Algorithms for Intelligent Robots

Tutorial 6: Robot localization with the particle filter

A robot (the red cross in Figure 1) is moving on a straight line along X direction. The robot is moving at a velocity of 0.1 m/s, with a variance of 2.5×10^{-3} (m^2/s^2) – the actual robot location is given by data file "robpos.mat". The robot is equipped with a range sensor that can measure distances from the robot to landmarks (blue stars in Figure 1). The sensor reading is corrupted by a zero-mean Gaussian noise. The measurement variance is 10^{-4} m^2. Assuming there is one landmark located at $x_1=3m$ and $y_1=1m$. A MATLAB function called "range_sensor.m" is given. It provides the noisy distance reading between the robot and the landmark, as in a real situation. If the robot can be anywhere in the range of x = [0, 4.5] m, implement a Particle Filter that estimates the robot location from 0 – 10 seconds. Compare the estimated robot position with the actual robot position and show the error change over time.
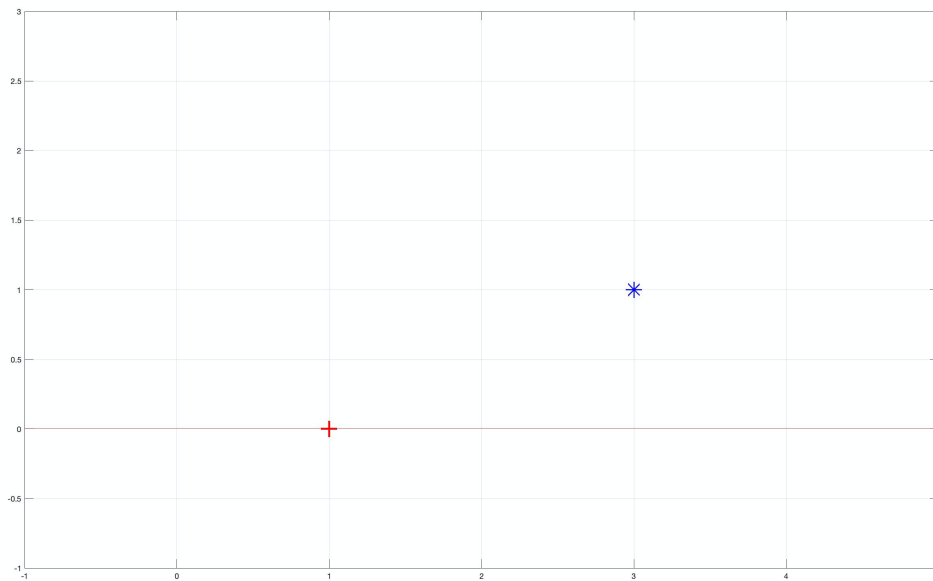

Figure 1.   A moving robot with a landmark.