Enhancement and Noise Reduction of Very Low Light Level Images

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Introduction

What we do

In this work, by applying an improved and effective image de-haze algorithm to the inverted input image, the intensity can be amplified so that the dark areas become bright and the contrast get enhanced. Then, the joint-bilateral filter with the original green component as the edge image is introduced to suppress the noise. I just validate the performace of Enhancement of low-light level image. But still some bugs remained.

Algorithms

In the propose of making result looks like one acuqired in haze, we invert the input low light image as follows:

$$I^c(x) = 255 - L^c(x) \tag{1}$$

For hazy image, the mathematic model as follows is widely used:

$$I(x) = J(x)t(x) + A(1 - t(x)) \tag{2}$$

To retore J from I, it is necessary to estimate the corresponding intensities of t and A.

Algorithms

$$J^{dark}(x) = \min_{c \in \{r,g,b\}} \left(\min_{y \in \Omega(x)} \left(J^c(y) \right) \right) \tag{3}$$

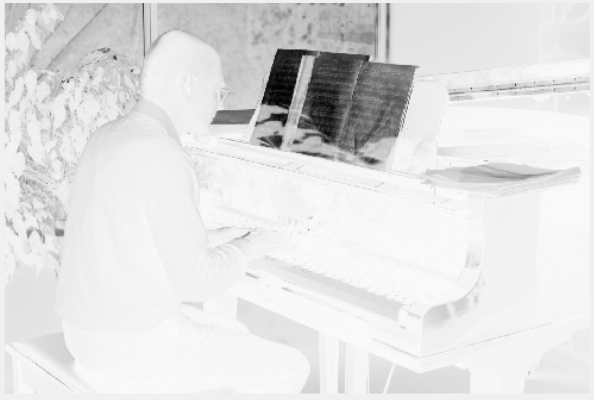
$$Y = 0.299 \times R + 0.587 \times G + 0.114 \times B \tag{4}$$

$$\hat{t}(x) = 1 - \omega \, Y(x)/255 \tag{5}$$

$$t(x) = \text{ meanfilter } (\hat{t}(x)) \tag{6}$$

$$J(x) = \frac{I(x) - A}{\max\left(t(x), t_0\right)} + A \tag{7}$$

Experiments



Further

Ongoing Optimization

- more general method
- Estimating a new Transmittance