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A New method to Design Accurate Images with Tree Structural Transformations

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ABSTRACT: *Image recognition and segmentation techniques are playing key role in the field of image processing. Present researchers are working on the design concepts of accurate image processing. This paper explains the method for designing of accurate image processing with the help of the principle called automatic construction of tree structural image transformation and graphics processing unit as a hardware unit. Genetic algorithms are also used to obtain fast image processing on graphic processors.*

KEYWORDS: Genetic Programming, weight images, CUDA, Island model, MCG model, optimization speed, Parenthetic values**.**

1. INTRODUCTION

In the recent days has become a tedious task to design accurate image processing without depending on the required problems. A method like automatic construction of tree-structural image transformation approximates a required image processing by combining tree structured image processing filters with evolutionary computation. Evolutionary computation is an optimization algorithm. For this method it is important to obtain fast processing with the help of improvised algorithms and parallel processing techniques.

This paper is employed with graphics processing unit to automatic construction of tree structural image processing transformation for realization of fast image processing optimization. It is also incorporated with multiple GPUs to increase processing speed.

2.WHAT IS ACITT

Automatic Construction of Tree-structural Image Transformation [1] is a study of digital image processing using genetic programming[2].It uses many image processing filters to automatically construct a tree structural image transformation. A tree structured image transformation is a combination of input images as terminal, non terminal nodes and a root in the form of output image.

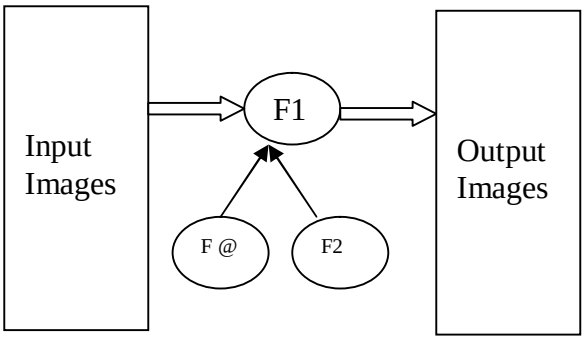

Fig 1: application of optimized tree structured image transformation to training and non training images.

From the above diagram the fitness of individual is measured as the difference of output images and target images with weight images.

2.1 Genetic Algorithm and Graphic Processor in Parallel

The recent research in image processing is focused on the implementation of Genetic algorithms[3] with graphic processor. Genetic algorithms are robust search algorithms influenced by the natural evolutionary process. Graphics hardware is designed for rendering images. Fitness evolution on graphics processors can be evaluated very fatly by using genetic algorithms.

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Genetic algorithms (GA) first introduced by John Holland and his colleagues, are search algorithms based on the mechanics of natural selection found in biology. GA's[4] are theoretically and empirically proven to provide robust search in complex parameter spaces. The standard GA proceeds as follows. A possible solution of a given problem is encoded as a finite string of symbols, known as a genome. An initial population of the possible solution called individuals is generated randomly or heuristically. The most well known operators are mutation, crossover and reproduction. The mutation operator is introduced in order to prevent premature convergence to local optima by randomly sampling new points in the search space with some probability. Crossover is performed with a different probability between two selected parents, by exchanging parts of their genomes to form two offspring. The flow diagram of GA process is given in figure2
The following figure shows the GA process

3. IMPLEMENTATION PROCEDURE

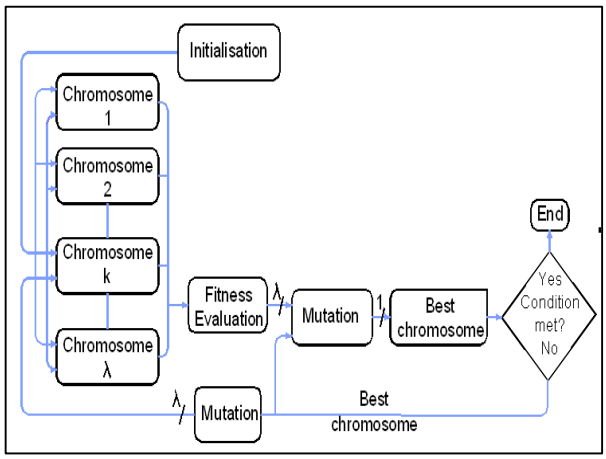

Image processing filters are used on programmable graphic pipelines for reducing optimization times.

- In the first step the system loads image sets and image processing filters(Kalman filter)and compiled to Graphic processing Unit [5] during initialization. at this stage the system executes selection, crossover and mutation operators and then calculates fitness values.
- Graphic Processing Unit performs tree structured image transformation.
- Graphic Processing Unit hardware [6]calculates the fitness of each individual.
- CPU reads regularly the fitness values from Graphic Processing Unit.

The following filters are used in GPU process.For calculation of present and its neighboring pixels , we used maen and sobel filters.
Difference filters are used for calculating of two images.
Binarization with mean values and Linear transformations of histograms are used for calculation of mean, maximum and maximum value in the whole image.

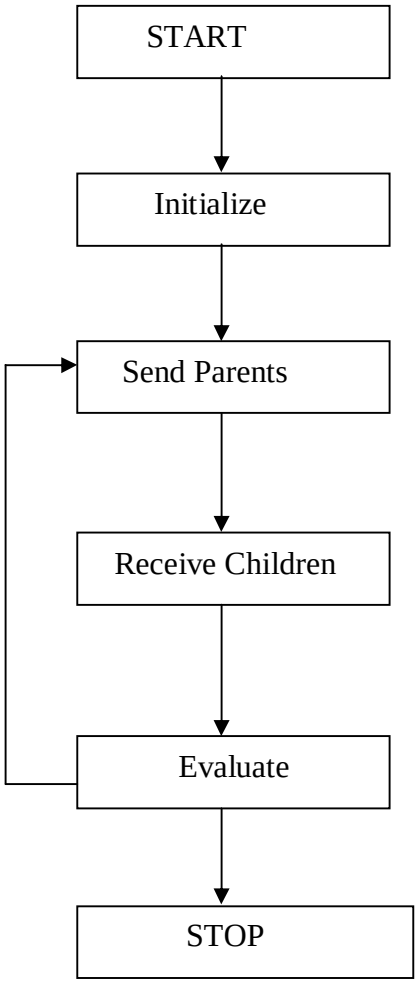

Fig 3: Flowchart for processing flow of CPU and GPU

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4. RESULT ANALYSIS

We compared the optimization speed of one Graphic Processing Unit's ACITT with one CPU's ACITT

Image Size	GPU-ACITT	CPU-ACITT
32x32	0.3	4.2
64x64	1.2	6.8
128x128	2.6	22.1
256x256	5.8	75.6
512x512	8.2	105.8

The optimization of GPU-ACITT is more than 11 times faster than that of CPU-ACITT for small images and it is more than 100 times with large images.

5. CONCLUSIONS

The proposed method is implemented based on Graphic Processing Unit on ACITT which performs in parallel with multiple Graphic Processing Units. Optimization of the proposed method is more reliable and faster than the ordinary ACITT.. Hence the proposed method is proved to be an efficient one.

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