Research Project:

Analysis of Simultaneous Localization and Mapping (SLAM) Algorithms.

Summary:

Simultaneous Localization and Mapping (SLAM) is a collection of techniques employed in the fields of robotics and autonomous vehicles. It enables the estimation of a robot's position (trajectory) while concurrently modeling the environment by creating a map. This is achieved through the use of sensors, such as Laser sensors (LIDARs), Sonars, or depth cameras, to calculate an unknown number of landmarks by observing their relative position between different time frames.

This Master's thesis focuses on analyzing the most common SLAM algorithms, including those based on Gaussian distributions, such as the Extended Kalman Filter (EKF) and the Unscented Kalman Filter (UKF), as well as the Particle Filter method, which is based on multimodal distributions. The modeling of a robot motion and range-bearing sensors are also addressed for a two-degree-of-freedom (DOF) robot in a static environment.

This thesis assumes the student has a solid understanding of linear algebra, probabilistic theory, and strong MATLAB programming skills. These prerequisites are essential for implementing the mathematical models and algorithms, particularly in the context of SLAM (Simultaneous Localization and Mapping).

Reference:
[1] H. Durrant-Whyte and T. Bailey, "Simultaneous localization and mapping: Part I," IEEE Robotics & Automation Magazine. Vol. 13, no. 2, pp. 99–108, 2006. DOI: 10.1109/MRA.2006.1638022.

Position offered (2024-25): 1 Master research project (6-9 months).

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