Auf dem Weg zum kognitiven Automobil

- Kognitive Automobile
- Umfeldwahrnehmung
- Verhaltensplanung
- Urban Challenge
- Schlussbemerkungen
Research @ mrt

Visual Inspection
- Deflectometry
- Surface Analysis
- Smart Illumination
- Classification

Mobile Perception
- Vision Sensor
- Sensor Data Analysis
- Cognitive Systems

Information Fusion
- Sensor Data Fusion
- Interacting Robots

Projects
Mobile Perception & Driver Assistance
- Defect detection on surfaces
- Identification for forensic and industrial applications

Location of Railway Vehicles
- Cognitive Automobiles

Location of Railway Vehicles
- GPS, Galileo
- Movement
- Map-Matching
- Sensor Data Fusion
- State-Space Representation
- Information Fusion
Cognitive Automobiles

- perceive their environment,
- understand it and know the crucial objects and parameters,
- expand their mental map cooperatively when more knowledge becomes available
- know their own skills and capabilities
- plan autonomously safe behaviour reactive to the current situation
- negotiate cooperative behaviour,
- learn
Demonstrators

VW Passat
Audi Q7

VW Touareg
Smart Roadster

Stereo Vision
GPS-Antennas
3D-LIDAR

2D-LIDAR Radar
E-Throttle E-Brakes E-Steering

Control Computer
IMU

Power Supply
Main Computer V2V Communication

4 - Juni 2010
Active Vision:
- Multifocal Vision
- Stabilised
- Attention Control
- Self Calibration

[Dang, Hoffmann, Stiller, IEEE Trans IP 2009]
Autocalibration of an active camera

left (frame 0)  rectified right and obstacles

disparity

bird's eye view

Dang, Hoffmann, Stiller 2006-2009
Diversity through Multiple Sensors
Lidar HDL-64E
Object Segmentation of Lidar Data employing „Local Convexity“

[Moosmann Stiller, 2009]
Missionsplaner – Urban Challenge Wettbewerb

- High Speed Section
- Offroad Section
- T-Junctions
- Zones
- Offset Intersection
- 4-way stop
- Parking Lots
- Start Chutes

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Parking Lots
Mission Planning

- Converts digital map into graph
- Edges are small road elements annotated and weighted by travel time
- Fastest path sought by A*/D*-algorithm
Urban Challenge 2007 Semifinals
Open Issues & Challenges

- Real Time 3D Perception of Dynamic Scenes
- Scene Understanding, Semantics
  - Urban Areas, Intersections
  - Prediction of Likely Scene Dynamics/Behaviour of Traffic Participants
  - Quality Assessment of Cognition
- Safe Automation
  - Behaviour Generation from Semantic Maps
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