Department of Informatics

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A2023 Image Processing

Assignment 3

Deadline: Tuesday, October 17, 2023 (end of day)

Objective

In this assignment we ask you to write and apply histogram equalization on greyscale images and color images. You will compare the histogram equalization applied to different color representations. To achieve this goal, color conversions will be needed. All methods will be implemented by yourself.

Task: Histogram equalization

This exercise is composed of three parts.

1. Colors separation and reconstruction

(a) Use an existing library to separate the three channels of your RGB image and show each of them separately.

(b) Write your own algorithm to separate an RGB image into the three channels of the HSL color space (H, S, L). See https://www.rapidtables.com/convert/color/rgb-to-hsl.html

(c) Write your own algorithm to reconstruct an RGB image from the H, S, L channels. See https://www.rapidtables.com/convert/color/hsl-to-rgb.html

2. Greyscale Histogram Equalization

(a) Write your own histogram equalization algorithm based on the method presented in the lecture.

(b) Apply your algorithm on the greyscale images provided on ILIAS.

3. Color Histogram Equalization

(a) Firstly, apply your histogram equalization algorithm on the R, G, and B channels and reconstruct your image.

(b) Secondly, apply the histogram equalization on the L channel of your HSL image and reconstruct your image with the new L channel and the original H and S channels. Convert the result on an RGB image.

(c) Visually compare the result of the two images after equalizing the histograms (RGB and HSL). What can you observe?

Hand-in

Submit on ILIAS **four files**:

- A greyscale image after applying your histogram equalization algorithm.
- An RGB and a HSL image after applying your histogram equalization algorithm.
- A text file with your name, surname, the link to your GitHub and a brief description of your algorithms (HSL to RGB and RGB to HSL conversion, histogram equalization) and the response to the question 3. c).

Please take these conditions into account, otherwise your exercise may not be evaluated. If you have any questions you can contact me via email.