Hybrid Approach for Edge Detection Using ACO & Canny

Navdeep Kaur and V. K. Banga

Abstract: Image edge is the most basic feature of image. Most of the classical edge detection methods are sensitive to noise, poor anti-interference performance. To overcome the limitations of the earlier work a new approach has been proposed for color images using color gradients, hybrid approach which is ant colony optimization as well as canny (ANTC). Color based edge detection has 10% more potential edges than the gray one. In practice, the more the adaptive parameters are provided, the more conveniently the proposed method can be used. In this paper, we employed two adaptive parameters like Peak signal to noise ratio and accuracy.

Keywords: Edge detection algorithms, ANT colony optimization (ACO), Canny edge detection algorithm, Hybrid (ANTC) edge detection method.

I. INTRODUCTION

Images are among the main data carriers presently used. This image processing field advances concepts to method the images, sometimes to get specific data, to boost their quality or sometimes to organize them for different applications. Through the years, many practices have now been planned for the image edge detection, which will be the strategy of noticing items in a image, wherever strength improves sharply in that case different form of methodologies have now been executed in several applications. Many of the standard edge-detection algorithms convolute a filter agent and the insight image, and then map overlapping insight image areas to result signals which cause significant reduction in edge detection [1].

Edge detection algorithms are of essential significance for image processing purposes since it's merely may establish within some short limits of items in the image. This method is as easy discussed below; the density values of pixels which are friend one another are compared. Throughout this method, the outstanding improvements of density is called edge regions [2]. If image has disturbances, it must be properly cleaned. Since sound influences the density modification in an image and it decreases the achievement charge for edge detection algorithms. To overcome sound issue, several reports were created for decades and numerous edge detection calculations has emerged. With constant growth, edge detection calculations have now been applied several places because of the ability manage to merely used in limited time and achievement costs raising time to time.

Aspects of use; visible examination section of automation techniques recognition of item limits by choosing the function remotely sensed images [3], the usage of face recognition [4], feature extraction from photographs taken by satellite, extracting features of medical photographs and so forth [5]. To realize the functioning concept of the edge detection calculations, firstly we ought to understand what the edge is. Edge that is essential part of image processing purposes gives boundaries data of things in the image and site information. Image and every item in the image has possess standard density value. Factors which enhances the density value could be known as edge.

On the foundation of the stated classification of the edge, we can conclude that the edge detection algorithms operate density difference in the image. While there are many various edge detection algorithm and these algorithms perform in various techniques for getting greater results, their fundamental purpose is to calculate density value of every pixel and is to test exceptional density change on the list of friend pixels. To discover edges, the images generally are changed into gray level. Each pixel of gray level images has a value between 0-255 based on density value own.

Edge detectors are accustomed to discover and localize the limits of objects within an image. The complication of edge detector developing may be the difficulty of defining exactly what indicates an edge. In practice, it is impossible to design an edge detector effective at finding all the actual, and the only correct
edges in an image [6]. Furthermore, edge detectors give unclear details about spot of object boundaries. In edge detection method, noise of the picture and picture characteristics have a substantial effect on results. To reduce these impact, many different edge detection algorithms are used. In this paper, we have proposed the hybrid approach of edge detection (ANTC) including ACO as well as Canny.

II. ANT COLONY OPTIMIZATION (ACO)

ANT colony optimization (ACO) is really a nature-inspired optimization algorithm motivated by the organic phenomenon that bugs deposit pheromone on the floor in order to level some positive route that should be accompanied by other members of the colony. Since then, a number of ACO calculations have now been developed including the Max-Min ant system and the ant colony system [7]. ACO has been generally applied in several problems. ACO is presented to undertake the image edge detection issue, where in actuality the intention is to get the side data presented in the image, since there is a difficulty to comprehend the image's material [8]. The planned method exploits a number of bugs, which move on the image pushed by the area alternative of the image's intensity values, to establish a pheromone matrix, which shows the side data at each pixel location of the image.

III. CANNY EDGE DETECTION ALGORITHM

Canny edge detection algorithm known as optimum edge detection algorithm and the absolute most generally applied edge detection algorithm in general. Canny spent some time working to boost edge detection methods that used commonly in those days by specifying several criteria. The main of requirements which are selected by Canny would be to find the reduced error rate. Another essential qualification is that the correct location of identified edges . Canny edge detection algorithm comprises several easy steps. It is explained further in 5 different steps:
- Use Gaussian filtration to easy the image to be able to eliminate the disturbance
- Get the density gradients of the image
- Use non-maximum elimination to remove spurious a reaction to edge detection
- Use dual threshold to ascertain possible edges
- Track edge by hysteresis: Complete the detection of edges by suppressing the rest of the edges that are weak and not linked to powerful edges.

IV. PROPOSED METHODOLOGY

This paper mainly focuses on hybrid approach (ANTC) based edge detection. A new approach has been proposed for color images using color gradients, hybrid approach based improved canny edge detector.

Fig 1: Flow Chart of Proposed Methodology (ANTC)

This detailed description of methodology is given in the following steps:
Step 1: Firstly we have taken input color images for edge detection.
Step 2: After the extraction of primary colors (red, green, blue) is done.
Step 3: Then the hybrid approach is used in each red, green, blue color channel.
Step 4: Then after that edge fusion is applied.
Step 5: At the end, final edge detected image is obtained.

V. RESULTS AND DISCUSSION

This shows the outputs of the existing approach i.e. (ACO) as well as the proposed approach i.e. Hybrid (ACO & Canny) Approach ANTC.

The following results completely shows that the proposed hybrid approach gives better outputs because edges are detected in an beneficial manner.
VI. PERFORMANCE EVALUATION

a) Accuracy: It computes the accuracy between the two different images, hence, they are complementary to the difference based measures. Their units are shown in correlated values.

Table 1: Accuracy table

<table>
<thead>
<tr>
<th>Input Images</th>
<th>Canny</th>
<th>ACO</th>
<th>Hybrid (ANTC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Image1</td>
<td>53.0431</td>
<td>93.6313</td>
<td>98.7836</td>
</tr>
<tr>
<td>Image2</td>
<td>67.0216</td>
<td>90.2038</td>
<td>98.3192</td>
</tr>
<tr>
<td>Image3</td>
<td>43.5508</td>
<td>93.1106</td>
<td>98.5941</td>
</tr>
<tr>
<td>Image4</td>
<td>50.7340</td>
<td>95.2645</td>
<td>98.3463</td>
</tr>
<tr>
<td>Image5</td>
<td>29.7150</td>
<td>94.7650</td>
<td>99.5319</td>
</tr>
<tr>
<td>Image6</td>
<td>93.7762</td>
<td>96.9096</td>
<td>99.4168</td>
</tr>
</tbody>
</table>
Figure 4 shows the graph of the existing as well as the proposed approach. It shows that the values of proposed approach are higher than the existing approach.

**Table 2: PSNR table**

<table>
<thead>
<tr>
<th>Input Images</th>
<th>Canny</th>
<th>ACO</th>
<th>Hybrid (ANTC)</th>
</tr>
</thead>
<tbody>
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<td>Image2</td>
<td>56.3665</td>
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<tr>
<td>Image3</td>
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<tr>
<td>Image4</td>
<td>54.6959</td>
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<td>65.0119</td>
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<tr>
<td>Image5</td>
<td>54.2627</td>
<td>57.1013</td>
<td>71.1140</td>
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<tr>
<td>Image6</td>
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<td>69.5162</td>
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<tr>
<td>Image7</td>
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<tr>
<td>Image8</td>
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<td>Image9</td>
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<td>Image10</td>
<td>56.3766</td>
<td>55.9204</td>
<td>65.1614</td>
</tr>
</tbody>
</table>

**VII. CONCLUSION**

The hybrid approach based edge detection can successfully reduce the poor speed issue with ant colony optimization. The color based gradients has the ability to remove the effect of the false edges while preserving the potential edges. The results of proposed work are improved over the existing work which is shown by parameters including PSNR and Accuracy.

**REFERENCES**


