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A Review: Image Edge Unmasking by Applying Renovated and Colony Optimization Technique

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ABSTRACT

Ant colony optimization (ACO) an optimization algorithm inspired by the natural behavior of ant species, which deposit pheromone on the ground to guide their foraging. The algorithm for edge detection using ant colony optimization is reviewed. The experimental results obtained through the implementation and edge unmasking is studied. The ACO-based edge detection algorithm represented the edge pixel position of the image using a pheromone matrix in which the movements of the ants driven by the image's intensity values are recorded. In this paper we reviewed the methods of edge unmasking, ANT colony optimization, different types of edges.

Keywords: ACO, Acquaintance, Edges, Pheromone, Shortest path.

I. INTRODUCTION

Digital image processing a process which processed the digital image by use of the different algorithms which are computer based. Edge unmasking was an elementary scheme for perusing the digital image proceedings. Edges in the digital images contain vital knowledge and edges has been detected and masked. In lots of techniques developed over the decades ACO was a suitable and satisfactory method for the optimization problems. The basic image processing technique follows some of the steps from top to bottom which includes: Repetition, transmission, compression, Image enhancement, edge detection techniques on image and also the proper and complete understanding about the image.

1.) Edges in Digital Image

An edge may be illustrated as a arranged set of cogonated pixels that forms a boundary between two dislocated regions. An edge is the substantial or spiritual line that fixes up the limit and this edge disunite the plane or some objects. Edges are the sudden jumps having high frequency. If we are able to discover or unmask edges in a correct and accurate way we become able to find and locate the basic properties about the images. So, by identifying the edges in the image the different features can be measured accurately. According to variation of intensity. Different types of edges are shown in fig.

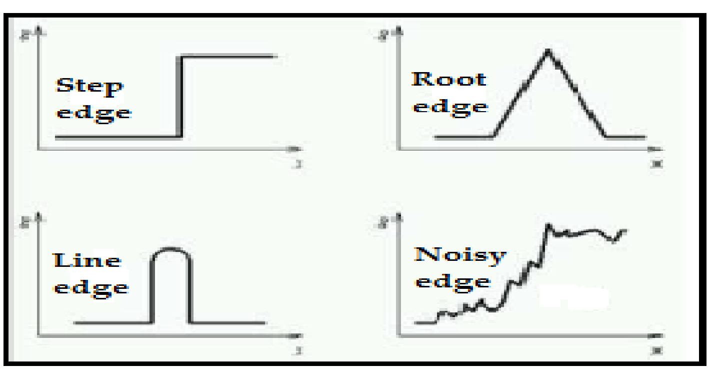

Figure 1: Different types of edges

2.) Jing Tina's Approach

Ant colony optimization (ACO) is an optimization algorithm inspired by the natural behaviour of ant species that ants deposit pheromone on the ground for foraging. In this paper, ACO is introduced to tackle the image edge detection problem[1].The proposed ACO-based edge detection approach is able to establish a pheromone matrix that represents the edge information presented at each pixel position of the image, according to the movements of a number of ants which are dispatched to move on the image. Furthermore, the movements of these ants ar driven by the local variation of the image intensity values,

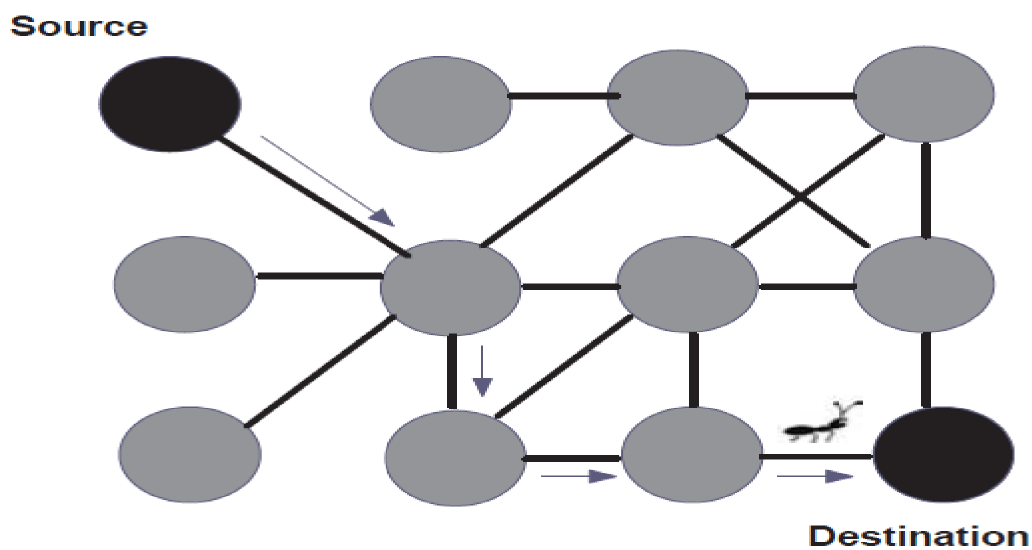

Figure 2: ACO technique

3.) Ant colony optimization (ACO)

Ant Colony Optimization is a relatively new approach to problem solving that takes inspiration from the social behavior of the ants. ACO is a population based approach and is inspired by foraging behavior of ant species [5]. In many ant species, ant walking to and from a food source deposit some substance on the ground called pheromone. Different ants adopt different paths to reach the food source and deposit the pheromone based on the fact that higher concentration of pheromone is deposited on shorter paths and smaller concentration on longer paths [8]. Here, the collective behavior of ants provides intelligent solution for finding the shortest path from the nest to the food source. If a single ant finds a shorter path and deposit higher concentration of pheromone on the way to food source then all the other ants gets attracted towards the higher concentration and hence following the shorter path. Ant Colony Optimization is an iterative algorithm[6]. At each iteration, a number of artificial ants are considered. Each of them builds a solution by walking from vertex to vertex on the graph with the constraint of not visiting any vertex that she has already visited in her walk. At the end of an iteration, on the basis of the quality of the solutions constructed by the ants, the pheromone values are modified in order to bias ants in future iterations to construct solutions similar to the best ones previously constructed.[14] Artificial ants are like real ants with some major differences:1) Artificial ants have memory, 2) They aren't completely blind, 3)They live in a discrete time environment. However they have some adopted characteristics from the real ants, like 1) They probabilistically prefer path with a larger amount of pheromone, 2)Shorter path is true path, larger is the rate of growth in the pheromone concentration, 3)They communicate to each other by means of the amount of pheromone laid on each path.

The procedure of ACO can be summarized as follows:

a) Initialization procedures

for each iteration n = 1:N do
for each construction_step l = 1:L do
for each ant k = 1:K do

Select and go to next pixel
Update pixel's pheromone (local)
End
end
Update visited pixels' pheromones (global)
End

b) Construction process

In the nth step of construction, one ant being randomly selected from K total ants and this ant will move over the image for L steps. This ant will move from the (l, m) node to (i, j) node which is its neighboring node or pixel, is specified by the transition probability.

$$\rho^{(n)}(l,m),(i,j) = \frac{\left(\tau^{(n-1)}i,j\right)^{\propto}(n_{i,j})^{\beta}}{\sum_{(i,j)\in\Omega(l,m)}(\tau_{i,j}{}^{(n-1)})^{\alpha}\,(n_{i,j})^{\beta}}$$

Where τ i, j (n−1) is the pheromone value of the node (i, j), Ω(l,m) is the neighborhood nodes of the node (l,m), ηi,j represents the heuristic information at the node (i, j) [17]. The constants α and β represent the influence of the pheromone matrix and the heuristic matrix, respectively

The function Vc (Ii, j) is a function of a local group of pixels c (called the *clique*), and its value depends on the variation of image's intensity values on the clique c.

$$n_{i,j} = \frac{1}{z}V_c(I_{i,j})$$

c) Update process

The pheromone matrix is updated in the update process after the two update operations. The first update is accomplished after the movement of each ant in each construction-step. Each building block of pheromone matrix is modified as given in equation:

$$\tau_{i,j}{}^{(n-1)} = \begin{cases}(1-\rho).\tau_{i,j}{}^{(n-1)} + \rho.\Delta_{i,j}{}^{(k)}, if\ (i,j) is\ visited\ by\ current\ kth\ ant \\ \tau_{i,j}{}^{(n-1)}\end{cases}$$

The second update is carried out after the movement of all ants within each construction-step according to

$$\tau^{(n)} = (1-\varphi).\tau^{(n-1)} + \varphi.\tau^{(0)}, \dots\dots\dots$$

II. LITERATURE REVIEW

Mohit Mehta, Munish Rattan et al [1] (2012) In this paper they 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.

Jeetu Singh, Ankit Vidyarthi et al [2] (2013) 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.

Charu Gupta, Sunanda Gupta et al [3] (2013) ACO is introduced to think about the image edge detection issues where the purpose is to evolve the edge information existing in the picture, since it is critical to understand the image's content. The main mechanism of ACO is the discovery of good tours is the positive feedback done through the pheromone update by the ants. Ant colony optimization is inspired by food foraging behaviour exhibited by ant societies to find approximate solutions to the tough issues. An ACO algorithm is the combination of prior information regarding the structure of a solution with the information regarding the structure of previously obtained good solutions

Sivaramakrishnan Rajaramanand ,Arun Chokkalingam et al [4] (2014*)* This paper proposes a modified bacterial foraging algorithm with a probabilistic derivative approach to detect edges in chromosome images. Chromosomal Edge Detection is fundamental for automatic karyotyping for noise reduction and getting useful messages from the edges. Subjected to staining and other imaging constraints, chromosomal banding patterns lack in resolution, contrast and suffer from noise. For this reason, chromosomal edge detection is highly preferred prior to the segmentation and classification of chromosomes.

III. OBJECTIVES

In the papers we studied to apply the ACO on the images for the edge detection whose main objectives were as follows:

a) Assemble the colored images
b) Identification of the edges in the images
c) Recognise the edges by the proper adjustments in the abrupt intensity changes
d) Implement the technique of edge detection in a suitable way so that the properties and features of the image can be unfolded in a convenient way
e) Unmasked image as a result is obtained but clear edges and less RMSE value was needed.

Problem Statement

Identifying the edges in the images is a challenging process. To mark-up the proper changes occur in intensity is also very difficult to look after. But for the recognition of the content of the images edge detection is considerable phenomenon [10]. For this edge detection purpose the algorithm must be selected in such a way that it will produce the desired output. Which include the clear and sharp edges for better performance and also the algorithm which we apply for the edge detection filter the relevant information from the images and sustaining the essential attributes of the images. The proposed work will give a renewed algorithm for the ACO which give its best results when applied for edge detection.

CONCLUSION AND FUTURE WORK

Edge detection plays a vital role in image processing applications, which is important part in computer vision. Reviewed paper shows edge unmasking but vague edges and higher RMSE value needed. The edges get more corrupt in noisy environment. So it becomes difficult to detect edges in such cases. So an approach that could develop edges with dense edge intensity needs to be developed. For the future work the use of modified ACO and the perception of the images will result sharp edges. In future we would try to increase the more accuracy of the edges and try to fetch the best performance. The ACO is applied in such a way that it will extract the attributes of images in a convenient way.

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