

CS 91R: The Computational Image

Assignment 5: Hough Transform

DUE March 4th at 11:59 PM

In this lab, we will experiment with the Hough Transform, a method for finding lines in images by combining some of the techniques used earlier in the course: edge detection, histograms, and homogeneous coordinates.

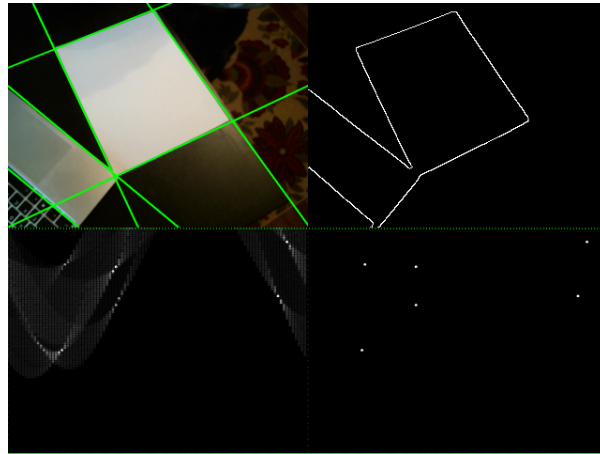


Figure 1: hough

1 Warm-up

1. Understand `create_hough(nimg: p5.Image, nrho: int, ntheta: int): 2D list`
 - This method creates the hough histogram with `nrho` bins for the line distance and `ntheta` bins for the angle. Remember the line equation we use for hough is $\rho = x \cos(\theta) + y \sin(\theta)$.
 - Write a few words about what the 2 `map` calls are doing in the reflection.
 - Why do we need to bound check `r` (making sure it's between 0 and `nrho`), but not `ti`?
2. In this lab we'll be using `jsfeat` for some of the things we've already implemented ourselves. Experiment a little with the arguments to `gaussian_blur` and `canny` to get the best results for edge detection.

2 Implementation

3. Implement `draw_hough_lines(hough: 2D list)`.

- The method should draw all the lines in the hough histogram that have non-zero counts.

Note: Odds are you will see many lines, you might use `max_count(hist)` to find the one most-likely line while debugging.

4. Implement `filter_lines(hough: 2D list): 2D list`

- Given a histogram of detected lines, return a new histogram. Some ideas:
 - threshold the histogram by some constant (i.e., have more than N votes)
 - threshold the histogram by some proportion (i.e., in the top 25% of vote)
 - non-maximal suppression: only lines that are the most voted-for in their neighborhood survive

3 Learning Objectives

- find lines in images
- use homogeneous coordinates to represent lines
- perform non-maximal suppression
- use [jsfeat](#) for some low-level image processing tasks

4 Deliverables

1. Commit the javascript `sketch.js` to the repo.
2. Write the reflection (as a markdown document named `reflection.md`) about what you were able to accomplish in this lab. Don't forget the collaboration statement!