Sheet 12
Topic: Monte Carlo Localization III
Submission deadline: Fri 20.07.2007, 11:00 a.m. (before class)

Introduction

In this exercise the resampling step is integrated into the particle filter. It builds on exercise sheet 11, the solutions and the corresponding source code. Please request last week’s solution per e-mail (lau@informatik.uni-fr....), if you had mistakes in your code!

Exercise 1:

Implement the stochastic universal sampler (slides 23-24) by completing the function `resample(part, weights, M)`. The parameter $M$ is the number of new particles to be drawn by the resampler. The resampling is performed after updating the weights. Test your code using $M = N$ and uniform particle initialization, and observe how the resampling affects the localization error.

Exercise 2:

To enable the filter to recover from global localization errors (e.g. after kidnapping) and to prevent particle deprivation after “unlucky” resampling, a number of random particles is generated in every time step. Use $M = 0.95 \cdot N$ for the resampling and generate $N - M$ random particles (uniformly distributed) in every time step. *Hint:* do not forget to re-adjust the weights.

Exercise 3:

How could the new particles of Ex. 2 be placed more effectively using the available information? No implementation required.