Homework 2

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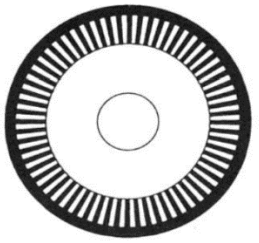
Problem 1:

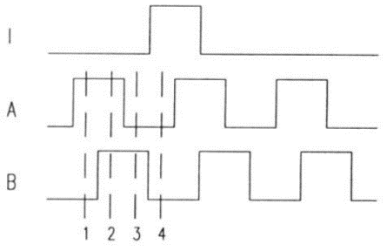
If there are 100 lines in the grating, what is the smallest detectable change in motor-shaft angle?

$$\frac{360^\circ}{100} = 3.6^\circ$$

Problem 2:

Explain how to determine the rotation directions if the following encoders are used. List two concerns while choosing an encoder.



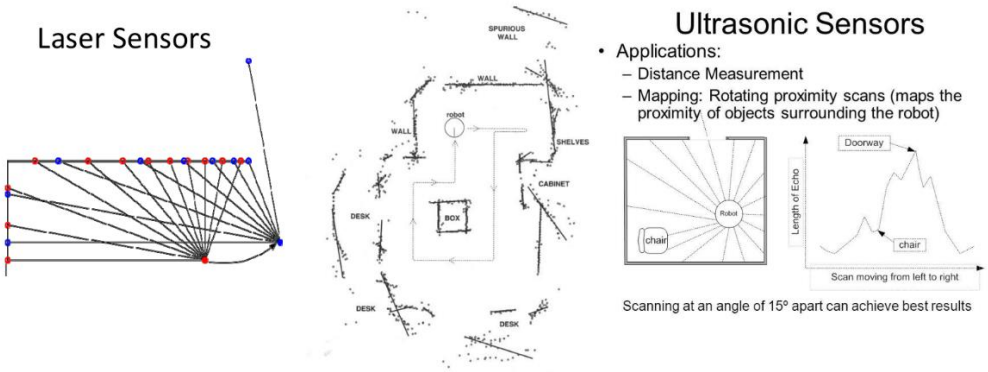


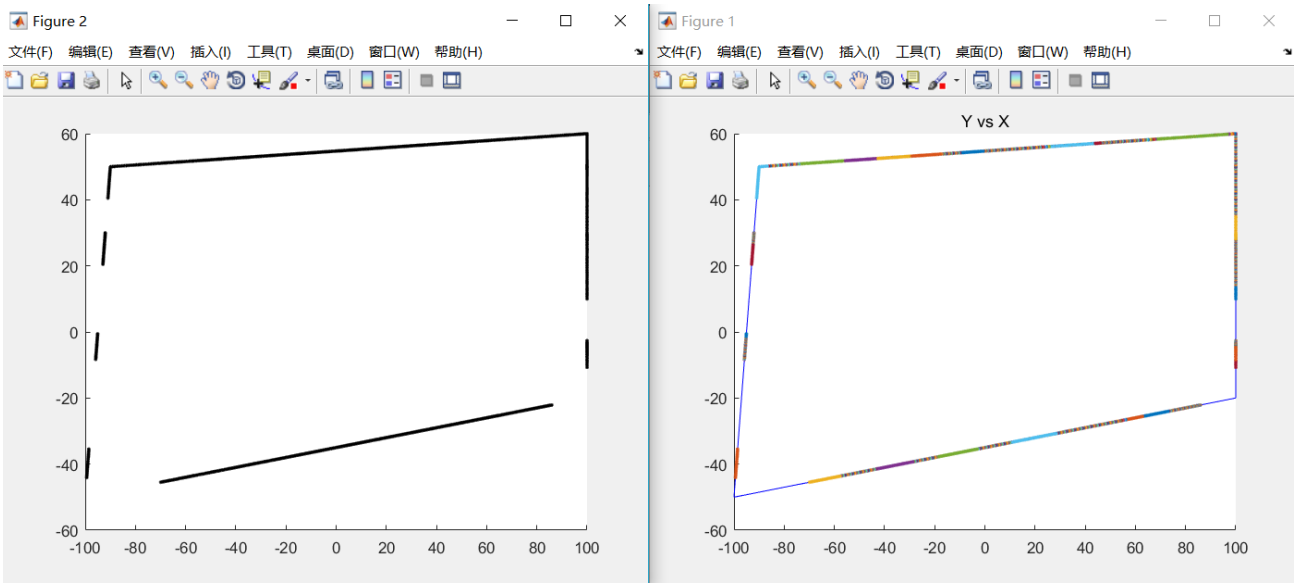
State	Ch A	Ch B
S_1	High	Low
S_2	High	High
S_3	Low	High
S_4	Low	Low

Using two sensors in quadrature-phase shift. The ordering of which wave produces a rising edge first tells the direction of motion. Additionally, resolution is 4 times higher.

Problem 3:

Simulate the process of mapping of a room by using a moving range sensor which knows its location accurately (randomly walking, or moving along a circle).





Problem 4:

Simulate the process of localization with GPS signals. When sender-receiver clocks are either synchronized or not synchronized, how many satellites are needed to achieve 3D accurate positions, respectively?