SAFESPOT (cf. [1])

- Integrated research project (IP) co-funded by the European Commission
- **Objective:** Understand how intelligent vehicles and intelligent roads can cooperate to produce a breakthrough for road safety.
- **Aim:** Prevent road accidents developing a Safety Margin Assistant that detects in advance potentially dangerous situations and that extends in space and time drivers’ awareness of the surrounding environment.
- > 50 Partners (automotive, research, logistics, ..)
Motivation (1/2)

• "More than 40,000 deaths are caused by road traffic accidents in the European Union, the direct and indirect costs of which are estimated at AC 180 billion, or 2% of EU GDP. Moreover, the disparity between different Member States’ road safety records is widening." (cf. [2])
Establishing Road Safety (1/2)

- **Pre-Crash**
  - Preventive Safety: Prevent emergency situation altogether
    - ex.: ACC (Adaptive Cruise Control), LDW (Lane Departure Warning)
  - Active Safety: Avoid crash by giving driver maximum control over the vehicle
    - ex.: ABS (Anti-lock Braking System), ESC (Electronic Stability Control)

- **Crash**
  - Passive Safety: Reduction of fatalities
    - ex.: Vehicle Structure, Airbags

- **Post-Crash:** Support medical intervention

Accidents involving Casualties due Misbehavior of the Driver

- Driving too fast
- Roadworthiness (e.g. alcohol)
- Pedestrian
- Overtaking
- Other
- Maneuvers: turn (right, left, over), reverse, start, right of way, driving too close

Source: Statistisches Bundesamt 2007 (cf. [3])
Establishing Road Safety (2/2)

- Autonomous ADAS: Stand-alone Systems
  - Typically based on sensors, application logic, actuators
  - → Intelligent „Agent“ (cf. [4], p. 29)
- Cooperative ADAS: Add communication layer
  - → Multi-Agent System (cf. [5], p. 79)

Conceptual Design (1/2)
Conceptual Design (2/2)

- Local Dynamic Map (LDM)
  - Data store for dynamic in-car data
    - Vehicle dynamics (e.g. speed, position, turn indicators)
    - Topological linkage to digital road network
    - Digital map extension: High resolution maps enriched with ADAS-related attributes (e.g. reference tracks)
- Application Programming Interface (LDM API)
  - Management of data (create, delete, update)
  - Extended set of functions for information retrieval
    - Spatial functions (e.g. distance, intersection)
    - Topological functions (e.g. next road element)
- Concept is abstract, not tied to a particular technology

Implementation

- LDM
  - Relational Database Management System (RDBMS)
  - Spatial Extension (re-use functionality in LDM API)
    - → PostgreSQL / PostGIS
- LDM API
  - JAVA class library
Validation

• How to test implementation w.r.t.
  – Initial requirements (IR)
    • IR define functionality
    • Can be tested using component tests (e.g. jUnit)
  – Real world behavior
    • Lab test
      – Implement sample LDM application
      – Simulate real world
      – Validate implementation against simulation
    • Field test
      – Equip car with sensors, refinement component, LDM...
      – Lengthy and expensive
      – Validation of whole SAFESPOT architecture

End

• Thank you for your time!
Bibliography


