Driver needs and behavior in automated traffic

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Together with:
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The Drive2theFuture project

- **Full project name:** Needs, wants and behaviour of “Drivers” and automated vehicle users today and into the future

- **Partners:**
  31 participants from 13 countries

- **Duration of the project:**
  36 months (May 2019 – April 2022)

- **Operational Program:**
  H2020 “Smart, Green and Integrated Transport” Work programme 2018-2020MG-3.3-2018: "Driver" behaviour and acceptance of connected, cooperative and automated transport; Research and Innovation Action (RIA)
Background

- Automation brings revolution to the transportation systems
- All transport modes are moving towards the era of automation
- Penetration rate of autonomous vehicles depends on:
  - User acceptance
  - HMI compliance to user needs
  - Safe behavior and interaction with other road users
  - Efficient training of AV operators
From skills to training programs

- Clustering
- Identification
- Development
- Testing

User Clusters → Skills and Knowledge → Training Needs → Training tools and Programs → Pilot Tests
Modeling and Impact Assessment

Methodological framework

Platform

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Behavioral Traffic Modelling

- Two-layer microscopic AV behavioral model
  - **Upper layer**: interaction between the driver/user and the vehicle
  - **Lower layer**: interaction of the vehicle with the road environment

- Interaction between vehicle and the surrounding traffic:
  - **Reinforcement learning algorithm**
  - Real **human driving trajectories** collected via unmanned aerial vehicles (drones) in urban environment (city of Athens)
  - Quantification of **safe driving profiles** parameters

- Interaction between vehicle and pedestrian:
  - **Inverse Reinforcement Learning algorithm**
  - **Automated** vehicle (Level 3) and pedestrian
  - Data collected from **virtual experiment** (FZI pilot in Germany)
Pilots

- Development of 3 pilot phases:
  - Phase I: Setting the scene
  - Phase II: Iterative development, verification and optimization, initial demonstrations
  - Phase III: Final, wide-scale demonstrations and training pilots across Europe

- Development of HMIs tested during the pilots

- All transportation sectors and modes

- Interaction with non equipped vehicles and vulnerable road users

- Different levels of automation

- Assessment of AV’s behavior and experience of the users and the participants
  - User surveys – Questionnaires, Interviews
  - Direct observations
  - Sentiment Analysis
Scientific and Social Impact

- **Humanizing AVs** through the formulation of safe and accepted driving profiles during the interaction with other road users
- Development of a **complete simulation suite**, incorporating a number of innovative tools
- Development of **HMI toolkit**, including a variety of tools → a **holistic solution for HMI** development tested in the pilots
- Identification of **skills and knowledge** for an AV operation result in designing targeted **training programs** for all sectors and modes
- Raise **public acceptance and market take up** of automation services based on the pilot outcomes
Future Challenges

- Enhanced **AV behavioral models** to include diverse roadway conditions and driving profiles

- **Extension** of the models and simulation from passenger cars to **other transport modes**

- Development of **HMIs** capable of handling any **emergency situation**

- Personalized **training programs** for all modes targeted to different users.

- Improved **pilot tests** for autonomous transportation
  - Larger testing period and network coverage
  - Participation of many different user classes
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