Module 4: Overview and To-Do List

Overview

The last module introduced the recursive Bayes filter. To implement it in practice, one requires the transition model $p(x_t \mid x_{t-1}, u_t)$ and the measurement or sensor model $p(z \mid x)$. In the previous assignment, the necessary values of these functions were provided. In real-world applications, however, the transition and sensor model have a more complex form and need to fit the robot hardware at hand.

Learning Objectives

In this module, you will learn a transition model that approximates the uncertainty in the motion of a wheeled robot, the odometry-based motion model. You will further learn the beam-based sensor model for range sensors.

Readings

Besides the material provided in Canvas, we recommend reading the following chapters in the course book: Chapter 5.4 for the odometry-based model and Chapter 6.3 for the sensor model.

After this learning unit, you should be able to:

- model the motion uncertainty of a wheeled robot
- implement an algorithm that samples from the odometry-based motion model
- understand and apply a sensor model to estimate the likelihood of a range measurement

To-Do List

In order to successfully complete Module 3, you should do the following:

1. **Read:** Read the provided sources to learn about the **odometry-based motion model (https://utn.instructure.com/courses/111/pages/odometry-based-motion-model?wrap=1)** and the **beam-based sensor model (https://utn.instructure.com/courses/111/pages/beam-based-sensor-model?wrap=1)** . *(approximated time: 4 hours)*
2. **Demonstrate:** Implement the sampling algorithm for the motion model and use the sensor model to compute the likelihood of a range measurement. See the **assignment page (https://utn.instructure.com/courses/111/assignments/187?wrap=1)** for more instructions. *(approximated time: 6 hours)*