**Kaitlyn Zahn**

*Assignment 1*

February 1, 2022

CS 8690

Computer Vision

Ye Duan

Youtube Video:

\*\* Youtube link in comments of submission. Did not publish to Youtube on time\*\*

Part I a: Grayscale Thresholding

*This program takes in a grayscale input image and threshold (between 0 and 255), displays the original image, and then binarizes the image based on the given threshold.*

Code:

Text

Description automatically generated

Part I b: Histogramming Images

*This program takes a grayscale input image and displays the histogram of the image.*

Code:

**

Part I Results:

A large building with many windows

Description automatically generated with low confidence

Building Input Image

Diagram, engineering drawing

Description automatically generated

Building Output Image, Threshold 50

A picture containing text, building, outdoor, apartment building

Description automatically generated

Building Output Image, Threshold 120

Diagram

Description automatically generated

Building Output Image, Threshold 200

Chart, histogram

Description automatically generated

Building Histogram

A picture containing text, building, outdoor, store

Description automatically generated

Roof Input Image

Engineering drawing

Description automatically generated with medium confidence

Roof Output Image, Threshold 50

A black and white image of a city

Description automatically generated with low confidence

Roof Output Image, Threshold 120

A picture containing night, dark, night sky

Description automatically generated

Roof Output Image, Threshold 200

Chart, histogram

Description automatically generated

Roof Histogram

Part II: Segmenting Images by K-Means Clustering

*This program takes an RGB or grayscale image as an input and applies k-mean clustering to segment the image based on the color of each pixel and the given k value.*

I was unable to get this function to implement successfully by hand, so comparisons are shown using the kmeans() function.

Code Using kmeans() function:

Text

Description automatically generated

A picture containing outdoor, building, apartment building

Description automatically generated

Original Input Image

*A picture containing engineering drawing

Description automatically generated*

KMeans() Function Output Image, k = 2

*A picture containing text, building, apartment building

Description automatically generated*

KMeans() Function Output Image, k = 3

*A picture containing building, outdoor, apartment building

Description automatically generated*

KMeans() Function Output Image, k = 7

Code by Hand:

*Text

Description automatically generated*

*Text

Description automatically generated*

*A picture containing text, outdoor, apartment building

Description automatically generated*

KMeans() By Hand Output Image, k = 3

*A large building with many windows

Description automatically generated with low confidence*

KMeans() By Hand Output Image, k = 5

*A large building with many windows

Description automatically generated with low confidence*

KMeans() By Hand Output Image, k = 7

Difficulties I Had

I was unable to get Part II finished. Originally, I had no idea where to start with writing a k-means clustering function by hand. Finally, I was able to randomly generate some centers and I realized that I could do the Euclidean distance between color values so I was able to implement that and assign each pixel to a center. I was never able to move the center after each iteration and implement connected component labelling, though.

Accomplishments I Had:

In general, Part I was relatively easy for me. Implementing the thresholding and histogram weren’t much of a challenge, but I was proud and felt accomplished seeing that I could do something so simple but powerful with an image. Part II was where I felt the most accomplished, though. Although I did not get it to work correctly, I was very proud that it seemed like I was beginning to make progress towards segmenting the image. To even get some k-means clustering done felt like a success.