

Module MA-INF 3310	Introduction to Sensor Data Fusion - Methods and Applications				
Workload 180 h	Credit points 6 CP	Duration 1 semester	Frequency every year		
Module coordinator	P.D. Dr. Wolfgang Koch				
Lecturer(s)	P.D. Dr. Wolfgang Koch				
Classification	Programme M. Sc. Computer Science		Mode Optional	Semester 3.	
Technical skills	<p>All participants shall get known to the basic theory of sensor data fusion. The lecture starts with preliminaries on how to handle uncertain data and knowledge within analytical calculus. Then, the fundamental and well-known Kalman filter is derived. Based on this tracking scheme, further approaches to a wide spectrum of applications will be shown. All algorithms will be motivated by examples from ongoing research projects, industrial cooperations, and impressions of current demonstration hardware.</p> <p>Because of inherent practical issues, every sensor measures certain properties up to an error. This lecture shows how to model and overcome this error by an application of theoretical tools such as Bayes' rule and further derivations. Moreover, solutions to possible false-alarms, miss-detections, maneuvering phases, and much more will be presented.</p>				
Soft skills	Mathematical derivation of algorithms, application of mathematical results on estimation theory.				
Contents	Gaussian probability density functions, Kalman filter, Multi-Hypothesis-Tracker, Interacting Multiple Model Filter, Retrodiction, Smoothing, Maneuver Modeling				
Prerequisites	none				
Format	Teaching format	Group size	h/week	Workload[h]	CP
	Lecture	60	2	30 T / 45 S	2.5
	Exercises	30	2	30 T / 75 S	3.5
	T = face-to-face teaching; S = independent study				
Exam achievements	Oral exam (graded)				
Study achievements	Successful exercise participation (not graded)				
Forms of media					
Literature	<p>W. Koch: "Tracking and Sensor Data Fusion: Methodological Framework and Selected Applications", Springer, 2014.</p> <p>Y. Bar-Shalom: "Estimation with Applications to Tracking and Navigation", Wiley-Interscience, 2001.</p>				