

CSC317 Visual Programming Homework Assignment #1

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1. Camera Model – If the focal length of a single-lens camera is 0.5 meter, the object has a height of 2 meters and the width of 1 meter. When the object is 10 meters away from the central projection point of the camera, what are the dimensions of the image?

$X=1, Y=2, Z=10, f=0.5$

$u = (.5)(1)/(10)+(.5) = 0.05$

$v = (.5)(2)/(10)+(.5) = 0.1$

$= (0.05, 0.1)$

2. Histogram Stretching – If the image has the greylevel values as {8, 2, 7, 9, 9, 6, 10, 7, 5, 5}, what is the result of Histogram Stretching if we need to expand the range of the greylevel values to the range of 1-20?

$\{2,5,5,6,7,7,8,9,9,10\}$

$Y = (19/8)(x-2)+1$

2 -> 1

5-> 8

6-> 11

7-> 13

8-> 15

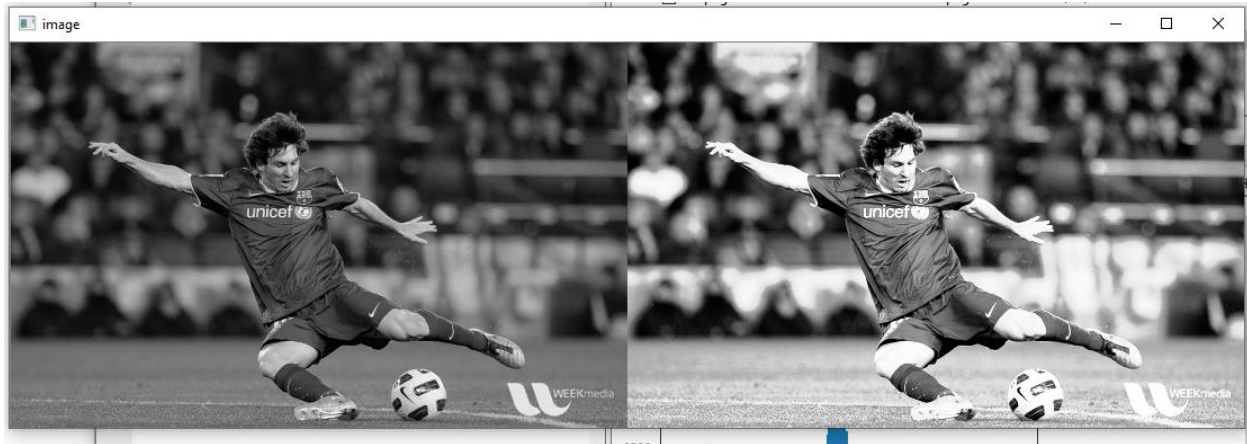
9-> 18

10-> 20

$\{1,8,8,11,13,13,15,18,18,20\}$

3. Programming OpenCV – (a) Find an image of your own choice and use the OpenCV to generate the histogram, (b) Apply the principle of Histogram Equalization, (c) Display the image after Histogram Equalization, (d) What does Histogram Equalization do to the original image?

d.) Histogram Equalization changes the contrast of an image; in this case the contrast intensities were better distributed on the histogram. This was accomplished by running a python program that effectively spread out the most frequent intensity values.



Spyder (Python 3.7)

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Editor - C:\Users\Caity\Desktop\WCU DOCUMENTS\WCU FALL 2019\CSC 317 VISU... File explorer

histogramPlot.py

```
1 #-*- coding: utf-8 -*-
2 """
3 Created on Wed Oct 2 11:02:24 2019
4
5 @author: Caity
6 """
7
8 import cv2
9 import numpy as np
10 from matplotlib import pyplot as plt
11
12 #read a image using imread
13 img = cv2.imread('../0-data/messi5.jpg', 0)
14 cv2.imshow('image',img)
15
16 plt.hist(img.ravel(), 256, [0,256]); plt.show()
17 equ = cv2.equalizeHist(img)
18 res = np.hstack((img, equ))
19 cv2.imshow('image', res)
20
21
22 cv2.waitKey(0)
23
```

Name	Size	Type	Date Modified
messi5.jpg	71 KB	jpg File	8/28/2019 8:39 PM
ml.png	79 KB	png File	8/28/2019 8:39 PM
notes.png	14 KB	png File	8/28/2019 8:39 PM
opencv-logo-white.png	7 KB	png File	8/28/2019 8:39 PM
opencv-logo.png	24 KB	png File	8/28/2019 8:39 PM
orange.jpg	48 KB	jpg File	8/28/2019 8:39 PM
pca_test1.ipa	32 KB	ipa File	8/28/2019 8:39 PM

Variable explorer File explorer Help

IPython console

Console 7/A

Python 3.7.3 (default, Apr 24 2019, 15:29:51) [MSC v.1915 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 7.6.1 -- An enhanced Interactive Python.

In [1]: runfile('C:/Users/Caity/Desktop/WCU DOCUMENTS/WCU FALL 2019/CSC 317 VISUAL PROGRAMMING/Images/0-data/histogramPlot.py', wdir='C:/Users/Caity/Desktop/WCU DOCUMENTS/WCU FALL 2019/CSC 317 VISUAL PROGRAMMING/Images/0-data')

Permissions: RW End-of-lines: CRLF Encoding: UTF-8 Line: 20 Column: 1 Memory: 87 %

11:19 AM 10/2/2019