This project has received funding from the European Union's Horizon 2020 research and innovation programme.
MAVEN
« Managing Automated Vehicles Enhances Network »

European H2020-MG-2014-2015 project
• MG-3.6a-2015 - Safe and connected automation in road transport
• Period: 01-09-2016 ~ 31-08-2019
• Budget: € 3.149.661,-

Focus:
• Platooning on arterial roads in urban areas
  → maximises throughput and efficiency of urban road networks.
  → Esp. at signalized intersections
• Hierarchical Traffic Management
• Traffic light phases negotiated with the demands of the traffic participants (e.g. platoons)

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Objectives

1) Develop a **generic multi-level system** for the **guidance of highly automated vehicles**, applied to dynamic platoons at signalized intersections and signalized corridors.

2) Contribute to the **development of C-ITS communication standards**, in particular message sets for vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) interactions to support vehicle platooning and negotiation and scheduling algorithms.

3) Develop and integrate **ADAS techniques to prevent and/or mitigate dangerous situations** taking into account Vulnerable Road Users (VRUs, e.g. pedestrians and/or cyclists).

4) **Develop, test, demonstrate and evaluate the MAVEN system** for signalized intersections and signalized corridors.

5) **Produce a roadmap** for the introduction of MAVEN-type systems.
Objective #1:
Development of a generic multi-level system for the guidance of highly automated vehicles.

- Current speed
- Position
- Planned direction
- Greenwave
- Routing

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Objective #2: Contribution to the development of C-ITS communication standards

- Backward compatible extension of CAM message (on Day1 SCH0)
  - For 12V interaction (explicit probing)
    - Includes info needed by TLC (platoon/vehicles intentions + features)
    - Includes feedbacks on advices compliance
  - For platooning initialization
    - Carries info for CAVs to detect opportunities for building/joining a platoon (e.g. Based on same expected route, desired speed, etc)

- Shorter CAM tx on a parallel SCH with higher frequency [10-30Hz]
  - For platoon control (e.g. Planned path, position, speed, acceleration, heading)
  - For platoon management (e.g. joining, brake-up, termination flags)

- SPAT and MAP extensions
  - Lane Specific GLOSA

- Collective Perception Message
  - Vehicles and infrastructure share sensor and detected object data

- Lane Advice Message
  - Vehicles get individual lane advice information

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Objective #3:
ADAS techniques to prevent and/or mitigate dangerous situations.
Objective #4:
Develop, test, demonstrate and evaluate the MAVEN system.

- Platoon Logic Development
- Simulation of
  - Platoons (forming, breaking...)
  - Lane-based queue length estimation
  - Agent-Aware GLOSA (AGLOSA)
  - Routing algorithms
  - Multi-Intersection Optimization

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Objective #4:
Develop, test, demonstrate and evaluate the MAVEN system.

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Objective #5: Roadmap for the introduction of MAVEN-type systems

- Survey with 209 respondents
- SUMO Simulations of Braunschweig, Helmond and Prague
- Real world trials with questionnaires
- Road authority & City interviews

Transition Roadmap & Whitepaper “Management of Automated Vehicles in a Smart City Environment”

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Some brief results...

- People have high expectations on the positive impact of automated vehicles (AVs)
  - Over 80% of the respondents believe that CAVs will decrease the number of traffic accidents
  - About 70% of the respondents expect improvements in traffic congestions.
  - Most customers would pay a bit extra, up to 5000€ for a car with automated features.
- Proper integration of AVs into a road infrastructure has clear positive effects on
  - Emissions, Travel time, Traffic flow harmonization, Safety and many others
- Already lower levels of penetration influence positively the travel experiences
  - 20% penetration (Effect of Speed change advice and Green wave optimization)
    - - 17,3% delays
    - - 10,9% queue length
    - - 0,4% CO2
- Different algorithms can aim at contradictory objective functions, so they must be combined carefully
  - For example, minimizing delay does not necessarily lead to most harmonized traffic flow.
- The transition phase however plays an important role
  - The transition period (i.e. lower penetration rate of AVs) will strongly influence the impact
  - Other impacts of AVs depend on policies that are enabled by automation (car sharing, electro-mobility, and others)
Thanks for listening!

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