Home assignment: Problem: To estimate the distance remotely using matlab

1. condition:

In a car, there is an acoustic sensor to detect the distance between the car and an object on the road. The technical specification is following

* Transmit signal =
* The distance = 10(m)
* Acoustic wave speed= 340(m/s)
* The minimum detectable distance = 1(m)

1. The time delay between the send signal and the receive signal is

Time delay= . Calculate the time delay.(the numerator is the twice of the distance

since the wave travels forward and backward between the car and the object)

1. Determine the sampling time to be appropriate. It should be less than the delay time /2.

In general the sampling time is about the minimum delay time/(10).Hence the minimum

detectable distance should be considered.

1. The following should be in matlab.

-plot the send and received signal

3.1) auto correlation method

-plot the auto correlation between the send and the received signal

-find the delay time and compare the calculated delay time

3.2) Quadrature method(as correlation method in text book)

-generate and plot signal\_1 =

-generate and plot signal\_2 =

- using the formula, find the phase difference between signal\_1 and signal\_2

-find the delay time and compare the calculated delay time.