Mobile Haze Removal Application

Holly Chiang, Yifan Ge

Motivation

In recent years, pollution has been an increasing public concern, especially in developing countries such as China and India. In 2013, China's hyperactive microblogs logged 2.5 m posts on "smog" in a single month. In this project, we implemented a haze removal application on various platforms. Our hope is to bring awareness as to the effects of air pollution.

Related Work

After researching existing implementations, we narrowed it down to two different approaches:

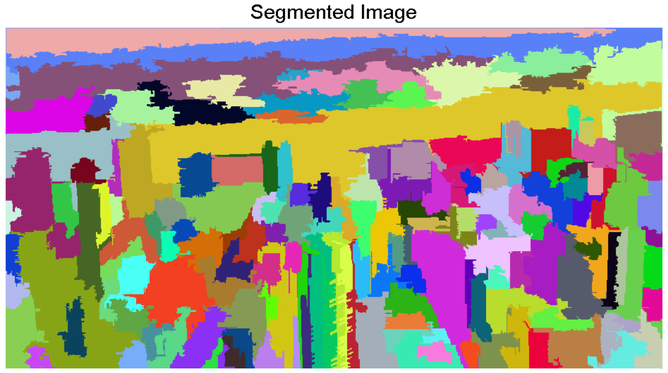
- Calculate the transmission using the intensity of the dark channels[1]
- Dark pixel detection through segmentation and linear fitting [2]

We chose to go with the second approach as we intended to implement the program on a mobile application, and due to limited computing power, speed and efficiency were our main criteria for algorithm selection.

Original Image

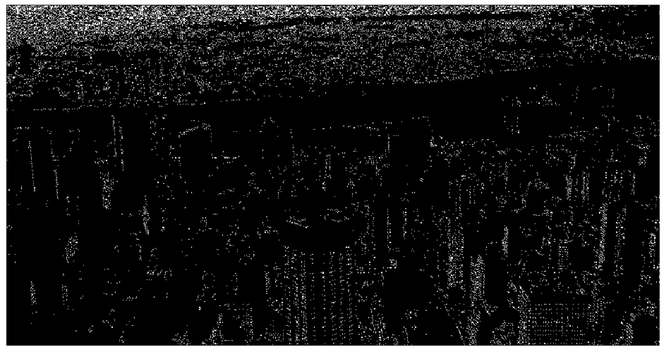
Dark Map

Segmented Image

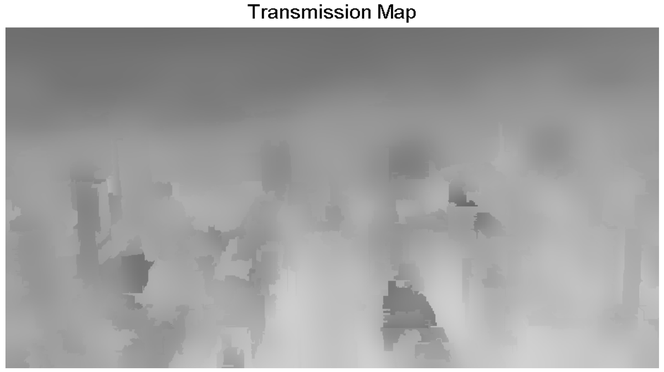


White Balanced Image

Dark Pixels Image



Transmission Map



Dehazed Image

Algorithm

$$I(x) = R(x)t(x) + A(1 - t(x))$$

$$(C_b - 128)^2 + (C_r - 128)^2 < \theta$$

$$t(x) = 1 - \frac{min_{r,g,b}\{I(x) - R(x)t(x)\}}{A^c}$$

$$\approx 1 - \frac{min_{r,g,b}I(x)}{A^c}$$

$$t = ax + by + c$$

$$R(x) = A - \frac{A - I(x)}{max\{t(x), t_0\}}$$

Implementation

We first implemented the program in Matlab. We later reimplemented the application in C++/OpenCV and ran it on an Android phone

Results

Our results are shown in the images to the left. The implementation from the Yu paper is shown in the bottom right. Our implementation performs better with respect to oversaturation.

References

[1] He, K., Sun, J., & Tang, X. (2011). Single image haze removal using dark channel prior. Pattern Analysis and Machine Intelligence, IEEE Transactions on, 33(12), 2341-2353.
[2] Yu, Q., Ding, Z., Rong, R., Zhang, Z., & Wang, D. (2011). Dark Pixel Detection: A Novel Single Image Dehaze Approach. IVCNZ.

Computer Science Department
353 Serra Mall
Stanford University
Stanford, CA 94305-9025, USA