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TEL519E IMAGE PROCESSING PROJECT PROPOSAL FORM

1. PROJECT TITLE

Detection of Object in Underwater Images by Detecting Edges

2. PROBLEM STATEMENT

Degradation of underwater image as a result of scattering and absorption in underwater condition makes the objects in underwater images diminish their perceivability. The level of obscurity in the image increases. Obscurity in the picture means less difference in image pixels, decreased shading and restricted perceivability. These could be demanding situations in object detection underwater images.

A. LITERATURE REVIEW

While searching the literature on this subject, I saw that different approaches were used in underwater object detection in the studies that I came across. One of them is the contrast enhanced and gray video frame balanced application method [1]. This method; It performed well in green turbid waters, but it was also observed that the method could not get sufficient results in dark areas.

Different methods have been proposed like to estimate the attenuation coefficients of underwater images using depth map, remove blurring and repair and rework the image [2], [3]. Deep learning-based studies have also been carried out on underwater image detection, and a 88% performance rate has been achieved using the MobileNet-SSD architecture [4].

In another study, a method is proposed that detects the object in underwater images by finding the boundaries of the object in the image [5]. The destruction in the underwater image is removed by stretching the contrast and segmenting it further using adaptive threshold, then enhancing the image by the Sobel operator to detect edges and make them distinct. The experimental results of the proposed method on underwater images has performed better than Canny operator, Prewitt operator and Hule et al [6].

B. OBJECTIVES

The aim of this project is to detect the edges of the images obtained from underwater and to locate the objects in the related image. Before this, an image enhancement process is required to remove blur and distortion of underwater images.

The reason that I chose this project is to improve myself in image processing and to apply some approaches to the detection of objects in the image.

## 3. APPROACH AND METHODOLOGY

A. METHODOLOGY

In order to solve the problem of object detection in underwater images, I will firstly need an image dataset consisting of underwater images and containing different objects such as rocks, sculptures, sea creatures, divers etc.

I will need to do an image enhancement process to remove the distortions in these underwater images.

Then I will have to use some filter operators to detect the boundaries of the images and I will compare the results of this operators.

B. PLAN FOR COMPLETION
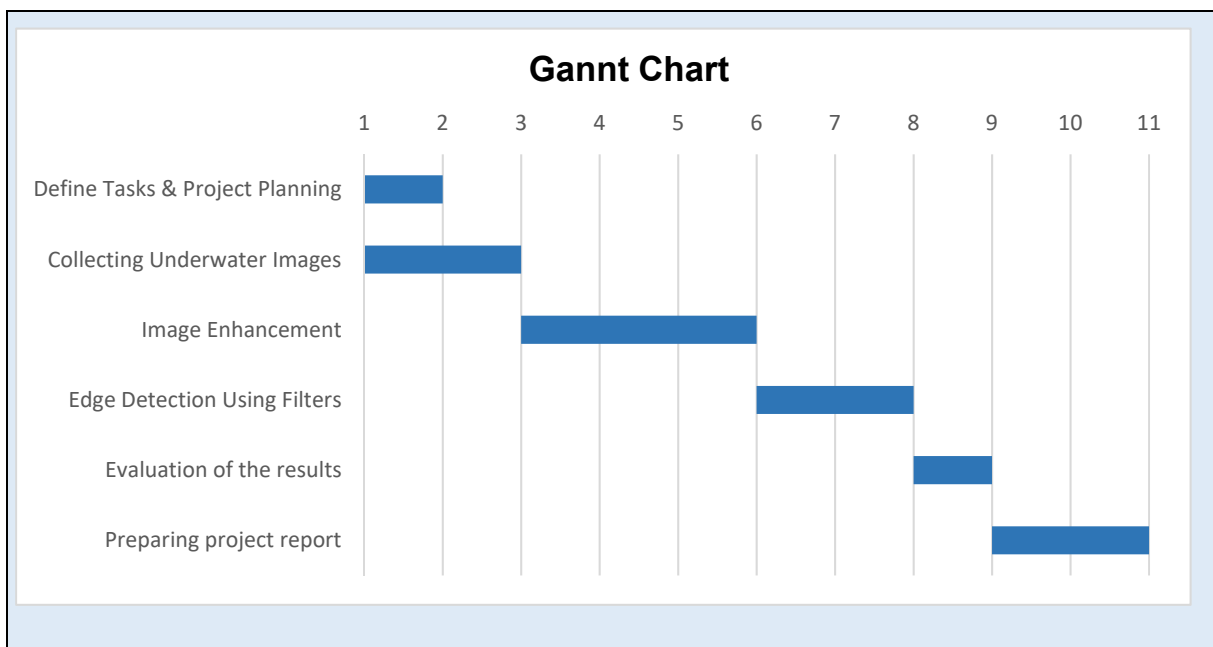
C. DELIVERABLES

In the output of the project, the edges of the objects in the underwater images will be determined. I am thinking of doing this application using MATLAB or OpenCV-Python. At the end of the project, a report will be prepared on the project topic and the outputs achieved. Source codes, project report and image outputs will be delivered.

4. CONCLUSION

In this project, a method that detects the object in the underwater images by detecting the boundaries of the object in the image is proposed. The destruction in the underwater image is eliminated by enhancing the image. Then filters are used to detect edges and highlight them. In the literature review, I saw a paper that use of the Sobel operator was suggested. In the proposed method, it produces consistently better and acceptable results for all considered test images, and provides much better and clearer boundaries of the object in restored quality images than the Canny operator, Prewitt operator, and Hule et al [5]. After completing the image processing course, I will expand my work by further improving myself in this field.

5. REFERENCES

[1]   C. Ancuti, C. O. Ancuti, T. Haber and P. Bekaert, "Enhancing underwater images and videos by fusion," 2012 IEEE Conference on Computer Vision and Pattern Recognition, Providence, RI, 2012

[2]   P. Drews Jr, E. do Nascimento, F. Moraes, S. Botelho and M. Campos, "Transmission Estimation in Underwater Single Images," 2013 IEEE International Conference on Computer Vision Workshops, Sydney, NSW, 2013

[3]   P. Drews, E. R. Nascimento, M. F. M. Campos and A. Elfes, "Automatic restoration of underwater monocular sequences of images," 2015 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Hamburg, 2015

[4]   Tansel Akgül, N. Calık, B. U. Töreyin, " Deep Learning-Based Fish Detection in Turbid Underwater Images", SIU, Gaziantep, Turkey, 2020

[5]   A. Saini and M. Biswas, "Object Detection in Underwater Image by Detecting Edges using Adaptive Thresholding," 2019 3rd International Conference on Trends in Electronics and Informatics (ICOEI), Tirunelveli, India, 2019

[6]   N. A. Hule, "Underwater Image Processing For Object Detection", International Journal of Innovative and Emerging Research in Engineering, vol. 2, no. 2, pp. 196-201, 2015.