Digital Image Processing(04/13/2016)

HOMEWORK ASSIGNMENT #4

RealSense

Due Date: 11:59am on 05/03/2016

Please read the submission guideline (posted on the class website) carefully before getting started.

All images in this homework can be downloaded from our class website: https://ceiba.ntu.edu.tw/1042DIP. Images are in the raw file format. The size of each image is listed in the appendix.

For MATLAB users, you are **NOT** allowed to use the MATLAB Image Processing toolbox except the imshow() and image() functions.

DEPTH MEASUREMENT EVALUATION OF YOUR REALSENSE CAMERA:

Use the white box of the RealSense to estimate the noise of the depth images acquired by your RealSense camera in the following way:

(a) Capture 300 depth images of the white box and crop each image so that each cropped image contains only the white box, as shown in Figure 1.

(b) Calculate the standard deviation for every pixel of each cropped depth image and save it as a 2D array of positive real numbers.

(c) Compute the mean and variance of the 2D array of standard deviation.

(d) Quantize the 2D array of standard deviation and save it as an 8-bit grayscale image so that its value of 255 corresponding to the max standard deviation.

(e) Enhance the above image with histogram equalization and display the image before and after the enhancement as shown in Figures 2 and 3.

(f) Plot the histograms before and after the histogram equalization as shown in Figures 4 and 5.

Repeat the steps for four distances between the camera and the white box (more precisely, for distance of 200, 300, 500, and 800 mm). For each distance, please show the followings in the report:

(1) The mean and variance of the 2D array of standard deviation.

(2) The max standard deviation for quantization.

(3) The grayscale standard deviation image and equalized grayscale standard deviation image as shown in Figures 2 and 3.

(4) The histograms before and after the histogram equalization as shown in Figures 4 and 5.

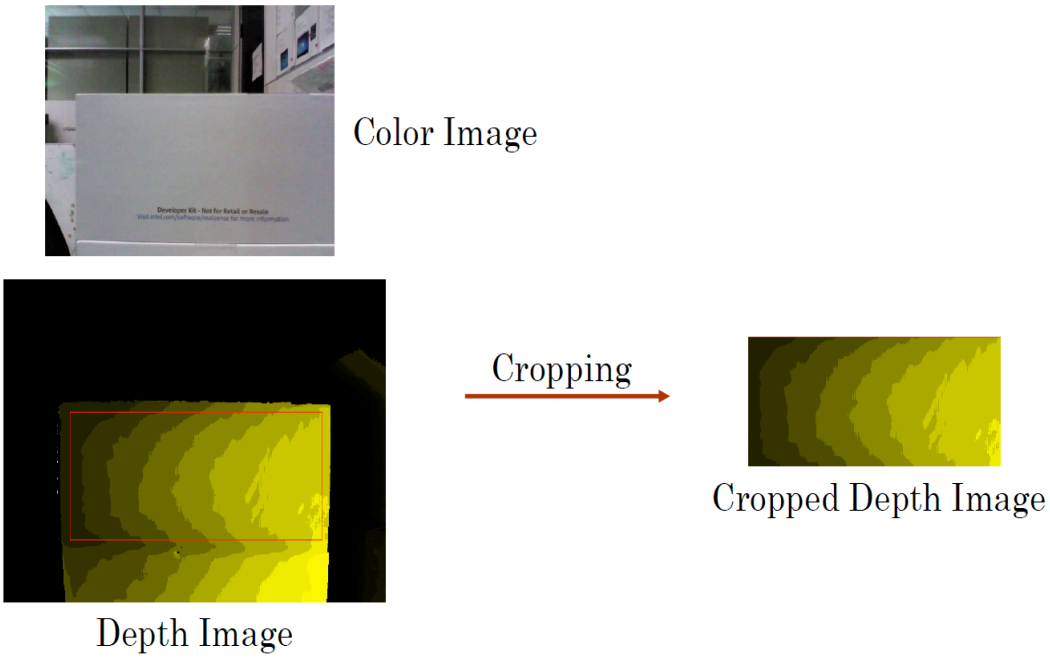

Figure 1

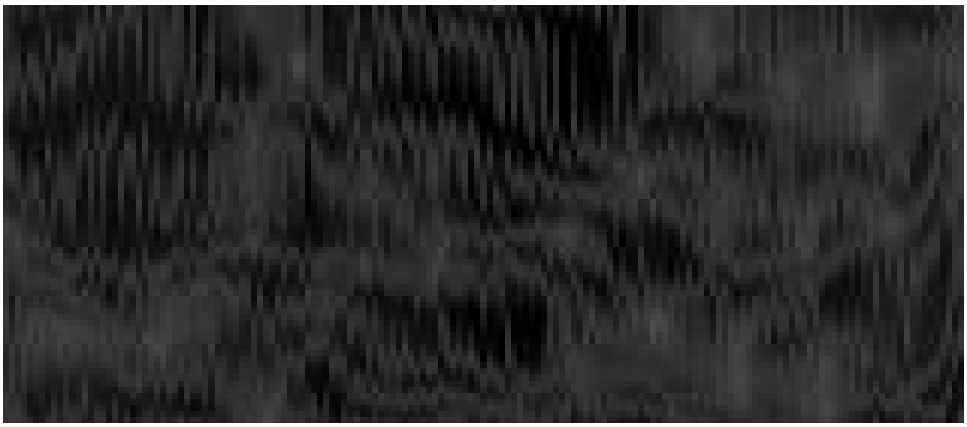

Figure 2: Grayscale Standard Deviation Image

Figure 3: Equalized Grayscale Standard Deviation Image

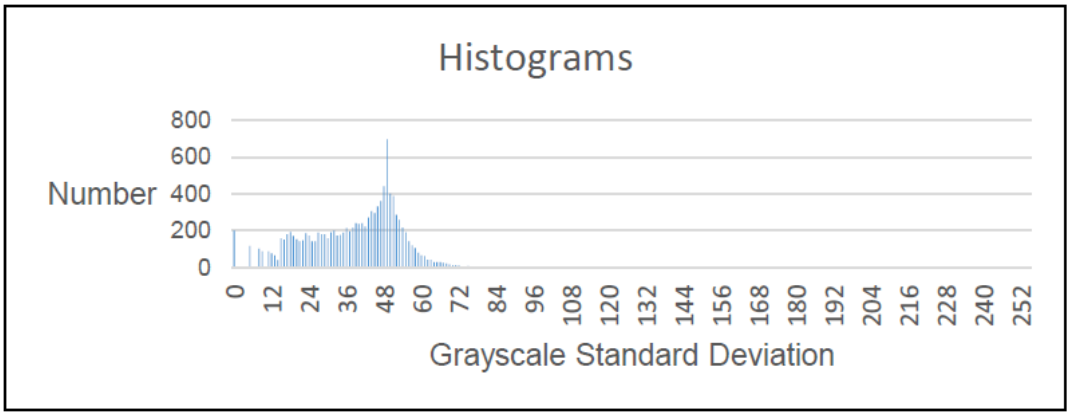

Figure 4

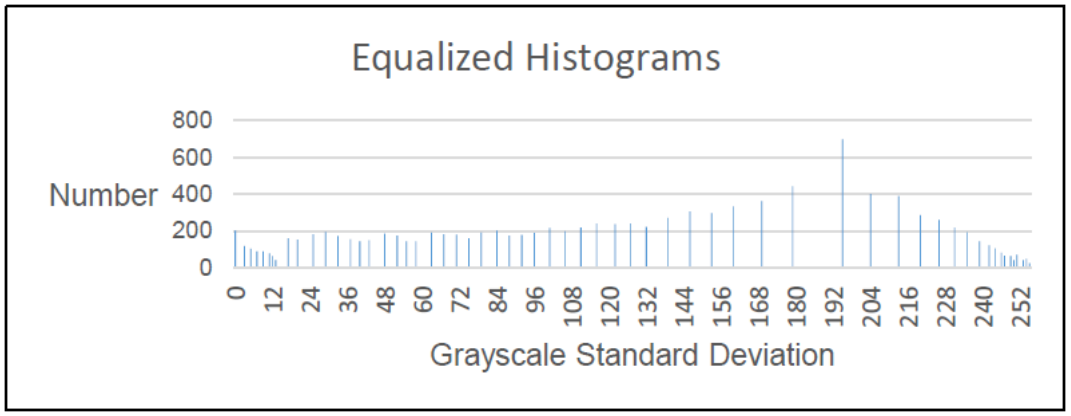

Figure 5