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A Practical Approach of Ant Colony Optimization Based Detection of Image Boundaries Using Matlab Simulation

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Abstract: Image Processing is the wide domain consist of different types of techniques such as Image Segmentation, image resolution enhancements, pixel based Image Editors but detection of the images Boundaries known as Image's Edge is the broad area. The captured images contains the noises and difficult to analyze the images pixel accurately. The Ant Colony Optimization (ACO) is the approximation algorithm which works on basis of probability and extract the pixels different where the intensity values get changed on due to lighting effect or pixel ratios. We have been proposed the algorithm for identify the Images Values based on the Pixel Matrix to generate the identify the image accurately. The concept is based upon the ants in which ants get move in all directions with following the shortest path and to remove the values that are not the accurate path. We have been generated the flow charts, reviewed the MATLAB Working that might generate the results with Accuracy and some of the performance parameters also specified such as PSNR (Peak Signal to Noise Ratio) with graphically representation.

Index Terms – ACO-Ant Colony Optimization, Image Processing, Computer Vision., PSNR.

1. INTRODUCTION

Image Processing means extraction of the image pixels in digital form needful for perform the required operations such as segmentation, edge operations, intensity values operations, etc. so you can get a more advantageous image or to extract some benefit information from it. Image processing essentially include the following steps: 1. Importing the image with optical scanner or by way of digital photography. 2. Reading and manipulating the image which incorporates data compression and image enhancement and recognizing style those aren't to human eyes like satellite TV for pc image. 3. Output is the remaining stage wherein result may be altered image or report that is based on image analysis. There are two varieties of methods used for image processing namely, analogue, and digital image processing. Analogue image processing can be used for the hard copy like printouts and photographs. Image analyses use various basic of interpretation at the same time as using these visual techniques. The three general phases that each one types of data through on the equal time as usage of digital technique are pre-processing, enhancement, and show, information extraction.

Ant Colony Optimization (ACO) is a heuristic search method that operates based on ant colony and is being used for discontinuous problems.

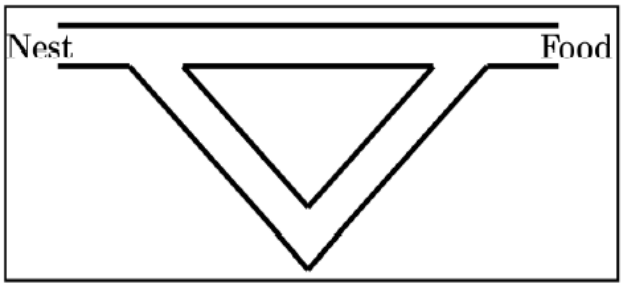

Fig 1: All ants are in the nest. No pheromone in the environment.

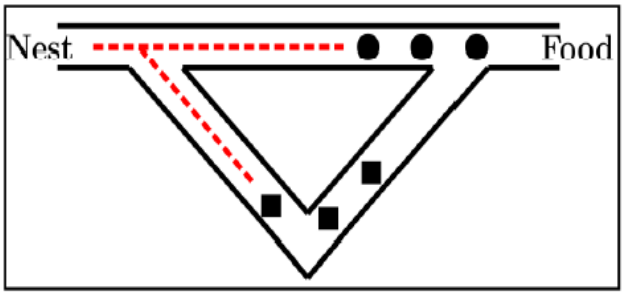

Fig 2: Foraging starts. Some ants take the short path some takes long path to the food source.

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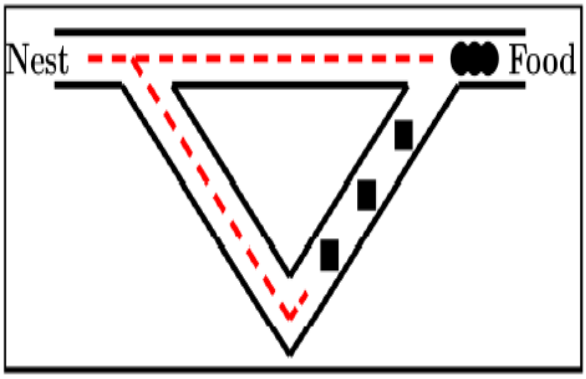

Fig 3: Ants Considered short path to arrive earlier at the food source because returning

During recent years this method is especially developed for edge extraction purposes. In order to reach suitable solution, it's necessary to specify initial ant positions and their movement type as well as their operation condition. So far, acceptable results are obtained but due to this fact that the basic ant colony algorithm is used and considering potential that this algorithm possess there is room for improvement.

Fig 4 Ants moving from nest (source) towards its food (Destination)

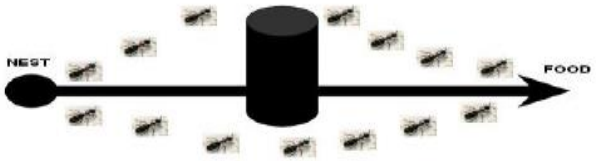

Fig 5 An obstacle placed on the way between nest and food

Edge:
An edge can be defined as a group of connected pixels lying between boundaries of two regions.

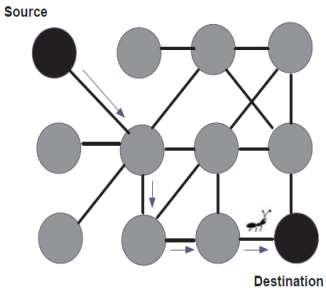

Fig 6: The movement of ant on the image from source to destination

Edge can also be defined as in binary images as the black pixels with one nearest white neighbor. An Edge is a local concept but the boundary is a global concept. An ideal edge is a group of pixels located at an orthogonal step transition in gray level. Blurry edges are also acquired by the factors like problems or imperfections happened at the time during of optics, sampling and image acquisition systems. So, edges can be closely seen as having a profile as that of ramp-like profile. The ramp's slope is related to the degree of blurriness inverse proportionally. The thickness of the edge is the length of the ramp. Blurred edges are thick and sharp edges are thin. It is well observed that the first derivative it is positive along the ramp, zero where the intensity level is constant and it is constant along the ramp. The edges obtained from natural images are usually not at all ideal step edges. Instead they are normally affected by one or several of the following effects:

• Focal blur caused by a finite depth-of-field and finite point spread function
• Penumbral blur caused by shadows created by light sources of non-zero radius.
• shading at a smooth object

Algorithm for Edge Detection:

• Take a color image.
• Smoothing: Annihilate as adequate noise as accessible, without wrecking genuine edges.
• Enhancement: the quality of edges is enhanced by applying differentiation.
• Threshold: Apply edge magnitude threshold to determine which edge pixels should be retained and which should be discarded as noise.
• Localization: Ascertain the postulate edge bearings.
• Evaluation with the algorithms.
• Get the image after edge disclosure

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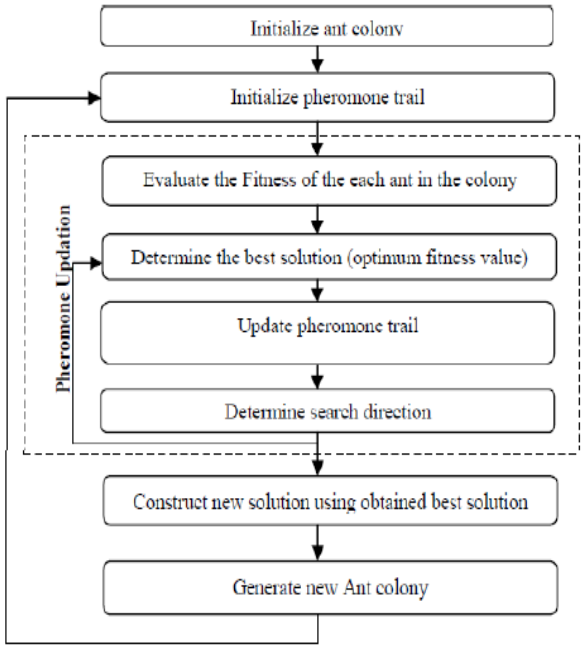

Applications

1. Image Compression: Segment the image into homogeneous components, and use the maximum suitable compression algorithm for every component to improve compression.
2. Medical Diagnosis: Automatic segmentation of MRI images for identify of cancerous regions.
3. Mapping and Measurement: Automatic analysis of remote sensing data from satellites to identify and measure regions of interest.
4. Transportation: Partitions a transportation network makes it feasible to discover regions characteristic by homogenous traffic state.
5. Edge Findings in the complex image is the difficult process and get it by accuracy using the image processing techniques.

Benefits

1. Segmentation accuracy determines the eventual achievement or failure of automated analysis procedure.
2. Development of pictorial information for human perception/interpretation.
3. Mapping and Measurement: Automatic analysis of remote sensing data from satellites to identify and measure regions of interest. E.g. Petroleum reserves.
4. It might be viable to research the image in the computer and provide cues to the radio logistics to assist detect important/suspicious structure.

II. LITERATURE REVIEW

Author [1] has been explained the concept of Digital Image Edge Detection based on the ACO techniques. The detection of the edge is one of the important part in the field of Image Processing. In this paper they proposed an improved ACO algorithm for digital images edge classification. The classification is basically done as per the natural phenomenon of the movement of ants for searching paths. They have proposed a new modified ACO algorithm for better visual effects and compared the experimental results with previous standard one.

Author [2] has been explained the ACO based algorithm. Edge detection is a fundamental problem in image analysis. Different evolutionary optimization techniques have been recently applied to this problem. Ant Colony Optimization is also an evolutionary optimization technique, which has been applied to this problem. But in this paper we present modifications in the previous implementation of ACO to further increase the clarity of detected edges in an image. Thus in this paper an improved ACO based algorithm for image edge detection has been presented. Series of simulation experiments demonstrate the feasibility, effectiveness and superior performance of the proposed approach as compared to basic ACO.

Author [3] has been explained the concept if parametric concept of ACO. Edge detection is one of the open issues in image processing. ACO, inspired by the foraging behaviour of ants, has been typically used for addressing this problem. ACO has different variants which differ in either the way in which route is constructed or the pheromone is updated on the ants. There has been significant work done by researchers with two typical ACO algorithms, i.e., Ant System (AS) and Ant Colony System (ACS). The proposed work aimed at drawing a comparison by changing the parameter value of phi for performance analysis. This proposed work can be an ideal template and ready reference for a novice researcher in the field of image processing to use a typical ACO algorithm out of the different ACO algorithm for this problem

Author [4] has been explained the some concepts in verbally of ACO. Edge detection is important part of image processing for object detection. So it becomes extremely important to have a good understanding of edge detection algorithms. An edge is the real or imagined line that marks the limit and divides of plane, object or appearance from other places or things. This means that if the edges in an image can be identified accurately, all of the objects can be located and basic properties can be

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measured. This paper introduces a classification of most important and commonly used edge detection algorithms, namely Sobel, Robert, Prewitt, Laplacian of Gaussian, Canny, Ant colony Optimization.

Author [5] has been explained the Edge Analysis of typical images. Edge detection of pictures is a vital task in computer vision and image processing. Edge detection is always study focus in the field of medical image processing and analysis. It is necessary step in medical image processing. Edge detection of noise free pictures is comparatively less complicated, however in most sensible cases the photographs area unit degraded by noise. Edges in photos provide low-level cues, which could be utilized in higher level processes, like object detection, recognition, and classification, furthermore as motion detection, image matching, and trailing. Edges and textures in image are typical samples of high-frequency information.

III. OBJECTIVES

The general goal is to provide an efficient Method of Edge Detection which should cover most of the edges of the input image and the parameters need to be modified. The input image need to be of grayscale image and can be of different resolution. Our objective is to identify the implemented algorithm's result on the basis of various parameters. The objectives of this research work are:

1. To implement the Image Edge Detection using Ant Colony Optimization algorithm using MATLAB on Windows 7 platform.
2. To improve the drawbacks of that algorithm and comparing it with the new improved algorithm.
3. To compare the results of both algorithms and represent those results graphically.

IV. PROPOSED METHODOLOGY

After the completion of the above step what we have done is to implement the updated algorithm. In this step we will implement the improved algorithm using MATLAB and then comparing the present algorithm with the altered one. At last we will do the result analysis and look after the differences in them with the help of graphs and charts. The MATLAB 2010b version implantation tool has been used for perform the real time operations.

1. Study of the Existing Algorithms
2. Identify the Different methods.
3. Identify the issue and Apply improved technique of Edge Detection using ACO.
4. Obtain Edged.
5. Performance measure of method by calculating performance parameters such as PSNR (Peak Signal to Noise Ratio), RMSE (Root Mean Squared Error).

V. CONCLUSION AND FUTURE WORK

In this research work, our proposed work described the techniques of Edge Detection using Ant Colony Optimization in Coloured Images. Our research work shows the accuracy in terms of image comparison and performance parameters such as PSNR.

In future, this work can be extended with other algorithms such as Fuzzy Neural Network and can be optimized the results in less time and high peromance parameters result.

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