**Assignment:**

* Each topic 300 words (Insgesamt also 600 Wörter ca. 1 Seite)
* Context (General Problem setup, situation, what methods are there)
* Main points (what are the main points the speaker wants to communicate)
* Practical application (How can these be used in practice or in further research)

**Topic 1**: Multimodal Sensor Fusion in Urban Environments

* 5 differnent talks
* Man kann sich aussuchen welche talk man zusammenfasst (entweder alle 5 oder nur ein paar)
* Zeigen welche Speaker man zusammenfasst

**Sensor fusion** is the process of combining [sensory](https://en.wikipedia.org/wiki/Sensor" \o "Sensor) data or data derived from disparate sources such that the resulting [information](https://en.wikipedia.org/wiki/Information" \o "Information) has less uncertainty than would be possible when these sources were used individually.

**Topic 2:** Topic of choice - The most interesting topic

* Indicate which topic

Multimodal Sensor Fusion in Urban Environment

Dr. Pascal Meißner

Sensior Fusion

Multimodel Sensor Fusion

Sensor Fusion Environments

Multimodal?

Sensor modality: How we perceive environment: Vision, Smell, Taste, Touch

Why is multimodal relevant?

Speech recognition: McGurk Effect

Machine Learning Fields involved:

Vision, Speech, Learning, Medical, Robotics

Bei ihm gings um Robotics

What is sensor fusion?

Joining from two or more sensors to perform a prediction

What is multimodel sensor fusion?

Replacing sensor with modalitys

Three types of sensor fusion

Competitive Fusion:

Complementary Fusion: Cover as much space as possible with sensors

Cooperative Fusion:

Why is it hard problem?

Correspondences between information from different sensors are unkown

Information provided at different type of uncertainty

Not all sensors are reliable (cheap cameras have bad picture quality)

Urban environments

Mobile Robots

Localization: Roboter must know where am i? (Competitive Fusion)

Mapping: Whats around me? (Complementary Fusion)

Navigation: What to do next? (Cooperative Fusion)

Sensor for mobile Robots

Internal Sensors: Monitor Robots internal state

External Sensors: Monitors robots environment

Localization with probabilities

Use probability Theory to explictly model uncertainies

Shift probabilites (diese Folie mit den Roten linien und den Türen)

Bayes Filter is a probailistic tool to estimate the locations of a robot

Summary:

Multimodelity: Use of differnt types of information (vision, sounds, …)

Sensionr Fusion: Combines data from different sources to obtain more robust/complete information

Bayer Filter: Filter fuses data of internal and external sensors to localize robots

**Second Talk: Towards Autonomous Mobile Manipulation for robots: A compositional approach**

How could me make a robot that move autonomously?

Es geht um Robots in unstructed environments, z.B. Kellner / Service

Problems:

How to scale up to complex tasks and increase transferability?

He worked on

Serivce Roboter

* + Scene Recognition: Der Roboter muss wissen wie die Umgebung aussieht, um richtige Actions abuleiten
  + Search for objects: Find object, know the relation how they occur with other objects, use the prediction to search other objects

Industrial Roboter

Teaching Roboter to pick and place objects onthe right location

Precondition: Neural net estimates the success of grasping objects

Postcondition: Location to place object is demonstrated in neural net

One neural net to combine them

Challenges in this area:

Combinaton of heulistic and accuracy

Feature selection for reinforcment learning

Learning NN to differnt proberties of objects

How to learn pre- and postconditions of elementary actions?

How to learn active perception for changing environments

Dr Jürgen Hess

Topic 1:

what it the general problem setup:

Reliable Environment Perception is required (Sun, Night, Day, Weather, etc)

We cant rely on one sensor (z.B. nur Kamera)

Thats why we combine Sensors (Camera, Lidar Sensor, Radar, etc.)

Einfach nur mal Auto anschauen

How to combine these Sensors?

situation, what field is this about

Multi-Sensor Einsatz für Roboter um Umgebung besser wahrzunehmen

Combining different types of sensors

Sensors must be time synchronized and calibrated with each other

what well-known and established methods / approaches are there

Multi Branch Network classification

* Early Fusion: Combine different sensor information at beginning and then learn the classifier. Hohes Precision (Sind die detections correct?
* Late Fusion: learn classifier for each sensor and then combine them. Hohes Recall (is everything detected?)

Topic2: Deep Reinforcement Learning

Combination DL und RL

DL RL

Sense -> Perceive -> World Representation -> Reasoning/Planing -> Act/Control

what it the general problem setup:

situation, what field is this about

what well-known and established methods / approaches are there

Qiang Li

Topic 1:

what it the general problem setup:

* Multimodal Sensor Fusion: Process of combining sensory data or data derived from sensors, to produce less uncertainty than we would with individual sources

situation, what field is this about

* Autonomes Fahre, Indoor
* Z = F(X)
* Model based approach:
* Data driven approach:

what well-known and established methods / approaches are there

* Kalman Filter to solve localization problem

Topic 2:

Towards dexterous (geschickt) manipulation robots

what it the general problem setup:

* Example 1: Combine ML and adaptive control for grasping and in-hand manipulation with multi-fingered robotic hand
* Example 2: Explainability, Manipulaity and trustability
  + Goal: Accurately pour drinks into various containers

situation, what field is this about

* Example 1
  + Learn DL Model with Hand-Dataset
  + Compliance control to improve the quality of grasping and in-hand manipulation

what well-known and established methods / approaches are there

* Example 2
  + Lear nto reduce speed of pouring – constantly slow down
  + Learn different stages