

# CSC 249 Homework 1 Report

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## 1 Introduction

For this homework assignment, we were tasked with taking two pictures of an object under different lighting conditions and load them into MATLAB. Then, we had to perform some simple image manipulation on the files: Convert them to grayscale, zoom in on regions of the image, and save the results as files.

Lastly, we needed to examine the resulting images and analyze the results, interpreting the intensity values of the image patches. I created a histogram for my resulting images to aid with this interpretation.

I completed all parts of this homework, and I set my code up as a set of generalized functions that can be used on any image.

## 2 How to Run

### 2.1 Dependencies

All of my code requires the Image Processing Toolkit to be installed, a requirement I found reasonable given that it provides much of MATLAB's functionality related to image manipulation. If it is not installed, MATLAB will show an error indicating so.

### 2.2 Running the program

To start the program, please run `Homework01.m`. The program will load the images I have provided from the `Input` folder, and output the following into the `Output` folder:

- Black and white images
- Histograms for the black and white images
- Cropped regions
- Histograms for the cropped regions

### 3 Interpretation / Results

I took two pictures of a water bottle under daylight and nighttime lighting conditions. I've shown the black and white images below and the histograms for the images.



Figure 1: Image 01



Figure 2: Image 02

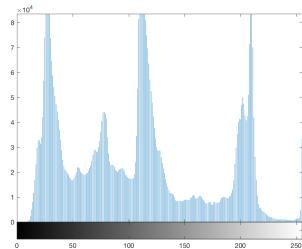


Figure 3: Image 01

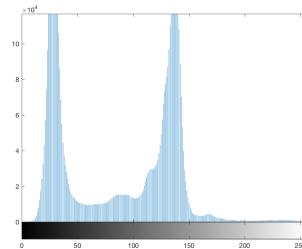


Figure 4: Image 02

The histogram curve is similar for both images, indicating that there might be some type of information about the object in question if you were looked at the distribution of colors. However, the nighttime image (Image 02) doesn't have the spike of colors on the brighter end of the daylight image.

#### 3.1 Zoomed Regions



Figure 5: Zoomed Region #1

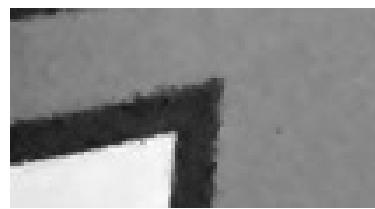


Figure 6: Zoomed Region #2

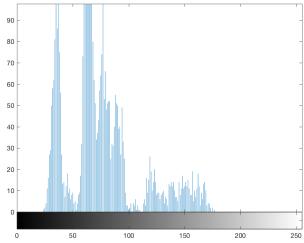


Figure 7: Region #1 Histogram

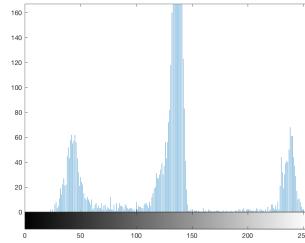


Figure 8: Region #2 Histogram

Above are the two image regions I chose. Image region #1 is from Image 1 and Image region #2 is from Image 2. I've also included the histograms for each images. You can see what the result of zooming the images in was; since there aren't enough pixels to sample from there is less detail available to examine. In the regions you can see individual pixels and there is very little detail.

Even though the intensity values are relatively similar, the regions come from different areas of different images. This demonstrates the potential difficulty in examining images using local details. Since we are looking very closely at the image on the level of individual pixels, the backgrounds of both images seem like a constant color despite being a part of a larger curved surface.

Another interesting observation from the histogram is that they have roughly the same profile with minor shifts in scale and position. This demonstrates the difficulty in using the intensity values for image recognition and refutes my earlier hypothesis that you could use that information to identify images. Overall, looking at the zoomed in regions shows the difficulty due to loss of information when you are only looking at a region of a sampled image. The regions could be interpreted as multiple things and only contain three main bands of values. This is a clear loss of information and context compared to the larger image.

## 4 Extra Credit

For extra credit, I generalized my black and white conversion function and other utility functions to run on any image. All of my functions are in their own files in the same directory as the main program.

## 5 Academic Honesty

I did not collaborate on this project and all work is my own.