Project Proposal

Topic to be explored:
Identifying fog and estimating fog density in images.

Topic description:

Fog is a common natural occurrence, especially here, in St. John's, and often affects the visibility of the environment. This topic delves into the development of a program using image processing techniques to identify the presence of fog in images and accurately estimate the fog density.

Potential reading material:

Y. Jiang, C. Sun, Y. Zhao and L. Yang, "Fog Density Estimation and Image Defogging Based on Surrogate Modeling for Optical Depth," in IEEE Transactions on Image Processing, vol. 26, no. 7, pp. 3397-3409, July 2017, doi: 10.1109/TIP.2017.2700720.

A. S. Parihar, Y. K. Gupta, Y. Singodia, V. Singh and K. Singh, "A Comparative Study of Image Dehazing Algorithms," 2020 5th International Conference on Communication and Electronics Systems (ICCES), Coimbatore, India, 2020, pp. 766-771, doi: 10.1109/ICCES48766.2020.9138037.

Guo, Hong, Xiaochun Wang, and Hongjun Li. 2022. "Density Estimation of Fog in Image Based on Dark Channel Prior" *Atmosphere* 13, no. 5: 710. https://doi.org/10.3390/atmos13050710

Szeliski, Richard. "10 Computational Photography." Essay. In *Computer Vision Algorithms and Applications*, 409-461. London, EN: Springer, 2011.

Implementation and testing details:

This project aims at learning how to develop programs that can identify items in images fed to it. Given that this is a one-person project, it was advised that the items to be identified should be limited to one. Estimating fog density will allow for in-depth image processing exploration. I also intended to try to incorporate some machine learning into my study.

I will be using data sets with images and measurements of fog density to test my program. I also found testing methods such as Mean Absolute Error (MAE), Structural Similarity Index (SSI), and Peak Signal-to-Noise Ratio (PSNR) commonly used to determine the accuracy of estimates.

The extra material that might be needed for this project might include a camera and a machine-learning course. I will be taking the course to experiment with increasing the reliability of my program. The focus will however be on image processing and fog detection.

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