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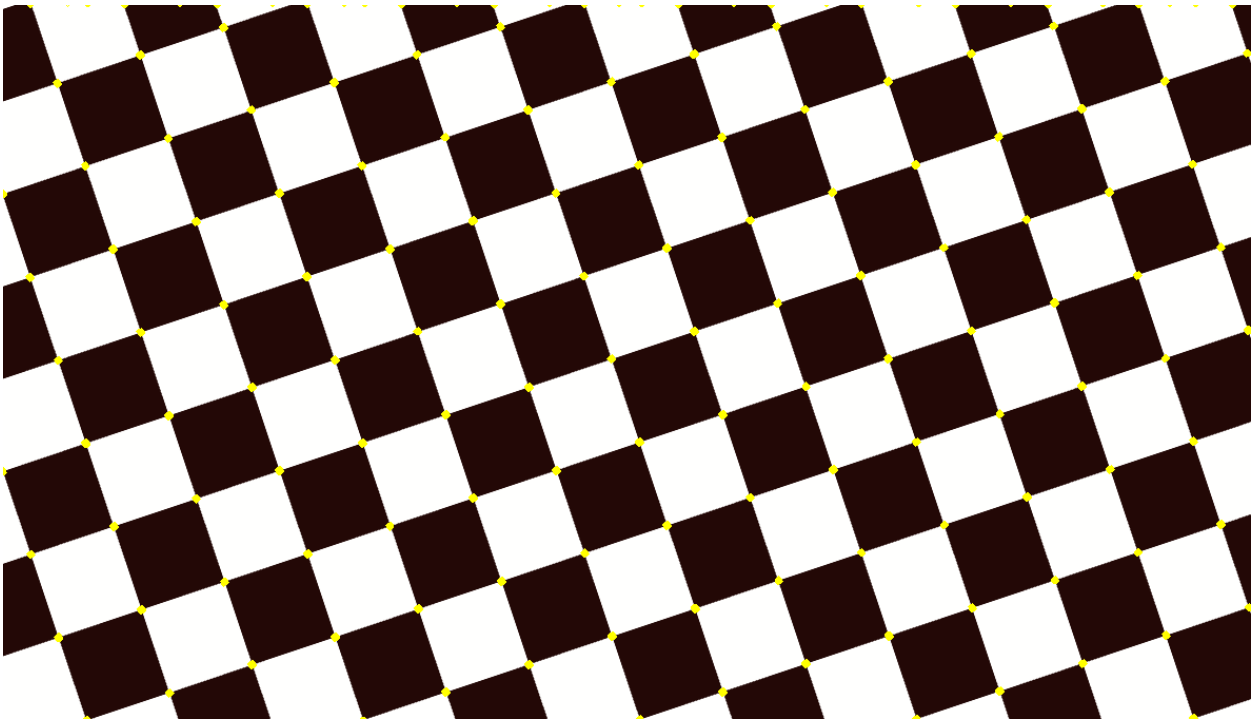
CSC-340

Harris Corners Assignment Report

The goal for this assignment was to create a program that finds the corners in an image. This is done by using the Harris corners method. The first steps in this method are to take a grayscale image and solving for the Ix, Iy, IxIx, IyIy, and IxIy images. These are found by using the following methods. For each pixel in the Ix image, you set the pixel to the absolute value the difference between the values of the pixels to the left and right of the current pixel in the grayscale image. For each pixel in the Iy image you set the pixel to the absolute value of the difference between the values of the pixels on top and below the current pixel in the grayscale image. For each pixel in the IxIx image you set the value to the value of the pixel in the Ix image squared. For each pixel in the IyIy image you set the value to the value of the pixel in the Iy image squared. For each pixel in the IxIy image you set the pixel to the value of the product of the values of the current pixel in the Ix and Iy images. After this is completed you then loop through every pixel again and at every pixel make a matrix m = [IxIx, IxIy],[IxIy, IyIy]], get the determinate and trace of that matrix, and plug it into the cornerness equation c = det(m) – (k*(trace(m)^2)). Once this is done save the cornerness value at each pixel in a new image. Once you have the cornerness image you then loop through all the pixels one last time and perform thresholding, taking only pixels that are within a certain percentage of the max cornerness value in the image. Once you have the final set of corners, they can be overlayed onto the original color image and displayed.

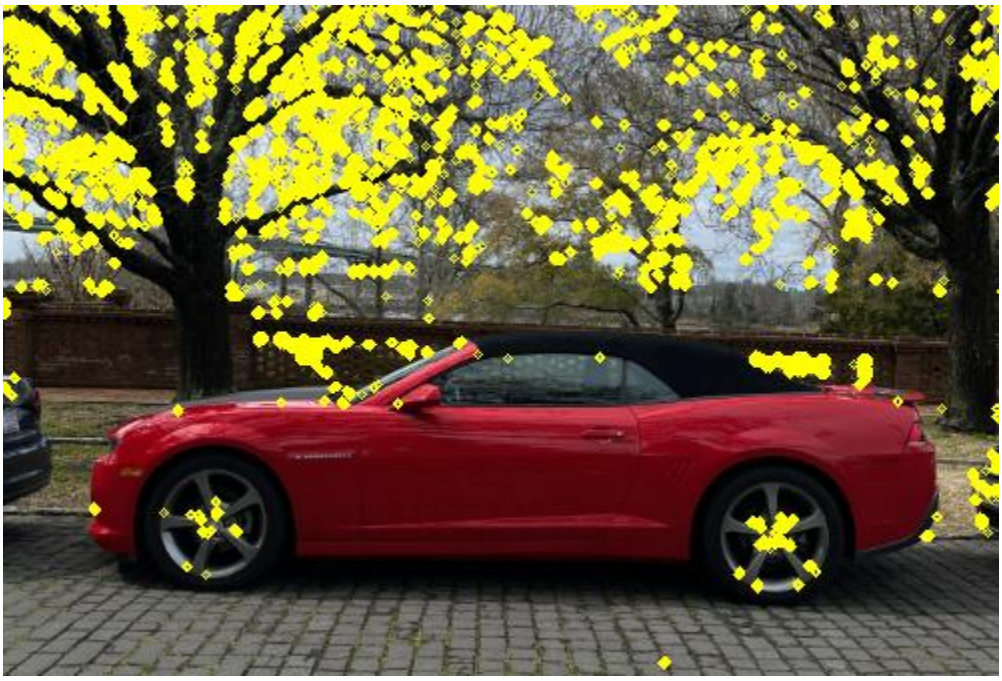
Here are a few images of the product of this program:

Threshold >.1*maxc



Threshold >.09*maxc

Threshold >.01*maxc



Threshold >.05 * maxc

Threshold >.05*maxc

Threshold >.05*maxc

Observations:

The algorithm tends to perform better on bright areas with sharp corners. Areas that are darker and have softer corners were harder for the algorithm to process properly. A good example of this is the car's interior image, the brighter area around the center console had a lot more corners properly identified than the darker areas to the left and right. Another good example is the sunset image, the program was easily able to identify the sharp corners at the tops of the houses and in the tree.

Issues Faced:

I didn't encounter many challenges while working on this assignment. One issue I encountered was adjusting the thresholding on the images and ensuring that the color of the corner pixels stood out in each image. Another challenge was accurately calculating the values for the Ix, Iy, IxIy, IxIx, and IxIy images. It took some time to understand these calculations, but by referring to the videos about Harris Corners on the canvas page, I was able to resolve them. Other than these aspects, the assignment progressed smoothly.