

The purpose of this MP is implementing the algorithm for line detection.

First, Using a Gaussian filter to smooth a given gray scale image and implement Sobel operators to calculate the magnitude and direction of the edge map. For these two functions, I directly used the function I wrote for MP5.

Next, perform Hough transform. The basic idea is for a point at (x,y) in x - y space mapped to a line in m - c space where $c = -x*m + y$. For edge detection E , if the line $c = -x*m + y$ passes through (m,c) , $A[m,c]++$. Polar form was used to avoid some error, eg. For a vertical line, $m = -\infty$ which is bad.

Third, detecting those significant intersections in the parameter space. The logic of my function is iterates over each cell in the A and checks if the value exceeds the specified threshold. For each cell exceeding the threshold, checks if it is a local maximum by comparing it with its neighboring cells. If the cell is determined to be a local maximum, its coordinates are added to the list of detected peaks.

Last, covert polar coordinates to Cartesian coordinates and draw the lines.

Result analysis, for each test images I need to use a different threshold to get better results. After trying, the results for each image are pretty good.