Project 1

Computer Vision | [asj170430@utdallas.edu](mailto:asj170430@utdallas.edu)

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Problem 1:

Problem 1: Write a program that gets as input a color image, performs linear scaling in the Luv domain, and writes the scaled image as output. Pixel values outside the window should not be changed. Only pixels within the window should be changed. The scaling in Luv should stretch only the luminance values. You are asked to apply linear scaling that would map the smallest L value in the specified window to 0, and the largest L value in the specified window to 100.

Description:

Input image is first converted into non-linear RGB by dividing by 255, so as to make all components range values from 0-1. Non-linear rgb is converted into linear RGB using inv gamma correlation. Then linear rgb is converted to XYZ using linear transformation and then converted in Luv. We assumed D65 so as to make Xw, Yw, Zw values as 095, 1.0, 1.09 respectively. Linear scaling is performed in Luv domain. All value greater than Lmax, are marked 100 and values lesser than Lmin are marked 1. The output is the converted back from Luv to XYZ and then linear RBG – nonlinear RGB and then sRGB values to display the output.

Screenshots:

Problem 2:

Write a program that gets as input a color image, performs histogram equalization in the Luv domain, and writes the scaled image as output. Histogram equalization in Luv is applied to the luminance values, as computed in the specified window. It requires a discretization step, where the real-valued L is discretized into 101 values. As in the first program pixel values outside the window should not be changed. Only pixels within the window should be changed.

Description

Input image is first converted into non-linear RGB by dividing by 255, so as to make all components range values from 0-1. Non-linear rgb is converted into linear RGB using inv gamma correlation. Then linear rgb is converted to XYZ using linear transformation and then converted in Luv. This is where Histogram equalization is applied. Range of values are assumed to be 101 (K=101). All values greater than 100 are rounded to 100.

Problem 3:

This is the same as the first program, except that the scaling is to be performed in the xyY domain. The scaling should stretch only the luminance (Y) values. In the specified window perform linear scaling that would map the smallest Y value to 0 and the largest Y value to 1.

Description:

Input image is first converted into non-linear RGB by dividing by 255, so as to make all components range values from 0-1. Non-linear rgb is converted into linear RGB using inv gamma correlation. Then linear rgb is converted to XYZ using linear transformation. Then XYZ is converted into xyY domain using

*def XYZ\_xyY(X, Y, Z):*

*if X+Y+Z != 0:*

*x = X / (X + Y + Z)*

*y = Y / (X + Y + Z)*

*return (x, y, Y)*

*else:*

*return 0,0,0*

Similar to problem 1, linear scaling is applied in xyY domain and results are generated.