Holistic Approach for Driver Role Integration and Automation Allocation

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Together with:
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The HADRIAN project

- **HADRIAN**: “Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs”

- **16 project partners** from 9 EU countries

- **Duration**: 42 months (December 2019 - May 2023)

- **Framework Programme**: Horizon 2020 - The EU Framework Programme for Research and Innovation - Mobility for Growth
Background

- Driving on highly automated levels offers improved safety by reducing human error together with the reduction of stress.
- Realistic AD (i.e., Automated Driving) systems lead to novel driver roles in which the driver needs to cope with unfamiliar transitions.
- An unfamiliar transition (e.g., AD level transitions) requires well-designed human-machine interfaces (HMIs) to allow the increase of driver awareness.
- HMIs require a "fluid" interaction between driver, vehicle and environment/infrastructure, which guide all types of drivers through different levels of AD.
HADRIAN Objectives

- Development and demonstration of **safe and acceptable AD transitions** via fluid-HMI

- Demonstration of **calibrated trust** in AD and AD level transitions

- **Recommendations and guidelines** for Human-Systems Integration for AD system development
HADRIAN Methodology

- Define a concrete and balanced field of **human-system contextualization** by reviewing the current mobility needs and expectations.

- Analyze the **constraints** related to the initial AD applications in order to formulate detailed AD applications with realistic implementation assumptions and human factors limitations.

- Explore the **driver role concepts** that are facilitated by novel HMI concepts such as fluid HM interactions.

- Conduct the selected **field demonstrations** and test the developed solutions.
Safety and Impact Assessment

- NTUA contributes to several Work Packages and leads the Work Package of Safety and Impact Assessment.
  
  - **Safety** focuses mainly on the operator and passengers’ active safety by measuring traffic conflicts and deviations from normal driving.

  - **Impact** refers to subjective beliefs and attitudes of the driver that potentially affect driving performance

- A holistic methodology based on KPIs was designed in order to enable the assessment of the enhancement offered by the HADRIAN innovations.
Assessment Methodology

- At the first stage, a list of KPIs was created based on the literature review along with a hazard identification procedure in the driving scenarios.

- Focus is given on Safety:
  - Accident and Safety Risk, Driver's Emotions, Driver's Perception, Driving Conditions, and Driver's Health

  and Impact:
  - Comfort, Acceptance & Usability, Trust, Reliability, and Accuracy

- A virtual assessment was conducted at a later stage by exploiting videos from the driving simulator.
Scientific and Social Impact

- Creation of innovative solutions, concepts and algorithms for a safe human-machine interface of highly automated driving functions and for safe and controlled transitions between automation levels.

- Reduction of the risk of driver behaviour related incidents by ensuring that driver is adequately alerted and engaged when the highly automated vehicle meets unexpected situations.

- Support of the "Vision Zero" objective by preventing road accidents and human errors.

- HADRIAN also addresses issues related to the environment by enabling car-sharing and last-mile solutions with AD vehicles.
Future Challenges

- Concrete **guidelines** for introducing Human-centered designs into autonomous vehicles to strengthen safety during driving.
- The creation of sufficiently safe smart vehicles that can respond to the complexity and dynamics of the road traffic environment.
- Special focus is required to be given regarding planned or unplanned transitions (e.g., takeovers) between AD levels.
- Investigation and support of smart road infrastructure to assist the drivers during the AD level transitions.
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