

Robot Perception

Course Workload		Assessment form (examination/ graded test/ ungraded test)
ECTS	Hours	
3	108	Exam

This course aims to provide knowledge and skills on development of robot perception systems with usage of all variety of sensor data. As part of the course, students study the physical foundations of sensor, basic methods of processing noisy sensor data for navigation purposes, as well as ways for data storage and provide operational access to sensory information. Course materials expecting from student a basic knowledge on probabilistic theory and linear algebra. After completing this course, students are able to build systems that ensure the robot's interaction with environmental objects using hardware and software solutions in spite of noisy in the captured sensor data.

Course structure:

1. Types of sensors and features of provided measurements

- 1.1. Disadvantages and advantages of each sensor type in robotic applications
- 1.2. Types of sensors and physical principles of their functioning, problems to be solved with their use

2. Probability and random processes

- 2.1. Least squares method and its use in state estimation problems, methods for outlier rejection
- 2.2. Basics of probability theory and mathematical statistics

3. Recursive data filtering

- 3.1. Improved Kalman Filters, Sigma Point Kalman Filter
- 3.2. Linear Kalman Filter and its Application to Nonlinear Systems

4. Algorithms of camera and lidar sensor data processing

- 4.1. Object detection and classification on image data
- 4.2. 3D Data Processing: Depth Camera and Lidar