

CS445 Spring 2023 Final Project Proposal

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Papers used:

- "Single Image Haze Removal Using Dark Channel Prior" by He et al.:
https://projectsweb.cs.washington.edu/research/insects/CVPR2009/award/hazeremv_drkchnl.pdf (We refer to this paper as "**Paper 1**")
- "A Retinex-Based Enhancing Approach for Single Underwater Image" by Fu et al.:
<https://xmu-smartdsp.github.io/news/newspdf/A%20RETINEX-BASED%20ENHANCING%20APPROACH%20FOR%20SINGLE%20UNDERWATER%20IMAGE.pdf> ("**Paper 2**")
- Fast Visibility Restoration from a Single Color or Gray Level Image by Tarel et al.
https://www.researchgate.net/publication/221110862_Fast_Visibility_Restoration_from_a_Single_Color_or_Gray_Level_Image. ("**Paper 3**")

Topic: Automatic dehazing of underwater and above-water images

Motivation (2-4 sentences): We wanted to detect the conditions of the image and combine methods to automatically dehaze and enhance the image. One of the conditions is for underwater images vs non-underwater images. One application is object-detection where the de-hazed image provides a clearer scene to be used to train a neural net to hopefully produce better results. We hope to learn about image enhancement and the possible techniques, such as the dehazing method, can be used for pre-processing images for object detection AI.

Milestones:

Task	Details	Planned Deadline
Implement paper 1	Create functions for transmission, scenic radiance, and atmospheric lighting	4/14
Implement paper 2	Create functions for color correction, decomposing the reflectance and the illumination, post-processing for fuzz and under-exposure	4/14
Create a classification function to detect if a scene is mostly underwater or not	First, attempt to implement a neural network classifier If neural networks are not feasible, then implement a color-based detection function	4/14
Combine the paper implementation and classifier	Use the classifier to determine which paper's method to implement. Construct an algorithm to combine outputs to have a better solution.	4/21
Evaluate method quality	See evaluation section below.	4/28
Complete report	Complete paper including methods, reports	5/3

Evaluation:

- For the classifier, we can use a larger dataset to verify the correct rate of our classifier is above 0.75
- To quantitatively evaluate the quality of output images, we use the blind contrast enhancement assessment metric proposed by paper 3. If the calculated metrics mentioned in the paper are better for the de-hazed image than the input image, then we are successful.

Resources:

- Paper 1 and paper 2 (already have links)
- Google collab Jupyter notebook and 3 computers: We will create the notebook and we have the 3 computers
- Dataset of underwater and above water images: search online databases for samples

Group: if working in a group, what will be the contributions of each group member

- Han Chen - Implement paper 2
- Daniel Zhuang - Implement classifier for detecting underwater or not
- Eric Jin - Implement paper 1,
- Jointly - Combine the functions, method evaluation, and complete the report