

CS512 Assignment 3 Report

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Abstract

In this assessment, we have performed line detection, model fitting and robust estimation operation of an image using OpenCV, Hough Transform, Matplotlib etc.

1. Problem statement

In this assignment, our aim was to perform line detection and fitting in an arbitrary size image.

1. Load the image and convert it to grayscale using OpenCV functions.
2. Perform edge detection using OpenCV.
3. Implement the Hough transform for detecting straight lines in the edge image. Do not use the OpenCV Hough Lines function (you may use it for verification).
4. Display the parameter plane as an image.
5. Detect k lines using the strongest k votes with non-maximum suppression. Select the number k as needed.
6. For each of the detected lines perform the following:
 - Find all the edge pixels belonging to the line (i.e., in the vicinity of the line).
 - Fit a line to the edge points belonging to the line.
 - Plot the lines you detected.

2. Proposed solution

Using the python libraries OpenCV, NumPy and Matplotlib I have implemented the program to perform Hough transform on the images. A few of the implementations and their working are listed below:

A. Image input and covert it to grayscale Using cv2 function I read an image and converted it to grayscale by using

function BGR2GRAY in cv2

B. For edge detection I used the Canny edge detection to get the edges in the image

C. Hough Transform

I implemented my function of Hough transform to detect line in the image 1D. Parameter plane by using the values from the Hough Transform I made the parameter plane and found the intersection point

E. Detect lines

After getting the intersection points from the parameter plane, I plotted the lines that I detected.

3. Implementation details

Some of the problems and design issues that were faced are as mentioned below:

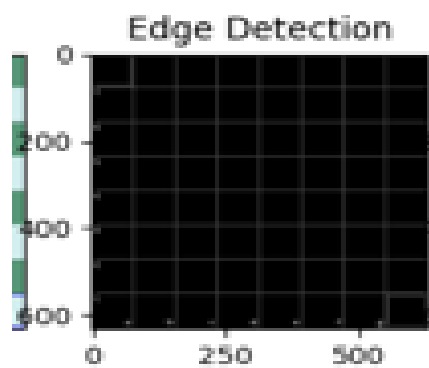
1. Initially, Hough lines would only detect single line.
2. One of the output subplots was overlapping the other one.
3. While plotting the parameter plane the axis of the plotted curve and the intersection point was not proper due to which the detected intersections were not plotted correctly.
4. At first, was not able to get the intersection points in the parameter space but was able to figure it out

4. Results and Discussions

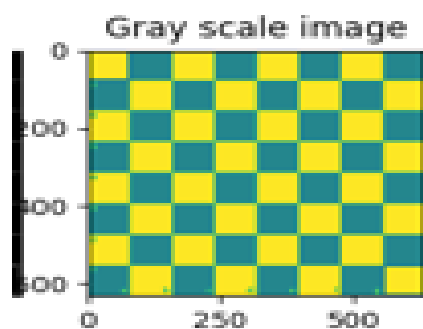
- Original Image:



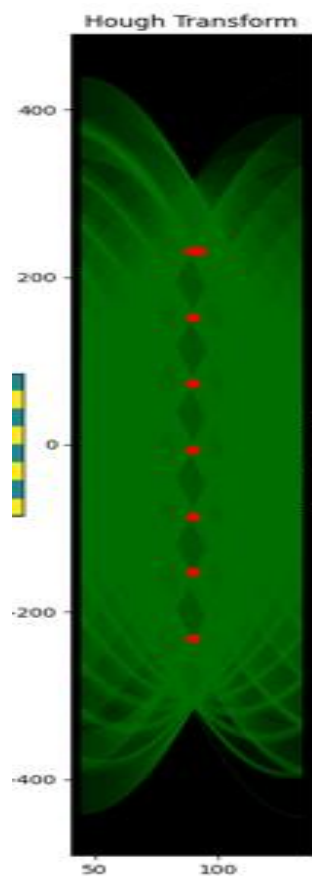
- Edge Detection (using Canny Edge Detection)



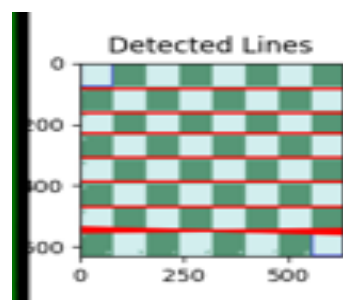
- Gray Scale Image



- Parameter Plane



- Detected lines on the image



References:

- https://opencv24-python-tutorials.readthedocs.io/en/latest/py_tutorials/py_imgproc/py_houghlines/py_houghlines.html
- https://docs.opencv.org/3.4/d9/db0/tutorial_hough_lines.html
- <https://www.geeksforgeeks.org/line-detection-python-opencv-houghline-method>