

# CMPEN 454 Project 1

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## 1 Theory Questions

### 1.1 Problem 1

Show that if you use the line equations  $\rho = x\cos\theta + y\sin\theta$ , each image point (x,y) results in a sinusoid in  $(\rho, \theta)$  Hough space. Relate the amplitude and phase of the sinusoid to the point(x,y).

### 1.2 Problem 2

Why do we parameterize the line in terms of  $(\rho, \theta)$  instead of the slope and intercept (m,c)? Express the slope and intercept in terms of  $(\rho, \theta)$ .

### 1.3 Problem 3

Assuming that the image points (x,y) are in an image of width W and height H, that is  $x \in [1, W], y \in [1, H]$ , what is the maximum absolute value of  $\rho$ , and what is the range for  $\theta$ ?

### 1.4 Problem 4

For point (10, 10) and points (20, 20) and (30, 30) in the image, plot the corresponding sinusoid waves in Hough space, and visualize how their intersection point defines the line. What is (m, c) for this line?