CmpE362 Project : Low-Light Image Enhancement

Ömer Şahin Albayram / 2021400303

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1 Introduction

I tried to implement a fast algorithm for low-light enhancement from this article[1]. Which focuses on de-haze algorithm to low-light enhancement.

2 Idea Behind of Algorithm

Since some of de-haze algorithms work prety well, authors of article find the way to apply one of those algorithm to low-light images.

2.1 Mathematics Behind of Algorithm

$$R^c(x) = 255 - I^c(x)$$

c is color channel (RGB) of images. I is intensity of image and R is same intensity in reverted.

Since idea behind algorithm acts low-light image as a hazed image, we need to check for hazed image formula for it from [2].

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

J is the intensity of the original objects or scene. t is for percentage of light emitted from object. A is for global atmospheric light.

$$t(x) = 1 - w * \min_{c \epsilon R,G,B} (\min_{y \epsilon \Omega(x)} \left(\frac{R^c(y)}{A^c} \right))$$

Where $w = 0.8$ and $\Omega(x)$ is a block which is centered by pixel x and block size is 9.

We choose A as highest pixel whose sum of RGB values is largest among 100 pixels minimum intensities in all color.

$$J(x) = \frac{R(x) - A}{P(x)t(x)} - A$$

$P(x)$ is multiplier which is $2t(x)$ when $0 \leq t \leq 0.5$ else 1.

2.2 Theory and result I got

Matlab has "imlocalbrighten" function for this enhancement algorithm and also I tried to implement this algorithm. The results of both implementations are given below.

Figure 1: Test image.

Figure 2: Result of function "imlocalbrighten" .

Figure 3: My implementation steps and results.

2.3 Results

Although I got a darker image than test image, I believe that my implementation is almost correct. Even though I believe that I failed about choosing minimum pixel during calculation of t(x), I could

not figure out where I failed exactly

3 References

[1] Dong, X., G. Wang, Y. Pang, W. Li, J. Wen, W. Meng, and Y. Lu. "Fast efficient algorithm for enhancement of low lighting video." Proceedings of IEEE® International Conference on Multimedia and Expo (ICME). 2011, pp. 1–6.

[2] K. He, J. Sun, and X. Tang. "Single Image Haze Removal Using Dark Channel Prior," in Proc. IEEE Conf. Computer Vision and Pattern Recognition., Miami, FL, Jun. 2009, pp. 1956-1963.