Estimation for Autonomous Mobile Robots

Winter

(in German: Estimation for Autonomous Mobile Robots)

Module-ID: FIN-INF-120485

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
AMR	6	Winter	starting at 1.	1 Semester	english	Master

Link:	LSF
Limited accessability:	
Responsibility:	Prof. Dr.-Ing. Benjamin Noack
Lecturer:	Prof. Dr.-Ing. Benjamin Noack
Classes:	• Lecture *Estimation for Autonomous Mobile Robots* • Exercise *Estimation for Autonomous Mobile Robots*

Applicability in curriculum:	- M.Sc. INF: Informatik - M.Sc. INF: Informatik Wahlpflicht (SPO 2027) - M.Sc. INGINF: Informatik - M.Sc. INGINF: Ingenieurinformatik - M.Sc. WIF: Informatik - M.Sc. WIF: Informatik Wahlpflicht (SPO 2027) - M.Sc. DKE: Applied Data Science - M.Sc. DE: Methoden des Digital Engineering - M.Sc. DE: Methoden der Informatik - M.Sc. DE: Fachliche Spezialisierung - M.Sc. DE: Informatik Wahlpflicht (SPO 2027) - M.Sc. DE: Digital Engineering (SPO 2027) - M.Sc. DE: Engineering Specialization (SPO 2027) - M.Sc. VC: Computer Science - M.Sc. VC: Computer Science (SPO 2027)

Intended learning outcomes:
Students who complete the course ...

- have an overview of basic problems and methods in parameter and state estimation for mobile systems.
- understand how to develop kinematic models for mobile robots and how to derive discrete-time prediction models.
- are familiar with the required mathematical tools and can derive and apply least-squares methods for localization and tracking of mobile systems, e.g., based on distance measurements.
- have a deep understanding of Kalman filtering and its nonlinear generalizations for dynamic state estimation and localization of mobile systems.

Content:

- Kinematics, System Models, and Dead Reckoning for Mobile Systems
- Sensor Models and Optimization Methods for Localization and Tracking
- DynamicState Estimation for Real-Time Localization and Tracking
- Linear Kalman Filtering and Nonlinear Generalizations

Workload:
56 h contact time 124 h independent study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
	Oral exam (30 min)	• Lecture (2 SWS) • Exercise (2 SWS)

Prerequisites according to examination regulations:	Recommended prerequisites:
none	Linear Algebra, Analysis

Media:	Literature:
	Literature will be announced in the lecture.

Comments:

Revision #1
Created 2026-10-20 17:13:32 UTC by Fakultät für Informatik
Updated 2026-10-20 17:13:32 UTC by Fakultät für Informatik