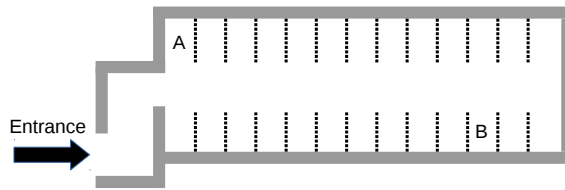


13 Topical Issues (RKH)

This question concerns tracking a vehicle to a parking space in a covered car park, where satellite navigation systems are unavailable. The vehicle is assumed to have an electronic map of the car park and to have been fitted with odometry sensors that provide the accumulated number of rotations made by a wheel and the direction the wheel is pointing in at any given moment. A particle filtering approach is used to track the car from the car park entrance. The car park layout is shown below, with dotted lines used to show parking bays:



- (a) Briefly describe the purpose of the prediction, correction and resampling stages of a particle filter. [6 marks]
- (b) Describe how the odometry information could be incorporated into the prediction stage and the map information into the correction stage. Why is odometry not typically incorporated into the correction stage, despite being a measurement? [6 marks]
- (c) If the wheel radius were unknown, one solution is to use an average wheel radius and associate a large noise with any derived displacements in the particle filter. Explain why this is not optimal and suggest a better approach. You should illustrate your answer by considering a vehicle that parks in space A and another that parks in space B as shown in the figure above. [8 marks]