ILLUMINATION CORRECTION ON FACE IMAGE

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Abstract—Many digital images suffer from poor illumination at the peripheries, often attributable to factors related to the light path between the camera and the microscope. So blur image will be found. A commonly used method for correcting this has been to use the illumination of an empty field as a correction filter (white shading correction). Different lighting condition affects the outputs. So it will become necessary to correct them to get appropriate output. In this paper we used RGB image and convert into HSI. Then perform HSI based color image equalization process using Iterative nth Root and nth Power. The iterative proposed method for equalization is based on achieving a normalized image with mean of 0.5 in R, G and B channels.

Keywords – Local motion-blur; complex background; physical method; image restoration, color image equalization

I. INTRODUCTION

The goal of illumination correction is to remove uneven illumination of the image caused by sensor defaults, non-uniform illumination of the scene, or orientation of the objects surface. Illumination correction is based on background subtraction. This type of correction assumes the scene is composed of a homogeneous background and relatively small objects brighter or darker than the background. There are two major types of background subtraction techniques depending on whether the illumination model of the images can be given as additional images or not:

1. Prospective correction,
2. Retrospective correction.

A. Prospective correction:

It uses additional images obtained at the time of image capture. Two types of additional images can be used:

A dark image is an image of the scene background acquired with no light.
A bright image is an image of the scene background acquired with light but without objects.

\[
\text{Dark} = \sum \text{dark}_i \\
\text{Bright} = \sum \text{bright}_i
\]

B. Correction from a Bright Image

If only the bright image is available, the method uses division of the source image by the bright image if the image acquisition device is linear, or the subtraction of the source image with the bright if the acquisition device is logarithmic with a gamma of 1.

II. METHODOLOGY

A. Image Uneven Illumination Correction Principles:

Improved HSV Color Space Transform: The areas covered by thin clouds show no distinct feature in Red-Green-Blue (RGB) color space. In order to use the characteristics such as high brightness, low
saturation and contrast [3], the uneven illumination correction processing is performed in HSV color space. HSV color space is based on a mechanism of human visual model, which uses hue, saturation, and value for color representation. Various color space models can be obtained under different coordinate systems, i.e., sphere model, cylindrical model, hex cone model, cone model, double-cone model, etc. [3]. In this paper, we adopt the HSV cone model. The axial direction of the cone model indicates the value component. The vertical axis indicates color from white to black. The radial direction of any horizontal circle section indicates the saturation component. The circumference’s angle of the circle section indicates the hue component. The transform equations from RGB color space to HSV color space.

Different lighting condition affects the outputs. So it will become necessary to correct them to get appropriate output. In this we used HSI Based Color Image Equalization using Iterative nth Root and nth Power. The iterative proposed method for equalization is based on achieving a normalized image with mean of 0.5 in R, G and B channels.

Mean value represents the average brightness of all pixels in the whole image.
HSI to RGB Conversation

\[ m = \text{Mean of R channel} \]

\[ \text{Abs}(m-0.5) > 0.17 \]

\[ m < 0.5 \]

\[ R = R^{(1-m)} \]

\[ R = R^{1/(1-m)} \]

HSI to RGB Conversation

\[ m = \text{Mean of G channel} \]

\[ \text{Abs}(m-0.5) > 0.17 \]

\[ m < 0.5 \]

\[ G = G^{(1-m)} \]

\[ G = G^{1/(1-m)} \]

\[ m = \text{Mean of B channel} \]

Continue
Following is the mathematical relationship between RGB space to HSI space (hue, saturation, and intensity: HSI color space):

\[ I = \frac{R + G + B}{3} \]

The more practical equation should also include the correction of mean gray level value is abs \( m - 0.5 \)

The next modification of the last equation includes the red, green and blue (R, G, B) channel image. The RGB correction should be performed for each channel separately in the simplest case. To maintain the mean luminosity of each channel in corrected image, the mean value of each channel should be considered. The total mean image value \( \mu_{RGB} \) is computed as a sum of the mean values from red, green and blue channel:

\[ \mu_{RGB} = \mu_R + \mu_G + \mu_B \]

### III. RESULT

Here we took one color image as an input as shown in fig 2. We demonstrate the effectiveness of this method. The tasks required to achieve this effect do not require excessive computer processing and were achieved in less than a minute.
IV. CONCLUSION

In this paper, we proposed an automatic illumination correction for RGB images that does not rely on strong assumptions about the true signal. The method draws on ideas from the mean intensity inhomogeneity correction method; however, it uses a different strategy for identifying image gradients due to non-uniform illumination that is more suitable for RGB images. Furthermore, we proposed an energy function with a closed-form solution that can be computed very fast.

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