TU DELFT TRANSPORT & PLANNING

Meaningful human control for safer and more accountable automated driving

Lucas Elbert Suryana
is studying *meaningful human control*

Supervisors
- Prof. dr. ir. Bart van Arem
- Dr. ir. Simeon C. Calvert
- Dr. Arkady Zgonnikov

When?
April 2022 – April 2026

What?
Our goal is to design and evaluate an automated driving control system (ADCS) that adheres to the concept of Meaningful human control. We will design the ADCS in such a way that it can be deployed safely, controllably, and responsibly.

How?
We are developing a framework to identify human intentions that can influence automated vehicle behaviour and assess their impact. We will use this framework to design a data collection method to recognize these intentions during driving operations. Then, we will integrate these human intentions into the decision-making process of the ADCS and feedback control algorithm. Finally, we will evaluate the compliance of our approach with the concept of Meaningful human control.

Why?
Our project will operationalize the concept of Meaningful human control through an ADCS, which will impact the future development of automated vehicles. By incorporating human intentions, we enhance transparency in the decision-making process of automated vehicles, leading to safer and more accountable rides.

What is Meaningful human control?

Meaningful human control is the idea that humans, not computers or algorithms, should ultimately remain in control and be morally responsible for all the decisions made by autonomous systems. For autonomous systems to be under meaningful human control, they must fulfil the condition of tracking and tracing.
Tracking refers to the ability of autonomous systems to monitor and evaluate their behaviour according to the predetermined goals or values set by humans (reasons).
Tracing refers to the ability of autonomous systems to attribute actions and decisions back to one or more human agents who were involved in its design, development, operation, or use.

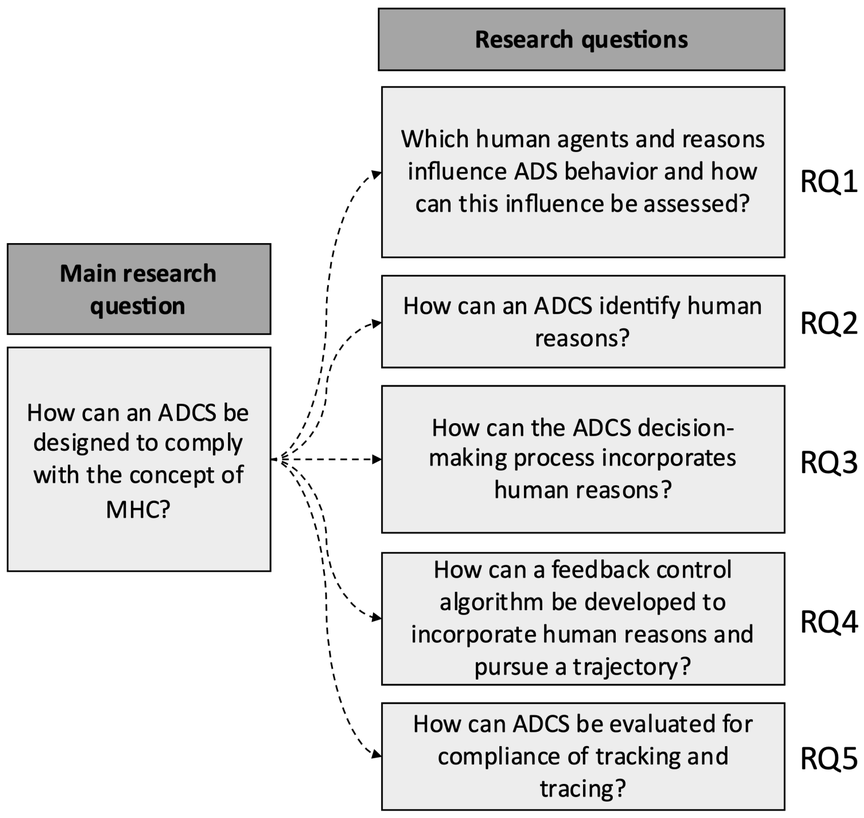
TU Delft Delft University of Technology

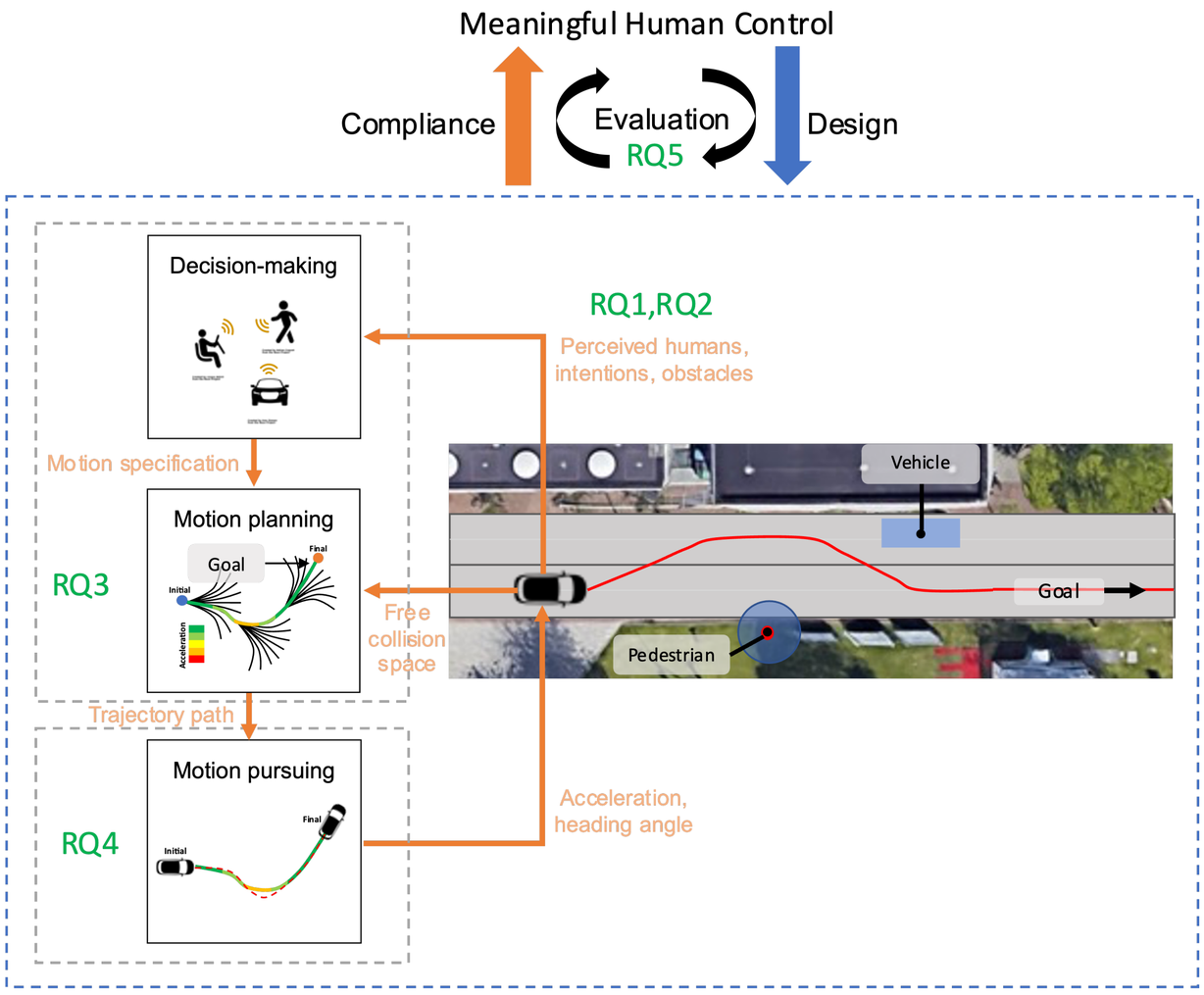
DiTT Lab Data Analytics & Traffic Simulation

lpdp

Research Questions

To achieve our objective, we have formulated a main research question along with its corresponding sub-research questions.





Methodology for RQ1 & RQ2

Questionnaire

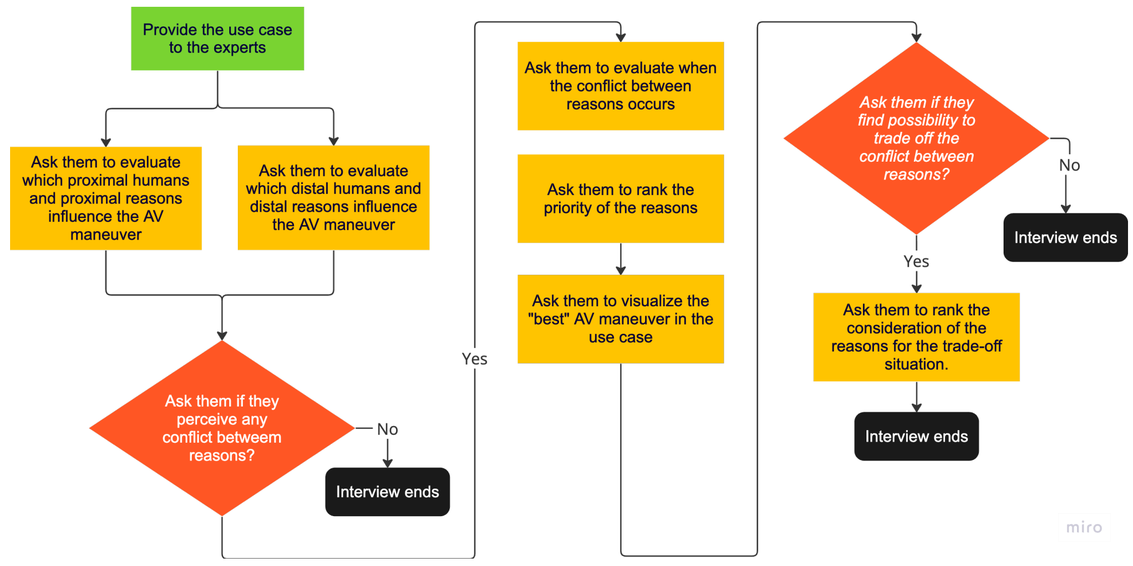
Preparing ***a mixed-methods questionnaire*** for a specific case study that examines the potential conflicts of reasons among human agents.

Expert perspective - n
Expert perspective - 2
Expert perspective - 1

Conducting interviews with the experts in ***human behaviour***, ***traffic regulation***, and ***AV***

Qualitative & quantiative analysis

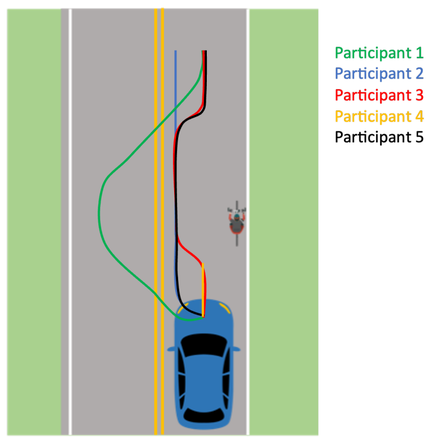
Analyzing ***the expert's perspective*** on how an autonomous vehicle ***should plan and execute maneuvers*** based on the MHC concept in a certain use case.



miro

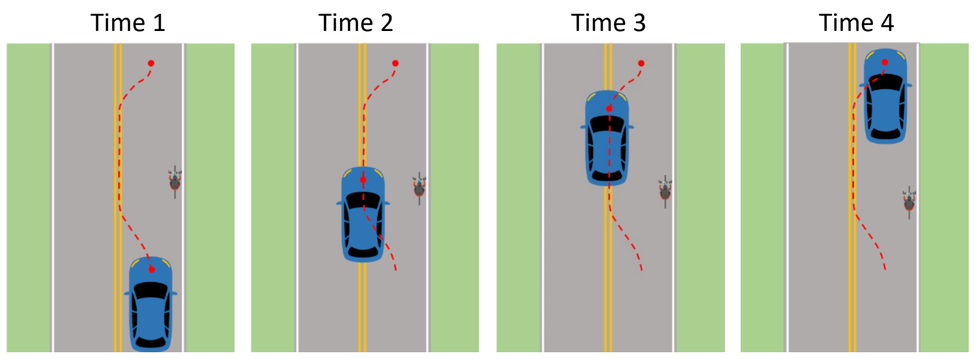
Pilot Results for RQ1 & RQ2

Considering the interests of the AV driver, cyclist, and road policymaker (for simplicity), in addition to establishing discrete prioritization of human interests from previous section, what should be a maneuver that is a compromise of those all interests?



Considering the interests of the AV driver, cyclist, and road policymakers (for simplicity) **in the context of the video**, whose interests do you think should be prioritized?

Participant	First priority	Second priority	Third priority	Reasons
1	Cyclist	AV driver	Road policymakers	**Cyclist** is vulnerable **AV driver** is also vulnerable but safer compared to the cyclist **Road policymakers** have little experience with AV presence, so it will take time for them to establish good policies
2	Cyclist	AV driver	Road policymakers	**Cyclist** is vulnerable, safety is more important than travel time **AV driver**, the problem is from the government side because they don't provide a bike lane. **Road policymakers** needs to provide a bike lane
3	Road policymakers	AV driver	Cyclist	**Road policymakers** rule should be obeyed. Every traffic participants should stay on the designated line. **AV driver** could overtake the cyclists **Cyclist** violates the traffic rules. He does not have right to ride
4	Cyclist	Road policymakers	AV Driver	-
5	Cyclist	Av driver	Road policymakers	**Cyclist** is vulnerable, safety is more important than travel time **AV driver** when crosses the double yellow lines will not risk any humans **Road policymakers** because it's okay to break the rules sometimes



Please provide a rough estimate for four different point in time from figure on the side to support your assessment. Assume we have four points in time: time step 1, time step 2, time step 3, and time step 4."

Humans	Interests
AV driver	To overtake the cyclist
Cyclist	To bike with a sense of safety
Road policymaker	All traffic participants should stay on the designated lane