Mobile Robotics

Sommer

(in German: Mobile Robotics)

Module-ID: FIN-INF-110526

Abbreviation	Credit Points	Semester	Term	Duration	Language	Level
MR	5	Sommer	starting at 4.	1 Semester	english	Bachelor

Link:	LSF
Limited accessability:	
Responsibility:	Prof. Dr.-Ing. Benjamin Noack
Lecturer:	Prof. Dr.-Ing. Benjamin Noack
Classes:	• Lecture *Mobile Robotics* • Exercise *Mobile Robotics*
Applicability in curriculum:	- B.Sc. INF: Informatik - Wahlpflicht - B.Sc. INF: Informatik Wahlpflicht (SPO 2027) - B.Sc. CV: Informatik - Wahlpflicht - B.Sc. CV: Computervisualistik Wahlpflicht (SPO 2027) - B.Sc. INGINF: Informatik - Wahlpflicht - B.Sc. INGINF: Informatik Wahlpflicht (SPO 2027) - B.Sc. WIF: Gestalten und Anwenden - Wahlpflicht - B.Sc. WIF: Informatik Wahlpflicht (SPO 2027) - B.Sc. INF (bilingual): Informatik - Wahlpflicht - B.Sc. INF (bilingual): Informatik Wahlpflicht (SPO 2027)

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

- have a comprehensive overview of concepts and algorithms used in mobile robotics applications, such as delivery robots or autonomous cars

- have a foundational understanding of the mathematical principles required for system modeling, planning, perception, mapping, and their probabilistic approaches
- understand how various components within a robotic system interlink and interact
- are able to select appropriate algorithms for a given setup in mobile robotics and implement them using the ROS2 framework

Content:
This course offers an introduction to the foundational principles and algorithms of mobile robotics, utilizing a flipped classroom approach. The course emphasizes a conceptual understanding of mobile robotics while introducing relevant mathematical underpinnings. Students complete preparatory work before each lecture, which they use in class to deepen understanding and application of knowledge. In the exercise, students deepen their knowledge with practical experience and complete programming assignments using the Robot Operating System 2 (ROS2) framework. With an emphasis on wheeled robots, this lecture covers

- the modeling of mobile robots,
- sensing of their own state and the environment—including image processing
- planning,
- control,
- localization,
- mapping,
- and advanced methods.

The main parts of the course are based on the book Computational Principles of Mobile Robotics

Workload:

- 28h Lecture
- 28h Practical Exercise
- 94h independent Study

Pre-examination requirements:	Type of examination:	Teaching method / lecture hours per week (SWS):
	Term paper about implementation, documentation, and presentation of a robotics project (Hausarbeit über Durchführung, Dokumentation und Abnahme eines Roboterprojekts)	Lecture (2 SWS) Exercise (2 SWS)

Prerequisites according to examination regulations:	Recommended prerequisites:

keine	• Linear Algebra and Calculus

Media:	**Literature:**
	Computational Principles of Mobile Robotics

Comments:

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