Optimizing Pattern Recognition Scheme Using Genetic Algorithms In Computer Image Processing.

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Abstract— This research paper, Genetic Algorithms is proposed to model an essential pattern recognition problem in Computer Image Processing. Detailed explanation of the reason for these algorithms is the most appropriate for finding solution of pattern recognition problems, that is, optimizing 32 by 32 and 128 by 128 three-dimensional images. Genetic algorithms are the central component in the processing.

Index Terms— Genetic Algorithms, Optimization, Image processing, Pattern Recognition.

I. INTRODUCTION

Genetic algorithms are adaptive optimization methods that outclass classical optimization methods when applied in computing and engineering problems. This research paper will arithmetically modal pattern recognition as the problem of optimizing an image processing function (Suganthan 1883) [4]. Many core properties of pattern recognition are taking over and the advantages of using it over other optimizing techniques. Other methods used in the application of computer bred holograms have a complex transfer function, that does not allow displaying of the optimal solution to on available devices. The tools allow the coding domain of binary images only genetic algorithms matched with coding schemes takes advantage of the two-dimensional topology structure. Using this technique may also in image recognition and reconstruction is applicable.

II. METHODOLOGY IN RECOGNITION PATTERN

Pattern recognition is a perception task that identifies patterns for features, attributes and categorizes these elements into distinct categories (Parizeau 432) [3]. This has a principal processes that include; feature extraction and classification.

The above primary process, there exist n+1 problems to find their best solution. The purpose of feature extraction is to assure that common attributes to all pattern, allow characterizing by classes. Discriminatory feature found in a class is reduced to simple matching table a look up scheme. This assumption is complex in the real optimizing model, hence the best-biased feature adoption.

Feature classification aims at finding the best class that is nearer to the classified pattern. The best solution is necessary for the definition of optimization (Zhou 3402) [6].

For Example;

If we let O= {o1, o2…….on} be pattern set, C= {c1, c2…….cn} be class set, and X= {x|x=<V,R>, V={v1, v2…….vn} is set vectors features and R is relationship set between features. Then the definition of the pattern recognition problem is composite

Function P as:

P=C (F (O))

Where F: O⇒X and C: X⇒C.

In the above equation, C represents feature classification function and F represents Feature extraction function.

Application of above extraction and classification feature principal in the image processing model by considering the following problem formulation (Zhou 3410) [6] inhabiting for a picture Y of dimension N by N, where N is the power of two (hologram-encoded as a binary aspect image).

Let O represent another image that can be gray-leveled and involved, the object, S the space of the binary image.

Optimal hologram Y in S acts as the problem that lessens the mean square error among F (Fourier transformation) and the object O:

$Y= \text{armin} (\| (F(X)-T) \|^2)$

A direct solution to the problem is the inverse of F transform of T. Implementation of the solution in the electronic devices available, hence rejected since it is difficult (Suganthan 1885) [4] of inhabiting of S (search space) to binary aspect image well-matched with available technology. In addition, it is complex to find the analytical solution to this controlled problem. Combinatorial search cannot be fingered successfully; the several possibilities grow as 2 N*N. Every single evaluation of a solution encompasses computing F. The genetic algorithms are the alternative iterative optimization techniques that may be used to find the solution.

Every iterative scheme requires the definition of S and the cost function (C), the mean square error among F of candidate Y and the object Image O:

$C(Y) =\| (F(X)-T) \|^2$.

In this research paper, I have compared two evolutionary techniques for pattern recognition in image processing; those are; Direct Binary Search Algorithms and Genetic Algorithms

A. DIRECT BINARY SEARCH

DBS is a hill climbing application to problem-solving. The steps involved are;

I. The search is initialized with random binary image Y (size N*N)

II. Using above formula $(C(Y) =\| (F(X)-T)\|^2)$ compute the cost function of Y.

III. Pass through all pixel of Y and modifies their value and keep it when it is with the least cost. This is the iteration of the algorithms.

IV. Continue until no other adjustment is accepted during an iteration of the algorithms.

Enhancement of this algorithm leads to a multiple starting point procedure. This increases hard to change and convergence is slow.

B. GENETIC ALGORITHMS

Genetic algorithms are population based optimization iteration technique. It acts on set candidate solution by exploring simultaneously several zones of the search space (S). It also combines likely solution candidates for the optimum solution at the end. Mutation process is on randomly chosen candidate solution and a candidate changing of a single pixel.

Decision on coding scheme is the essential part of algorithm design. Using Quad-tree representation of binary images is more efficient and also takes into account two-dimensional nature of the picture. It also provides the depth of branches.

New solution acquired by substitution of two chosen arbitrary trees from the parent trees. This is similar to changing quadrants of identical size but from an unlike the image scene among the holograms connected with the parent candidates solution.

III. RESULTS

The tables below shows a comparison of Direct Binary Search (DBS) algorithms and Genetic Algorithms (GA) for 32 by 32 images and 128 by 128 images

Table1: matched results of the DBS and GL techniques for 128 by 128 images.

Sr. No.	Method	No. Iterations	Uniformity	Efficiency
1	DBS	150000	81.5%	60.1%
2	GA	150000	96.1%	71.5%

Table2: matched results of the DBS and GL techniques for 32 by 32 image.

Sr. No.	Method	No. Iterations	Uniformity	Efficiency
1	DBS	15360	97.1%	67.1%
2	GA	150000	98.8%	70.2%

IV. DISCUSSION

The above results show that Genetic Algorithms are more uniform and efficient compare to Direct Binary Search. From above investigation, pattern recognition problems in image processing are involved and multi-stepped. It is, for this reason, important to use a well-developed technique in optimization. The following are sub-problems properties in pattern recognition in image processing in a computer.

Noise tainted observation; if the noise does not exist pattern recognition may be effortless to solve. However, it is an unrealistic assumption in real-world image processing in a computer.

Enormous search space; search space is huge for the image processing problem with the recognition pattern. If there are n features in selection problem, the 2n is search space and features may be selected or not (Parizeau 440) [3]. This makes the method unfeasible and needs of an efficient search algorithm.

Uneven objective function; differentiable and even objective function is hard in the optimization of pattern recognition problem. This makes the problem complex to solve the derivatives of an objective and cost function. The objective function is multi-modal, hence difficult to explain the function using local search strategies.

Continuous and discrete search space: Recognition pattern has both continuous and discrete optimization of the problem that is distinct in nature. Integration of the two is difficult and complex.

The above four properties make the optimization of image processing problem difficult use any the revolutionary techniques; it also makes it peculiar to any other problem than can be solved in this manner.

V. CONCLUSION

The genetic algorithms discussed in this paper take into account two dimensional structure of an image (32 by 32 and 128 by 128). This shows that GA is more valid in optimizing patterns in image processing based on the results of uniformity and efficiency comparison of DBA and GA. But more testing should be carried out to give a detail prove of the approach. The Genetic algorithms can also handle higher level classes for example, in case image conversion and segmentation.

Use of topological information obtained from this algorithm in other fields is important where optimization of image processing is required.

The paper also gives a global perspective of the genetic algorithms in image processing pattern recognition. However, the definitions of objective and cost function are not well addressed. Analyzing the issues in any peculiar way can be hard, but shall depend on the complexity of the image processing device.

VI. REFERENCES

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