

IMAT 5233 Intelligent Mobile Robotics

Additional Maths Exercises

Question 1

- a) The robot has moved -0.8m in x and 1.2m in y. How far has the robot travelled?
- b) The robot has moved 2.2m in x and -0.2m in y. How far has the robot travelled?
- c) The robot has travelled 3.2m at a heading of 38° . How far has the robot travelled in x and y?
- d) The robot has travelled 1.9m at a heading of -72° from a starting position of (-2.1m, 1.9m). Where is the robot now?
- e) The robot is positioned at (1.3m 1.6m). The robots sonar sensor detects an obstacle 2.1m away at a heading 35° . Where is the obstacle?

Question 2

- a) Convert the following into radians:
180° 270° -34° 326°
- b) Convert the following into degrees:
1.75R 2.68R 0.5πR 1.5πR

Question 3

The robots position is (1.2, 3.6, 120°). The robots sonar sensor detects an obstacle 1.4m away at a heading of -85° . Where, in terms of the global co-ordinate space, is the obstacle?

Question 4

A robot helicopter has been programmed to maintain an altitude of 0.8m. The helicopter is fitted with a sonar sensor on the bottom which records distance to the ground in mm. Find the RMSE of the helicopters control performance given the data readings below:

Time (s)	65:26	65:39	65:51	66:03	66:12	66:24	66:37	66:50	67:01
Sonar reading (mm)	85	82	79	75	72	77	84	86	83

Question 5

Fit a linear trend line to the data below:

H Bridge Current (mA)	42	36	41	22	34	28	38	24	26
Motor Speed (RPM)	31	26	32	19	29	24	30	19	22

Question 6

Find the Pearson correlation coefficient for the data above.