Data Acquisition and Analysis in the Application Platform for Intelligent Mobility (AIM)

Prof. Dr. Frank Köster
Dr.-Ing. Nils Müllner
Institute of Transportation Systems – Research Infrastructure

- Laboratories and Large-Scale Research Facilities
  - Application Platform for Intelligent Mobility (AIM)
  - Test Bed Lower Saxony – planned to be in full operation in 2019
  - LSA-Laboratory
  - DeCodeLab
  - IdeeLab
  - ...
  - ICT-Infrastructure
  - Databases & Application Server
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Methodological Framework

- **Macroscopic**
  - Models & Knowledge
  - Simulation → Synthetic Data
  - Measurements → Real-World Data

- **Mesoscopic**
  - Models & Knowledge
  - Simulation → Synthetic Data
  - Measurements → Real-World Data

- **Microscopic**
  - Models & Knowledge
  - Simulation → Synthetic Data
  - Measurements → Real-World Data

- **Sub-Microscopic**
  - Models & Knowledge
  - Simulation → Synthetic Data
  - Measurements → Real-World Data

**Data- & Knowledge-Management**

- Raw Data
- Pre-processed Data
- Domain Data
- Responses
- etc.

**Analysis / Interpretation / Modeling / Understanding**

**Repositories etc.**

**Models & Knowledge**

- Simulation → Synthetic Data
- Measurements → Real-World Data

**Research & Development Platforms**

- Project-Specific Requirements / External Data and Knowledge / User-Functions & Use-Cases etc.
- Acceptance Test
  - System Validation
  - System Integration + Test
  - Sub-System Integration + Test
  - Component Testing

- Sub-System Design
  - Component Design

- Formal Methods / Simulators / Digital Twins / Test Stands / Proving Grounds / Test Beds
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**Operate**

**Deploy**

**Release**

**Test**

**Integrate**

**Develop**

**Plan / Refine**

**Measure**

**Operate**

**Deploy**

**Release**

**Test**

**Integrate**

**Develop**

**Plan / Refine**

**Measure**
Application-Platform Intelligent Mobility (AIM) (1/13)

Large-scale research infrastructure in the area of Brunswick (Germany): An entire city serves as a platform for application-oriented research and development-activities in the field of intelligent mobility

- AIM consists of
  - databases, models, simulation toolboxes and simulators
  - dedicated test tracks
  - real urban areas within the city of Brunswick
  - selected surrounding areas around the city of Brunswick
- Besides observation it is possible to influence selected large-scale aspects (e.g. traffic flows) and microscopic aspects of traffic/mobility (e.g. via traffic lights and assistance and automation systems).
- The different building blocks of AIM are represented by a set services / service-clusters.
Application-Platform Intelligent Mobility (AIM) (2/13)

Services / Service-clusters provided by AIM

- **Overview**
  - Databases / Maps / Models
  - Simulation / Simulators
  - Test tracks
  - Reference tracks in the BS region
  - Traffic flow data in the BS region
  - High-precision positioning in the BS urban area
  - Modular Mock-up
  - Modular and Scalable Application Platform for ITS Components
  - Infrastructure / Proving Grounds / Living Labs – for Development and Test
  - Vehicle fleet / Mobile services
  - Traffic management / traffic data platform
  - Driver Performance Database
  - NDS platform
  - Integration of public passenger (rail) transport data

- **Laboratories / Test Beds / Driving Simulators**

- **Vehicles**
  - Mobility portal

- **Data-Platforms / Backend-Systems for Data and Services**
  - Virtual traffic management centre
Institute of Transportation Systems – Research Infrastructure Test Bed Lower Saxony (1/3)

Approximately 280 km of different types of roads will extend AIM – with a focus on highways. Technical components of the Test Bed Lower Saxony are based on established AIM-Components. The integrated use of AIM and Test Bed Lower Saxony will be possible.

- **Camera-based Detection** – anonymized detection of traffic objects and their trajectories → ground truth
- **Communication** – Car2X via WiFi 802.11p and Mobile
- **Maps** – highly accurate and up to date maps for vehicles and various simulation-purposes
- **Scenarios and Models** – parametrizations and (sub-) models for the construction of (ecologically) valid simulations
- **Interfaces to Traffic Infrastructure and traffic-related Databases** – e.g. connection to the traffic management
- **Backend-System** – data management and delivery of online services
- **Cadastre** – in particular, documentation of the test field status / quality
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Test Bed Lower Saxony (2/3)

Camera-based Detection of Traffic

Anschlussstelle Cremlingen (A39)

Kreuz Wolfsburg/Königslutter (A2 / A39)
Proving Grounds & Test Beds

Used Sensors
- Lidar
- IBEO
- V2X
- NEC Linkbird
- DGPS

Mobile Sensor Pole connected by V2X

System Under Test (SUT)

Sensors
Actuators
Vehicle Gateway
Data Fusion
Automation
HMI

Simulation & Simulators

Required Models
- Vehicle Model
- Lidar Model
- V2X Model
- GPS Model
- Sensor Pole Model
- Steering Force Injection Model
- 3D Environment Model
Applications – Simulation-Based Testing (1b/3)
Applications – Camera-Based Sensor Systems (2/3)
Applications – AR-based Test-Environments (3a/3)
Thank You for Your Attention…

Prof. Dr. Frank Köster
German Aerospace Center (DLR)
Institute of Transportation Systems
Lilienthalplatz 7
38108 Brunswick
Germany
Frank.Koester@dlr.de