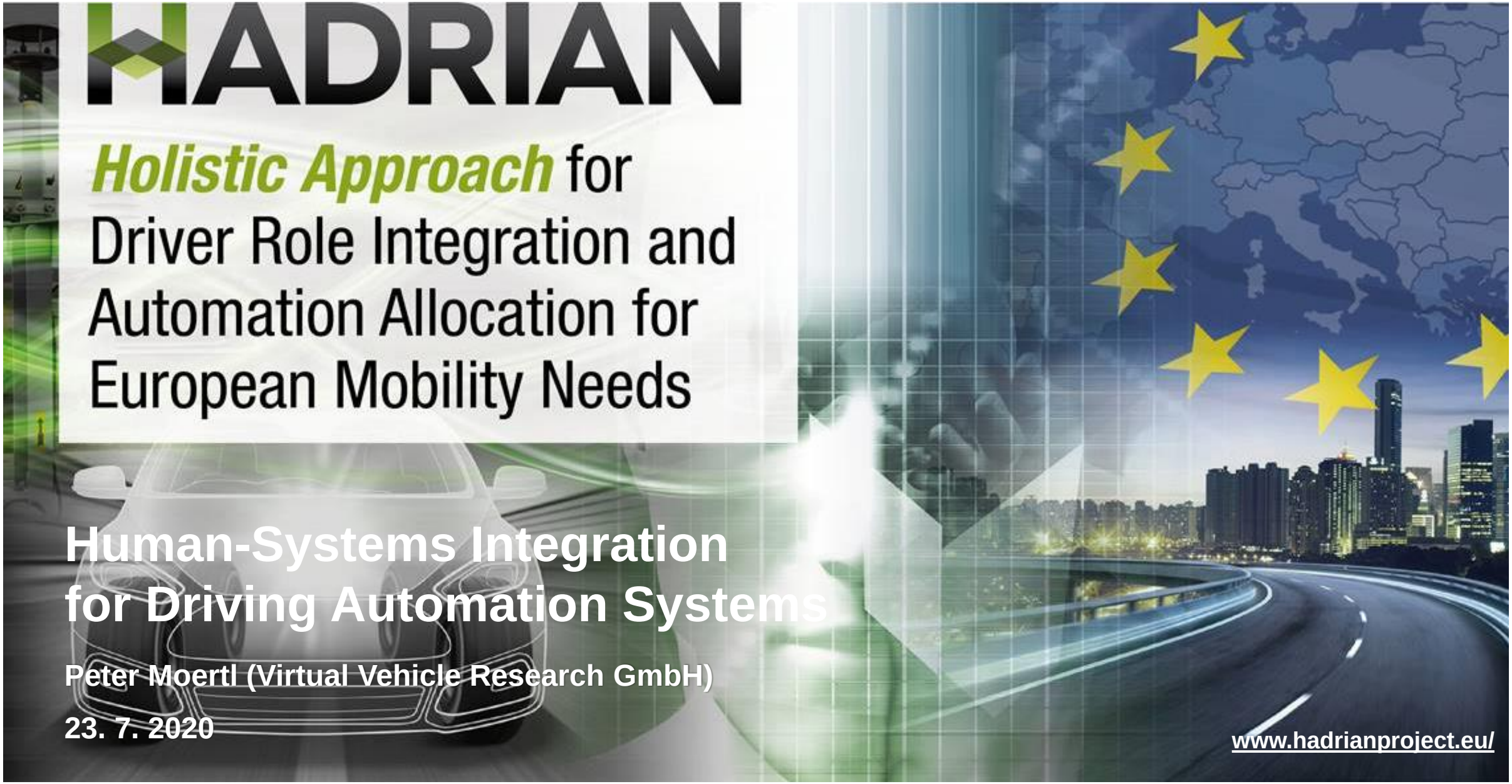

Human-Systems Integration for Driving Automation Systems

Peter Moertl (Virtual Vehicle Research GmbH)

23. 7. 2020

www.hadrianproject.eu/

HADRIAN has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 875597.

OVERVIEW

HADRIAN
Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

Give a general overview of current HSI discipline that is currently emerging

HSI challenges for automated driving

Introduction to the HADRIAN approach

In the remainder of this session and the next one, presenters will present different facets on this topic

HUMAN SYSTEMS INTEGRATION

- Integrating humans and technical systems has a long tradition
  - **Human Factors Engineering (HFE): since World War II**

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HUMAN SYSTEMS INTEGRATION

- Integrating humans and technical systems has a long tradition
  - Human Factors Engineering (HFE): since World War II
  - Human Computer Interaction (HCI): since 1980s
  - Human Centered Design (HCD): since 1990
  - **Human Systems Integration (HSI): since 2000's:**
    - INCOSE Working group to define HSI: https://www.incose.org/incose-member-resources/working-groups/analytic/human-systems-integration
  - HSI is the transcultural and transdisciplinary technical and management process used **to ensure that the human elements of a system are appropriately addressed and integrated within the wider systems engineering lifecycle** and management approach to a project.

PRINCIPLE INTEGRATION PROBLEMS BETWEEN HUMANS AND DRIVING AUTOMATION

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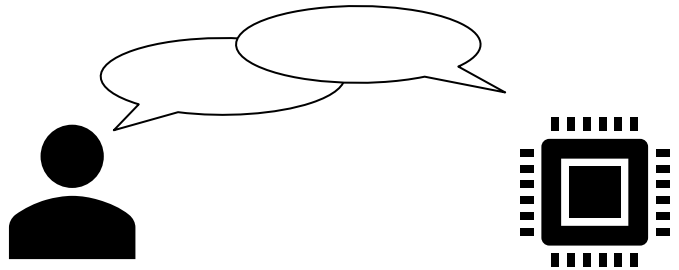
- Monitoring automation
  - Humans are good controllers but bad monitors, e.g. Endsley (2018)
- Switching responsibilities
  - Driver out-of the loop problem, e.g. Hancock (2019)

Watching versus doing

- Collaboration between human and automation
  - Trust calibration, e.g. Hoff & Bashir (2015)
- Understanding what is going on now
  - Mode awareness, e.g. Abbott et al. (2013)
- Understanding what will happen next
  - Indicating intent, e.g. Merat et al. (2018)

Understanding Each Other



HADRIAN APPROACH FOR HSI IN AUTOMATED DRIVING

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Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

- Human needs as starting points for system development
- Holistic versus solipsistic system definition
- Iterative design and risk and opportunity management
- Naturalistic research with virtualization methods

PROJECT HADRIAN

- **Response to call** H2020-DT-ART-2018-2019-2020
  - Human centred design for the new driver role in highly automated vehicles
  - **Coordinator**: VIF
  - **Duration**: 42 Months
  - **Start**: Dec 2019
  - **Funding**: 8 Mio EUR

MAIN HADRIAN INNOVATIONS

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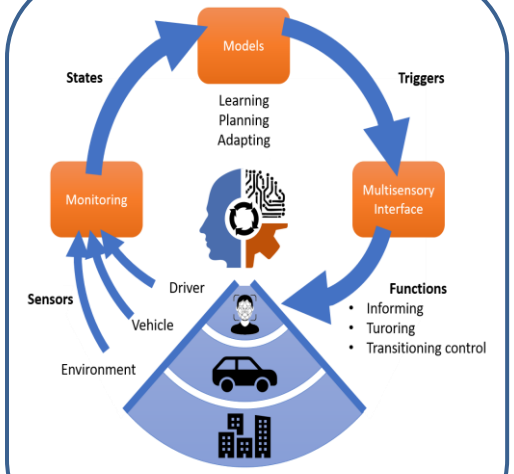
Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

Holistic Design Approach

Investigate Driver Role per SAE J3016 and possible Extensions



Fluid Interactions

MOBILITY NEEDS AS START FOR CONCEPT DEVELOPMENT

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- Mobility needs (e.g. Diehlmann & Häcker, 2013) as starting points for identifying how to integrate automated driving to improve people's lives

Harold

- Used to drive his whole life
- Recently received driver license restrictions
- Wants to stay mobile!

Sven

- Very good truck driver, hard to replace
- Stands under lots pressure while experiencing long stretches of monotonous driving
- Long times away from family

Florence

- Time pressure to run successful business
- Work during transport as productivity gain
- Public transport options limited and lack of confidentiality

HADRIAN INNOVATIONS FOR DRIVING AUTOMATION SYSTEM (DAS)

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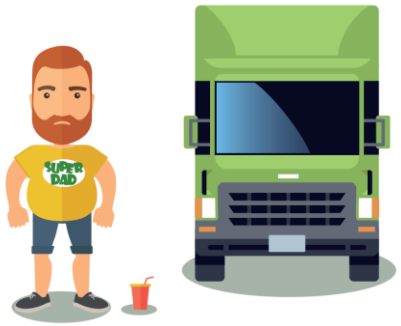
Harold
- Used to drive his whole life
- Recently received driver license restrictions
- Wants to stay mobile!

"DAS supports Harold so he can keep driving manually"
- Information assistant visually simplifies driving tasks so that driver can continue manual driving
- Guarding angel safety functionality
- Driver monitoring



Sven
- Very good truck driver, hard to replace
- Stands under lots pressure while experiencing long stretches of monotonous driving
- Long times away from family

"DAS to keep Sven connected, engaged, and optimize his time away"
- Active driving automation suggestion
- Predictable automated driving at level 3 and 3 + driving
- Driver monitoring and active, dynamic functionality offering

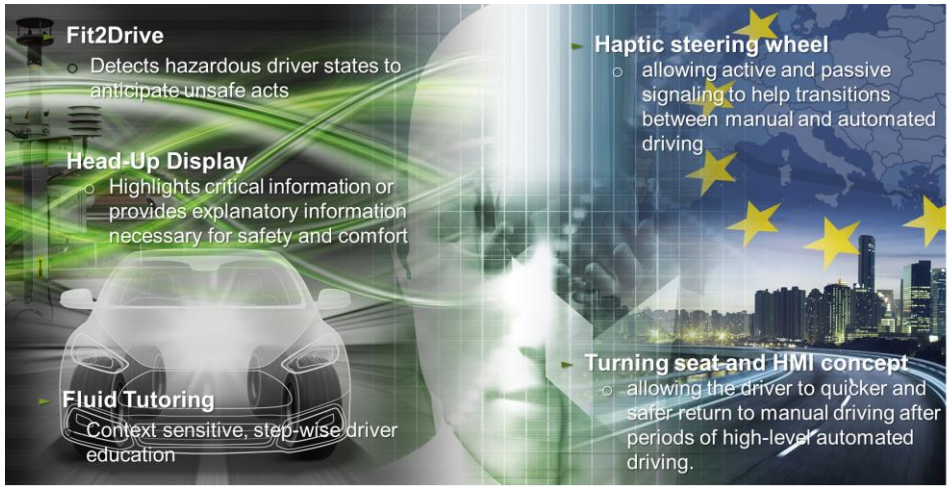
Florence
- Time pressure to run successful business
- Work during transport as productivity gain
- Public transport options limited and lack of confidentiality

"DAS tailored to predictably allow specific working tasks during automated driving"
- Plannable work through automated route selection
- Predictable automated level 3 and 3 + driving
- Driver monitoring and active, dynamic functionality offering

NEXT STEPS

HADRIAN
Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

Vorgangsname	2020 Q4	2021 Q1–Q4	2022 Q1–Q4	2023 Q1–Q4
Project HADRIAN				
WP1 – Technical, human and environmental constraints for driver role characterization	VIF			02.08
WP2 – Development of Driver State Monitoring		VIF		31.01
WP3 – HMI Development and Evaluation	VIF			31.01
WP4 – Field Demonstration	LUS			03.04
WP5 – Safety and Impact Assessment				
WP6 – Ethical and legal considerations	TUA			03.07
WP7 - Project Management & External Liaison	TOF			30.06







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REMAINDER OF THIS SESSION

HADRIAN
Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

The following presentations in this session provide background from several HADRIAN consortium partners

- Age-related Differences in the Interaction with Advanced Driver Assistance Systems - A Field Study (VIF): Neuhuber, Lechner, Emre, Stocker, Kubicek
- A fluid-HMI approach for Haptic Steering Shared Control for the HADRIAN Project (Tecnalia): Vaca-Recalde, Marcano, Sarabia, González, Perez Diaz
- Fluid Interface Concept for Automated Driving (ViF): Pretto, Mörtl, Neuhuber
- Evaluating HMI-Development Approaches from an Automotive Perspective (IKA): Bavendiek, Ostad, Eckstein

Two more HADRIAN partners will present in HSI session 2 just after this one (plus other presenters):

- Toward Driver State Models that Explain Interindividual Variability of Distraction for Adaptive Automation (ViF): Höfler, Mörtl
- Hand-Skin Temperature Response to Driving Fatigue: an Exploratory Study (University of Granada): Gianfranchi, Di Stasi, Diaz-Pedra

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HADRIAN
Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

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