Albert-Ludwigs-Universität Freiburg
Institut für Informatik
Lecture: Introduction to Mobile Robotics
Summer term 2007
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# 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.