ECE637 Lab report 4
Pointwise Operations and Gamma

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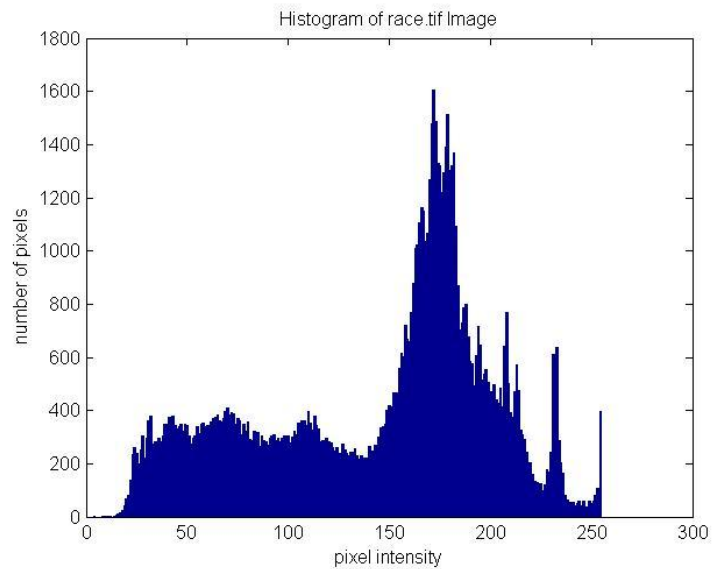# Section 1. Histogram of an Image

Figure 1.1 Histogram of race.tif
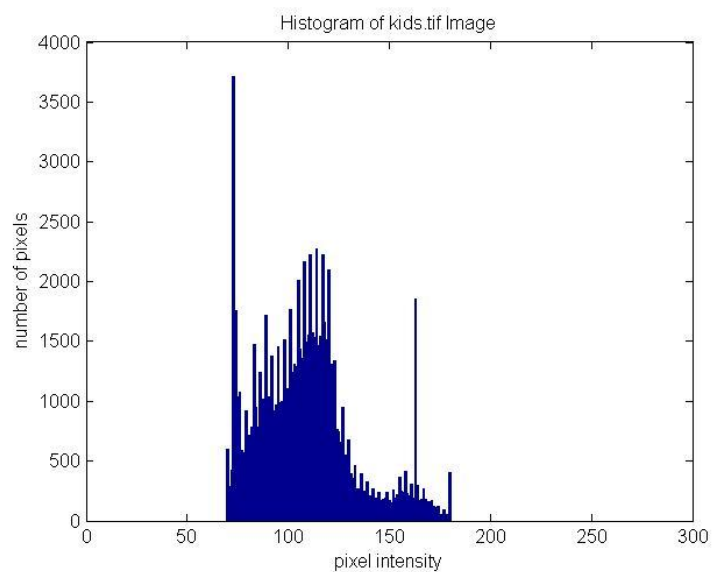

Figure 1.2 Histogram of kids.tif

Section 2. Histogram Equalization

Part 1. function equalize.m.

```
function [Y] = equalize(X)

L = 256;
H = hist(X(:),[0:255]);
```

```matlab
total = sum(H);
Fx = zeros(1,L);
Z = zeros(1,L);
for i = 1:1:L
    Fx(i) = sum(H(1:i))/total;
end
clf;
figure(1)
plot(Fx);
title('CDF of the image');
xlabel('intensity');

Ymax = max(Fx);
Ymin = min(Fx);
Z = (L-1)*(Fx - Ymin)/(Ymax-Ymin);
[m n] = size(X);

Y = zeros(m,n,'uint8');

for i = 1:1:m
    for j = 1:1:n
    Y(i,j) = Z(X(i,j));
    end
end
road = 'E:\2016spring\ECE637\lab4\equalized_kids.jpg';
imwrite(Y,road);
```

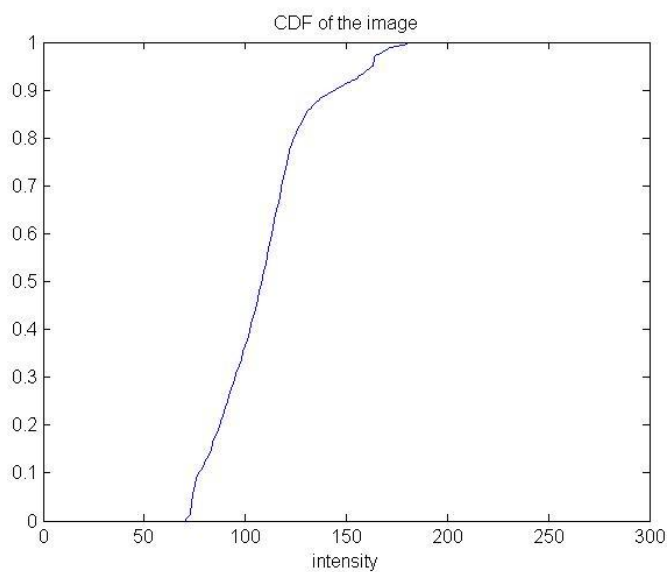## Part 2. a labeled plot of Fˆ x(i) for the image kids.tif

Figure 2.1 Fˆ x(i) for the image kids.tif

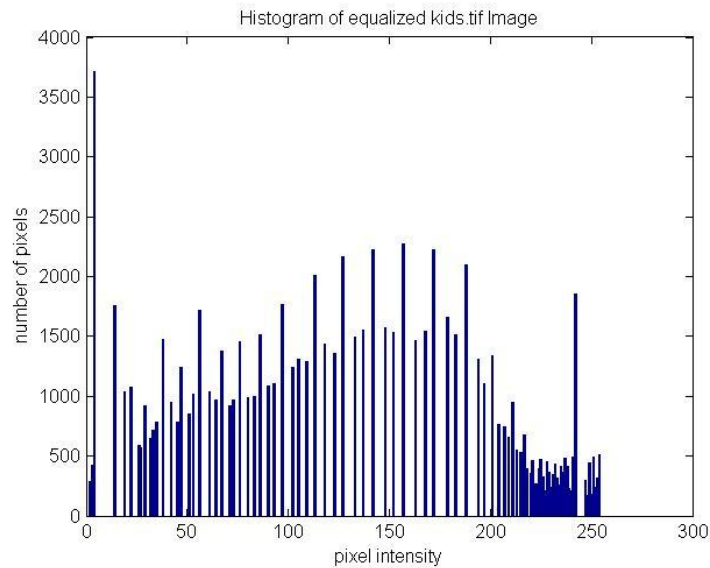# Part 3. a labeled plot of the of the equalized image's histogram.

Figure 2.2 the equalized image's histogram.

Part 4. the equalized image.

Figure 2.3 the equalized image.

Section 3. Contrast Stretching

Part 1. Code for stretch

```
function output = stretch(input,T1,T2)

map = zeros(1,256);
```

```
map(T2:end) = 255;
[m n] = size(input);
output = zeros(m,n,'uint8');
for i = T1:1:T2
    map(i) = 255*(i-T1)/(T2-T1);
end
for k = 1:1:m
    for j = 1:1:n
        output(k,j) = round(map(input(k,j)));
    end
end
road = 'E:\2016spring\ECE637\lab4\stretched_kids.jpg';
imwrite(output,road)
```

Part 2. the transformed image and its histogram
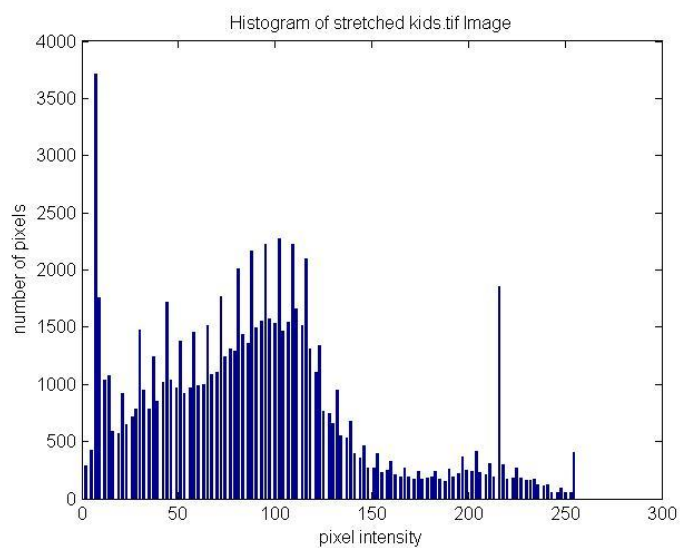

Figure 3.1 the transformed image.

Figure 3.2 the transformed image's histogram.

Section 4. Gamma (γ)

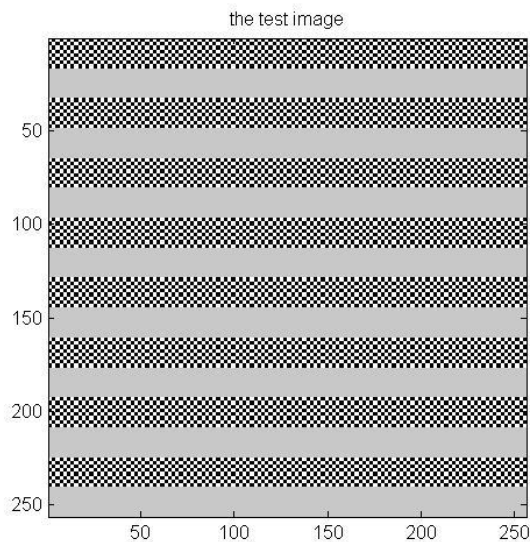# Part 2. Determining the Gamma of Your Computer Monitor

My gray level = 200.

the test image

Figure 4.1 gray level image

Procedures:

First we know that $I_g = I_c$,through calculation we can have

$\dfrac{I_{255} + 0}{2} = I_{255}\left(\dfrac{g}{255}\right)^{\gamma}$, which gives the result as $\gamma = \dfrac{\log(\frac{1}{2})}{\log(\frac{g}{255})}$

Results: γ =2.85,g=200.

Part 3. Gamma Correction

For the linear.tif:

Use $\gamma = 2.85$ to correct the image.

The formula used in this part: $g = I_{255} \cdot \left(\dfrac{I_g}{255}\right)^{\frac{1}{2.85}}$

Figure 4.2 linear.tif original image and corrected image

For the gamma15.tif:

Use $\gamma = 2.85$ to correct the image.

The formulas used in this part:

Since the picture has already been corrected by 1.5, the first step is to

transfer it back:

$$I_g = I_{255}\left(\frac{g}{255}\right)^{1.5}$$

Next part, we choose γ=2.85 to correct the image.

$$g' = I_{255} \cdot \left(\frac{I_g}{255}\right)^{\frac{1}{2.85}}$$

gamma15 image

image (gamma = 2.85)

Figure 4.3 gamma15.tif original image and corrected image