Algorithms for Intelligent Robots

Tutorial 3: Motion control

Question 1

A car-like robot is at the location (1,3). Calculate its steering angle to reach the goal location (10,8) using the pure pursuit method.

Question 2

Find the feedback control laws for v and w of a differential drive mobile robot to drive it from the current pose (-5, -3, 45^0) to the goal (1, 1, 0^0) given the control parameters (γ, λ, h)=(3, 6, 1).

Question 3

Using the Simulink model of the differential robot developed in Tutorial 1 (t1q2.m and diffcar.mdl) and the feedback control laws in Lecture 3, develop the following simulation programs:

a) The robot goes from an initial pose to a final pose of your choice
b) The robot follows a curve defined by function $\arctan(x^2)$
c) Plot the planned path and the actual trajectory of the robot

Question 4

Using the kinematic equations of a tricycle robot provided in lecture 2:

$$\begin{cases} \dot{x} = v_c \cos\theta \\ \dot{y} = v_c \sin\theta \\ \dot{\theta} = v_c (\tan\alpha)/d \end{cases}$$

develop the following simulation programs:

a) A Simulink model of the robot
b) The robot follows a set of waypoints of your choice using the pure pursuit algorithm
c) Plot the waypoints and the actual trajectory of the robot