Image Dehazing

GROUP - 6

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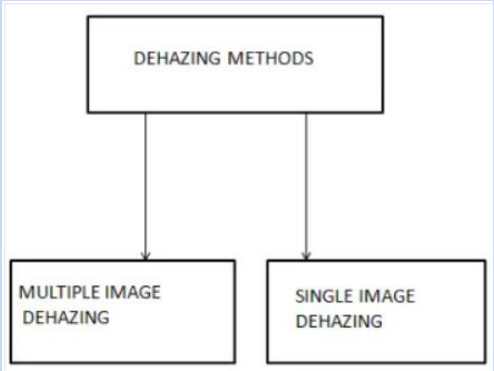
Project Description

- Image dehazing is a well-known ill-posed problem, which usually requires some image priors to make the problem well-posed. Single image dehazing aims to estimate a haze-free image from a hazy image. It is a classical image processing problem, which has been an active research topic in the vision and graphics communities within the last decade.

- As numerous real-world tasks (e.g., traffic detection and environmental monitoring) require high-quality images, and the hazy environment usually leads to deprecated images, it is of great interest to develop an effective algorithm to recover haze-free images.



DEHAZING

- A physical degradation process known as the atmospheric scattering model has been widely applied in many dehaze works. In this manner, the Contextual Regularization based image dehazing is proposed.
- A method for recovering a haze-free image given a single photograph as an input.

METHODOLOGY

- Atmospheric light estimation
- IMAGING MODEL AND PROBLEM CONSTRAINTS

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

- Transmission Map Estimation
- Scene Radiance Recovery

$$J(x) = \frac{I(x) - A}{[max\ (t(x), \varepsilon)]\delta} + A$$

Atmospheric Light Estimation

We first pick up the top 0.1% brightest pixels in the dark channel, and then select the one with the highest intensity as the estimate of A.

The following method produces a similar result but performs more efficiently.

The method begins with filtering each color channel of an input image by a minimum filter with a moving window.

Then the maximum value of each color channel is taken as the estimate of the component of A.

Estimation of Scene Transmission

Dehazing an image requires to estimate an appropriate transmission function t(x) and the global atmospheric light A.

$$t^* = \mathcal{F}^{-1}\left(\frac{\frac{\lambda}{\beta}\mathcal{F}\left(\hat{t}\right) + \sum_{j\in\omega}\overline{\mathcal{F}\left(D_j\right)} \circ \mathcal{F}\left(u_j\right)}{\frac{\lambda}{\beta} + \sum_{j\in\omega}\overline{\mathcal{F}\left(D_j\right)} \circ \mathcal{F}\left(D_j\right)}\right),$$

where F(·) is the Fourier transform and F−1(·) is its inverse transform, (·) represents the complex conjugate, and ◦ denotes the element-wise multiplication. The division is also performed in an element-wise manner.λ is the regularization parameter, β is the medium extinction coefficient, uj is the auxiliary variable, Dj is a first-order differential operator

Current Status of the Project

Currently we are working on a dataset of an image with dimensions 640 x 963 pixels. We selected the image from the dataset and produced dehazed versions of the image using Boundary Constraint and Contextual Regularization.

Original Image

Dehazed Image

Dataset

The Dataset used for this project consist of images of both jpg and png formats.

Dataset

Base Papers / Demo Code

Paper 1 :
Base paper 1

Github :
GitHubLink

Paper 2 :
Base paper 2

Results Obtained :
ResultsLink

The web-link given below provides the rough work, statistics and information regarding the current status of our project. The dataset are also included.

ImageDehazingReportLink

References

- Dana Berman, Tali Treibitz, and Shai Avidan. Non-local Image Dehazing. In CVPR, pages 1628–1636, 2016.
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Thank You!