The Edge detection scheme in image processing using ant and bee colony optimization

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Review of the literature

Various image edge detection techniques have been discussed in the study of researchers. Gradient and Laplacian are edge detection techniques that have been discussed in the study. The major drawback of using gradient-based algorithms is their sensitiveness towards the noises. Prewitt filter is one of the types of Gradient-based algorithms which is much sensitive towards the noise. In the gradient-based algorithm, the size of the kernel, as well as coefficients, can not be changed therefore the governing image cannotadapt the kernel size as well as a coefficient. Therefore it is needed to get robust solutions that can be adapted to different noise levels. An adaptive edge detection algorithm is used to differentiate the continents of valid images through visual artifacts created by the noise.

Discrete optimization algorithms have been proposed by Nadipaly (2019)in which ant and bee colony optimization and biological finds on the real ants have been discussed. This study has also discussed the artificial counterpart of the ant as well as communications networks for the ant and bee colony.

Edge detection of the blurred image has been performed byKhorram and Yazadi (2019) where ant colony optimization techniques have been used. In this study, different color values are used for the blurred detection of the image based on their strength and image.

In the study of Aberni et al. (2020), a pheromone matrix was established for edge detection using ant and bee colony optimization. Edge information at each pixel was represented through the pheromone matrix.

Research gap

From the research paper on gradient-based techniques noises drawback has been mentioned but the way of handling for better image processing is missing. Along with Laplacian edge techniques for images, processing considerations need to be developed over making the integration of gradient-based techniques. Prewitt filter and the existing noise issue have been detected easily from the literature but what is the scope of handling it is unknown. At the time research provide information about image processing along with drawbacks the way of overcoming issues needs to be added. In this study, we have tried to overcome all the problems and issues present in the existing detection techniques. Various Ant and bee colony optimization techniques have been proposed however; in this study, we have proposed solutions that solve all the limitations of conventional methods.

Objective and Scope of the research investigation

The objective of the study

- To analyze edge detection scheme for image processing by using ant and bee colony optimization.
- To understand the challenges of conventional methods for the noise sensitivity concern in image edge detection processing.
- To analyze the edge information validity in each pixel of the image of the used ant and bee colony.

Scope of the study

In this study ant and bee colony optimization has been introduced to solve the image edge detection problem as well as analyze the edge information present in each pixel of the image (Khudov et al. 2020). It is difficult to understand the connection of the image therefore ant and bee colony optimization techniques have been applied to find the solution space. The scope of the study is to understand the different optimization techniques based on ant and bee to solve the problems of image processing. In the present time, Ant and bee colony optimization is used to solve the computation problems. Artificial ants follow the path of the real ants and provide good paths through the graphs (Kaur et al. 2018).

Numerous optimization tasks such as internet routing and vehicle routing are performed by using ant and bee colony optimization. The scope of the study is to apply ant colony optimization to various combinatorial optimization problems. Consistency and stability of light sources are the two measures issues during the image processing therefore ant and bee colony optimization techniques can be used to solve this issue (Zhang and Dahu 2019). Multivariable problems in image processing can be solved by using the application of ant and bee colony optimization techniques. The purpose of using ant and bee colony optimization is to solve the image edge detection issues as well as evolve the information of edges present in the existing picture.

Extraction of edges in a digital image is known as image edge detection (Hancer 2020). Series of actions are performed in the Image edge detection to determine the points where the sharp changes in the intensity are measured. The image content can be understood by performing a series of actions. The important details of the image are represented through the extracted edge points (Vimal et al. 2020).

Edge detection acts as a preprocessing step for object recognition. Ant and colony optimization techniques allow to detection of a change in the intensity of images as well as to capture the physical properties of the world. The scope of the study is to understand the two types of events such as geometric events as well as non-geometric events that are used for changing the intensity in the image (Rai 2022). The study provides scope to understand the discontinuities in-depth, surface tension, and color and texture of the image. Changing illumination, inter-reflection and shadows are the non-geometric events that can be understood through the study. The study helps to understand the conventional approaches for image detection such as Prewitt operator and Sobel operator (Oliva et al. 2019).

The scope of the study is to understand the role of edge detection in image processing. Algorithms based on ant and bee colony optimization are used to overcome the limitation present in the existing studies as well as make them evitable for the distributed system (Singh et al. 2020). The scope of the study is to understand the techniques of edge detection that consist of false edge detection as well as production of the thick or thin line related to the house issues. In the transitional study of ant and bee colony optimization, it has been found that traditional approaches suffer from the probabilistic choosing problem and hard path.

Proposed Methodology

The image edge detection techniques that have been used in this study are applied to 2D images for generating the pheromone matrix. Ant and bee colony optimization techniques have been used in the proposed mage edge detection (Perumal and Vekurugan 2018). Pheromone matrix has represent the intensity change of each pixel in the real image that is affected through the edge location.

The proposed methodology helps to construct a pheromone matrix that allows the ants to move on a 2-D image through which one pixel steps out to another pixel. Pheromone matrices have been used in the study to deal with the edge information of each pixel in the image. a pheromone matrix allows extracting the edge of the image (Jama and Baykan 2020). Local variation of the images intensity values is used for detecting the movements of ants. Several steps are involved in the ACO optimization including the initialization process where images are taken as input and artificial ants are used to provide solutions Ant and bee colony optimization techniques are used for the construction pheromone matrix that runs for the number of iterations (Pravin et al. 2019). The construction process and update process are involved in the Iterative process. The decision process is the last process where the edge is determined.

Importance of Proposed Research Investigation

The proposed research investigation is important to understand the ant and bee colony optimization algorithm (Dinh and Tu 2021). The study is important to solve the various computation problems that arise on the images such as image compression, image edge detection, structural damage monitoring, and image

segmentation. The study is important to understand the application of ant and bee colony optimization in image processing (Sharma and Mir 2019). The algorithm used in the study helps to find the optimal solution for the issues present in image processing.

The importance of the study is to understand the challenges present in the optimization of image processing and how it can be solved through ant colony optimization. Optimization problems play an important role in both the industrial world as well as for the scientific world (Tang et al 2021). Observation of ant colonies has inspired the development of these algorithms. In human life, image processing plays an important role. Advancements in image processing technologies are used in various fields such as medical, military, commercial, and various industrial areas (Jino Ramson et al. 2019).

The study is important to understand the concept of soft computing where processing and analysis of images play an important role. Fragmentation noises, as well as imprecise information, are the most common uncertainties found in image processing therefore this study is important to understand the role of ant and bee colony optimization in solving the traveling salesman problem (Li and MR 2019).

Chapter-wise details of Proposed Research Investigation

Chapter 1: (Introduction): This is the first chapter of the study. In this study, we have discussed the overview of the whole study. The study deals with the background of the study, the significance of the study, the research rationale as well as the objective of the study (Goel and Maininj 2020). This chapter helps to understand the overview of the ant and bee colony optimization as well as their importance in the image edge detection techniques. The chapter helps to set objectives for completing the study as well as helps to find the need of the study as well contribution of the study (Banharnsakun 2020).

Chapter 2 (Literature review): This is the second chapter of the study. In this chapter, various literature related to the study has been discussed. The study helps to understand the contribution of that literature as well as the limitations of those studies (Tang and Pan 2021). This chapter helps to gain knowledge regarding the concept of image edge detection and its optimization. Several kinds of literature are present regarding the use of different optimization techniques for image edge detection.

Chapter 3(Research methodology): This is the third chapter. In this chapter, various research methodologies and techniques have been discussed. Proposed research design, research approach, research philosophy as we; as data collection method have been discussed. This chapter allows us to design the procedure and framework through which data are gathered (Larqabi et al. 2021). The chapter provides information regarding the different ways through which relevant data related to ant and bee optimization techniques can be gathered.

Chapter 4: (Data analysis and findings): This is the fourth chapter. It is considered one of the most important chapters of the study. This chapter allows us to analyze the gathered data in the research methodology chapter (Dhal et al. 2020). Analyzing the collected data helps to get findings through which the objective of the study is matched. Qualitative data and quantitative data analysis are the two approaches through which data analysis is done. The findings we obtained after data analysis helps in completing the study (Akay et al. 2021).

Chapter 5: (Conclusion and Recommendation): This is the fifth chapter. In this chapter, the overall summary of the study is provided. The overall summary shows what was the reason for conducting this study as well as the procedure followed to complete the study (Dash et al. 2020). This chapter discusses the limitations of the present study as well as provides recommendations to overcome those limitations in future studies.

Work plan and expected duration of the investigation

Work done	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week	9th week	10th week	11th week	12 week
Introduction	▓	▓										
Literature review			▓	▓								
Research methodology and data gathering					▓	▓	▓					
Analysis and the data as well as relevant findings								▓	▓	▓		
Conclusion and recommendation											▓	▓

Table 1: Work done and available time for the investigation

(Source: created by author)

The above table 1 shows the working plan during the study as well as discusses the time duration required for completing the study. It shows the completion of different stages of the study in planned time.

Facilities available for the investigation at scholar end and facilities required on campus

Various journals, pdfs, and articles related to ant and bee colony optimization have been used in the investigation that has provided updated information related to the role of ant and bee colony optimization in the image edge detection techniques (Pare et al. 2020). Updated information through the different scholars helps to complete the study in an updated and efficient manner (Khudov et al. 2020). The reliability of the study has been increased by using different updated scholars. The accuracy and effectiveness of the investigation have been increased through scholars that help in the successful completion of the study.

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