Single Image Atmospheric Veil Removal Using New Priors

N° 1434

Alexandra Duminil, Jean-Philippe Tarel, Roland Brémond

Université Gustave Eiffel, France

Introduction

Visibility restoration of outdoor images is a well-known problem in both computer vision applications and digital photography, particularly in **adverse weather conditions** such as **fog.**

Such weather conditions cause **visual artifacts : loss of contrast, color shift**, … which contributes to **reduce scene visibility**. With fog, contrast reduction is caused by the **atmospheric veil.**

Objective

Image dehazing goal :
obtain an image as close as possible to the corresponding image **without degraded conditions.**

Contributions

- The use of **Naka-Rushton** function in the inference of the atmospheric veil
- **Generalizing** to different kind of fog.
- The ability to **restore** images with **color disortions** such as **nighttime** images.

Approach

➢ Koschmieder's law

$$I = I_0\, t - Is(1 - t)$$

I_s : sky intensity

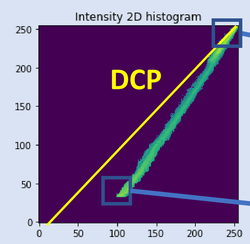
$t = e^{-kd}$: transmission map

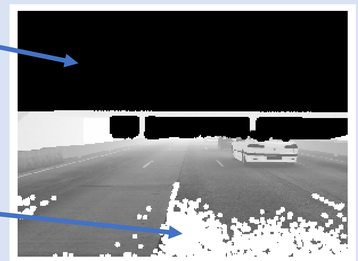
Foggy image | Image without fog | Veil

➢ Reinterpretation of the DCP method

$$t(x) = 1 - \omega\,(\frac{pre-veil}{I_s})$$

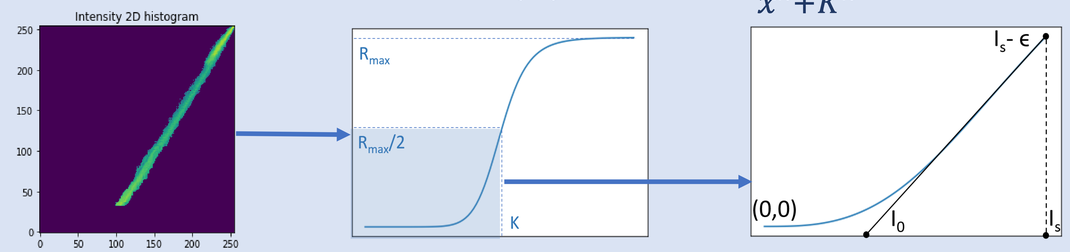
Reinterpretation of the constant **ω** as a **smooth modulation function**



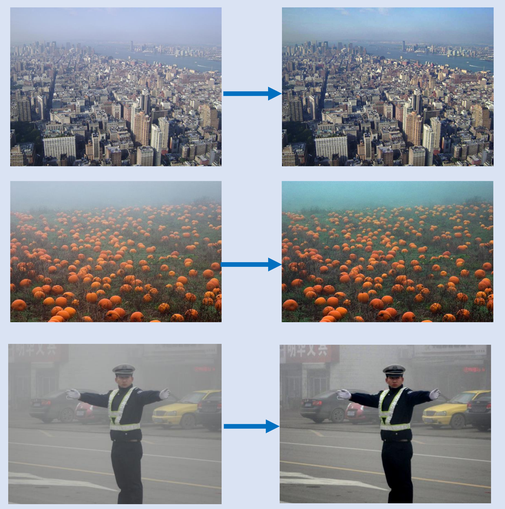


➢ The Naka-Rushton model

$$R(x) = Rmax\,\frac{x^n}{x^n + K^n} + b$$



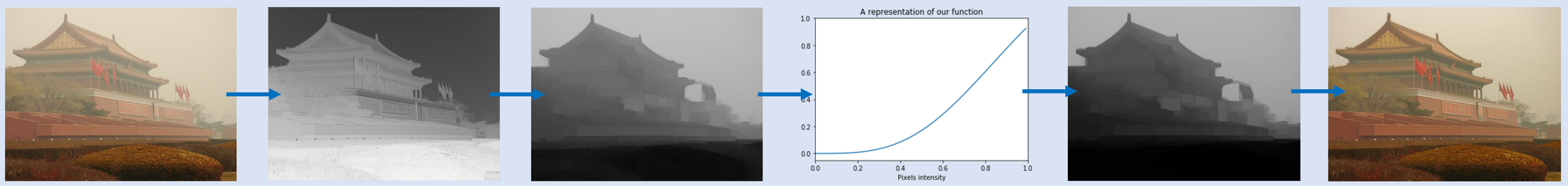
Results



Conclusion

- The proposed method is able to **generalizing** to different kinds of **fog with natural rendering**
- It can be extended to nighttime images.
- For more information :

Algorithm Flowchart



Input foggy image | One channel | Pre-veil | Parameters estimation | Veil | Restored image