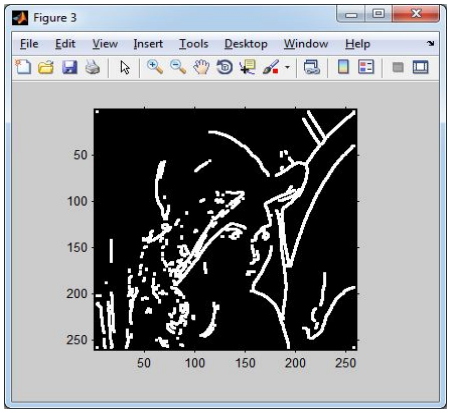
Comparison of crossover rate



Screenshot1



Screen shot 2



Screenshot 3

V.CONCLUSION

In this paper, the idea of segmentation methodology using genetic algorithm applied for image mining is explained.The output of image segmentation is a set of segments that as a whole cover the entire image, or a set of contours extracted

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from the image. Image segmentation remains a challenging problem in image processing. Genetic Algorithms are one of the best ways to solve a problem for which little is known. They are a very general algorithm and hence will work well in any search space. Genetic algorithms use the principles of selection and evolution to produce several solutions to a given problem. There are various reasons for fitness selection based on Genetic Algorithm compared to the traditional methods. The traditional methods are stuck at local optima or pre-mature convergence. They require the existence of derivatives of objective and constraint functions and also require mathematically well defined objective and constraint functions.

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