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14th International Road Safety Conference

GAMBIT 2023

NEW DECADE - NEW ACTIVITIES - NEW TECHNOLOGIES

Gdańsk University of Technology, 29-31 May 2023

HONORARY PATRONAGE

Ministry of Infrastructure

GDDKiA

KRAJOWA RADA ZARZĄDÓW DRÓG POWIATOWYCH

Konwent Dyrektorów Zarządów Dróg Wojewódzkich

MEDIA PATRONAGE

magazyn Autostrady Budownictwo drogowo-mostowe

Drogowo-Mostowy.pl

budownictwo inżynieryjne.pl

Nowoczesne Budownictwo Inżynieryjne

drogownictwo

WORKSHOP ORGANIZERS

EuroS@P EUROPEAN ROAD SAFETY PARTNERSHIP

InfRO@D EUROPEAN DIGITAL EDUCATION IN RIM

Erasmus+

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New Decade – New Activities – New Technology

Gdansk University of Technology, 29-31 May 2023

VIRTUAL REALITY AND SIMULATION AS A TOOL

Carmelo D'Agostino

Carl Johnsson

Hampus Norén

Lund University (LTH) - Sweden

LUND UNIVERSITY

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The VR Traffic Safety Hub at Lund University

- a PhD student and a Postdoc in Transport Engineering
- a Postdoc in behavioral science
- a lab technician
- …and some external help

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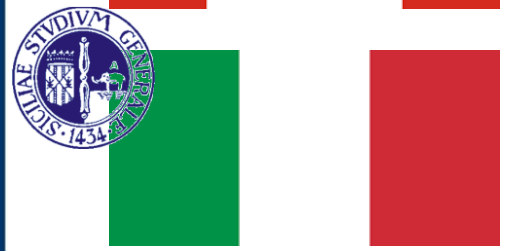
…me Carmelo D'Agostino

Ryerson University



University of Catania

Accident modeling and road safety assessment

Lund University

Virtual Reality Traffic Safety Hub

Non accident indicators

Supervisor of 8 PhDs
Coord. of 3 res. projects

Leader of the traffic safety group (5 seniors and 3 PhDs)

the conventional approach

Accidents
Serious conflicts
Slight conflicts
Potential conflicts
Encounters
Fatal
Severe injury
Slight injury
Damage only

Hydén, 1987

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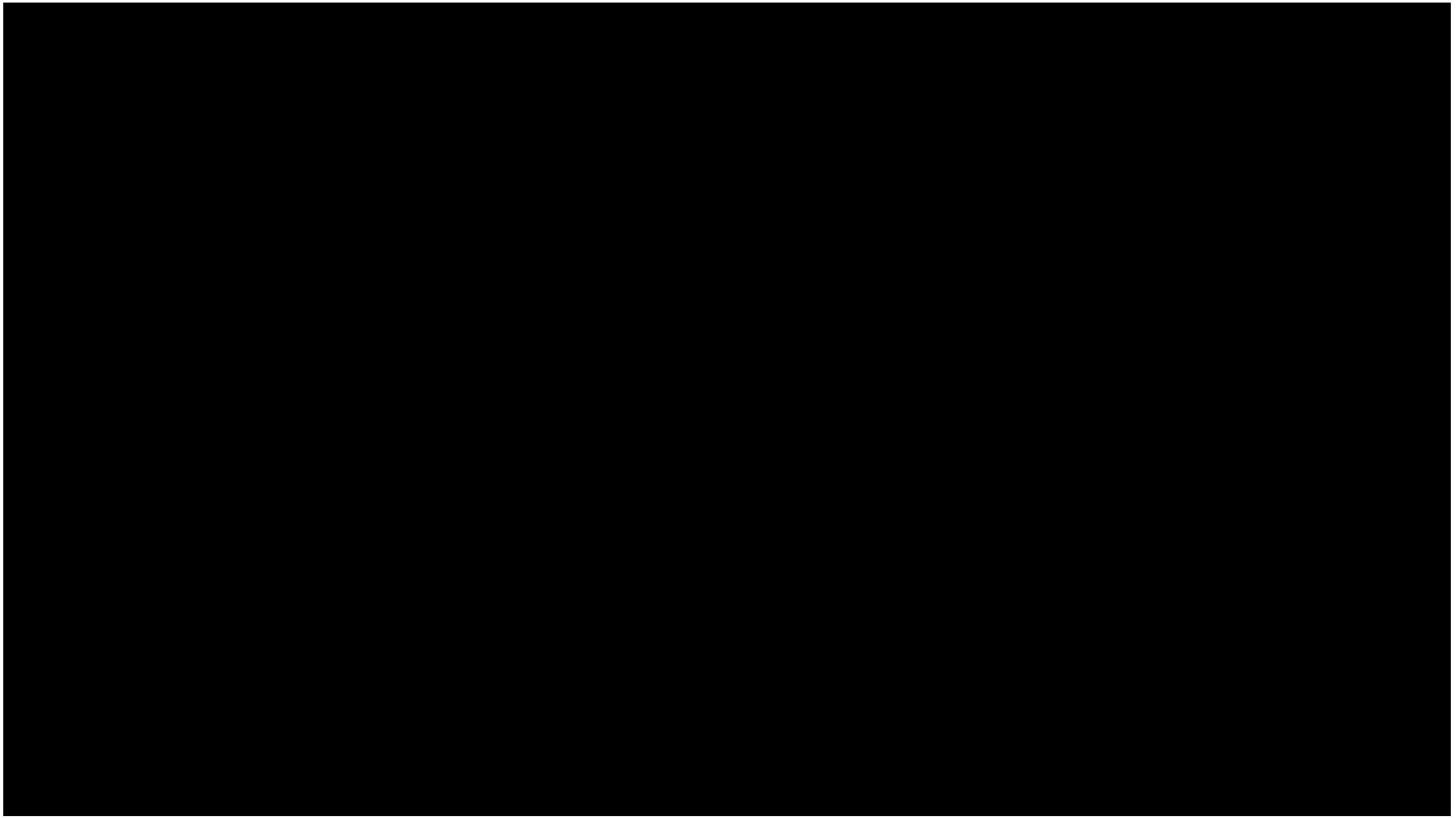

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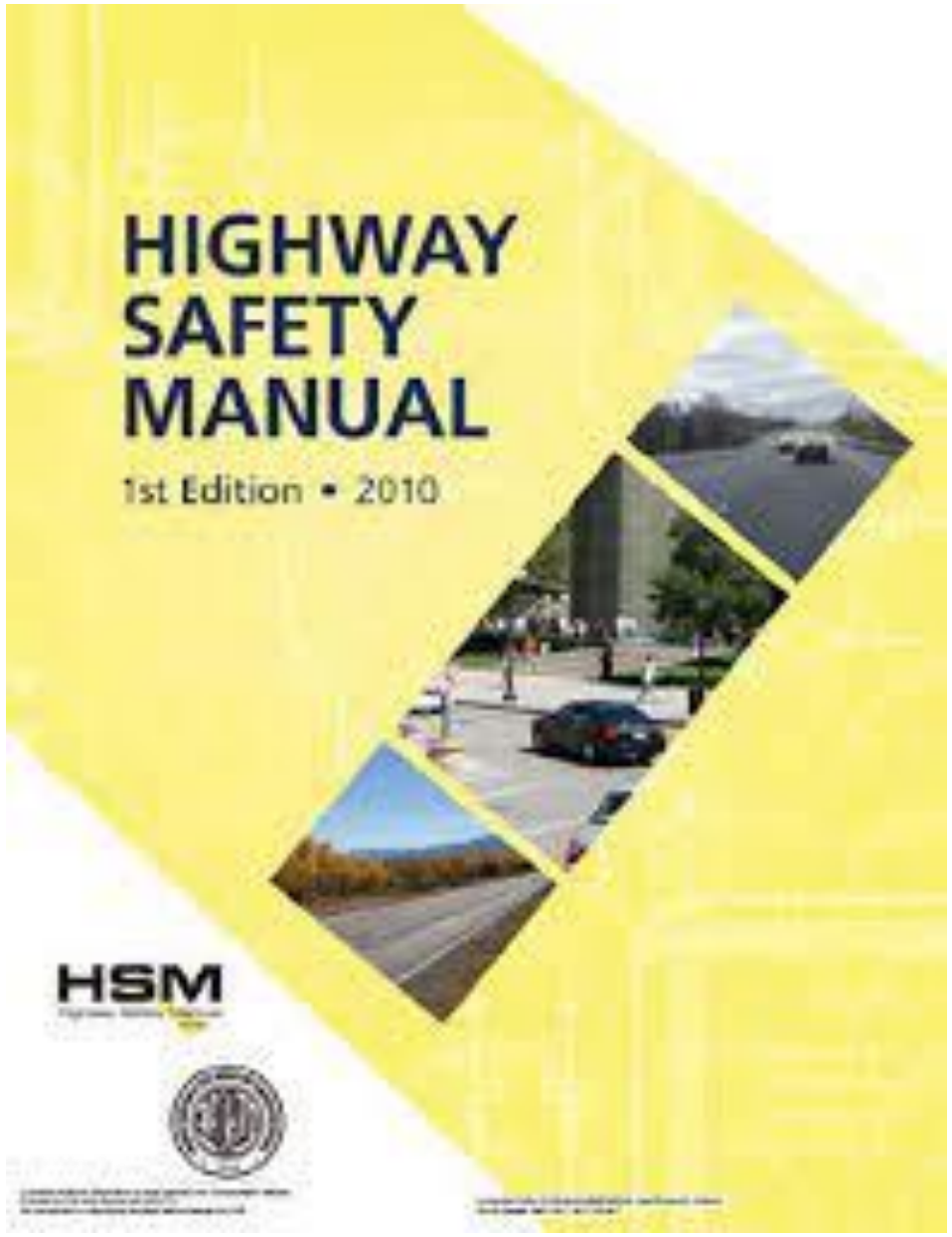

Or accident analysis

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Why VR?

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Why VR?

To investigate what is it not possible to do with observational studies

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Automated Vehicles hold great promises but…

- Policies and legislation hindrance

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Automated Vehicles hold great promises but…

- Policies and legislation hindrance

- Unknown implications for road infrastructure

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Automated Vehicles hold great promises but…

- Policies and legislation hindrance
- Unknown implications for road infrastructure
- Accident-based approaches are inadequate

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Automated Vehicles hold great promises but…

- Policies and legislation hindrance
- Unknown implications for road infrastructure
- Accident-based approaches are inadequate
- No data on automated vehicles in open traffic

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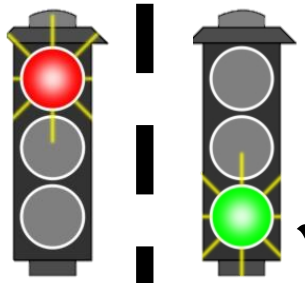

With simulation

✓New behavioral models to fully explain interactions

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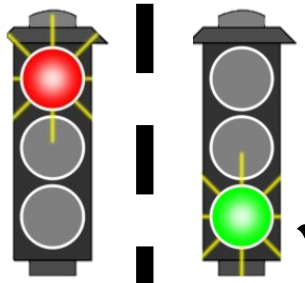

With simulation

- ✓New behavioral models to fully explain interactions
- ✓New accident prediction method

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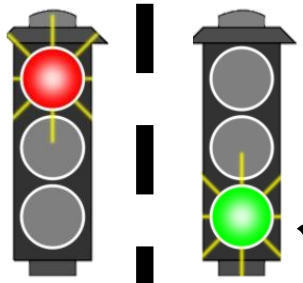

With simulation

- ✓New behavioral models to fully explain interactions
- ✓New accident prediction method
- ✓Adjusted risk concept *(non accident indicators)*

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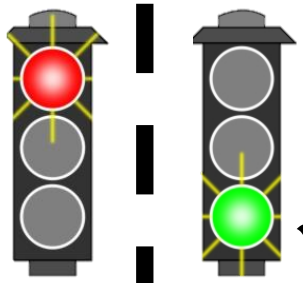

With simulation

- ✓New behavioral models to fully explain interactions
- ✓New accident prediction method
- ✓Adjusted risk concept *(non accident indicators)*

- ✓Multidisciplinary simulation platform

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how?

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HANDLE (FFI)

AdvICE (FFI)

SUperSAFE (ERC)

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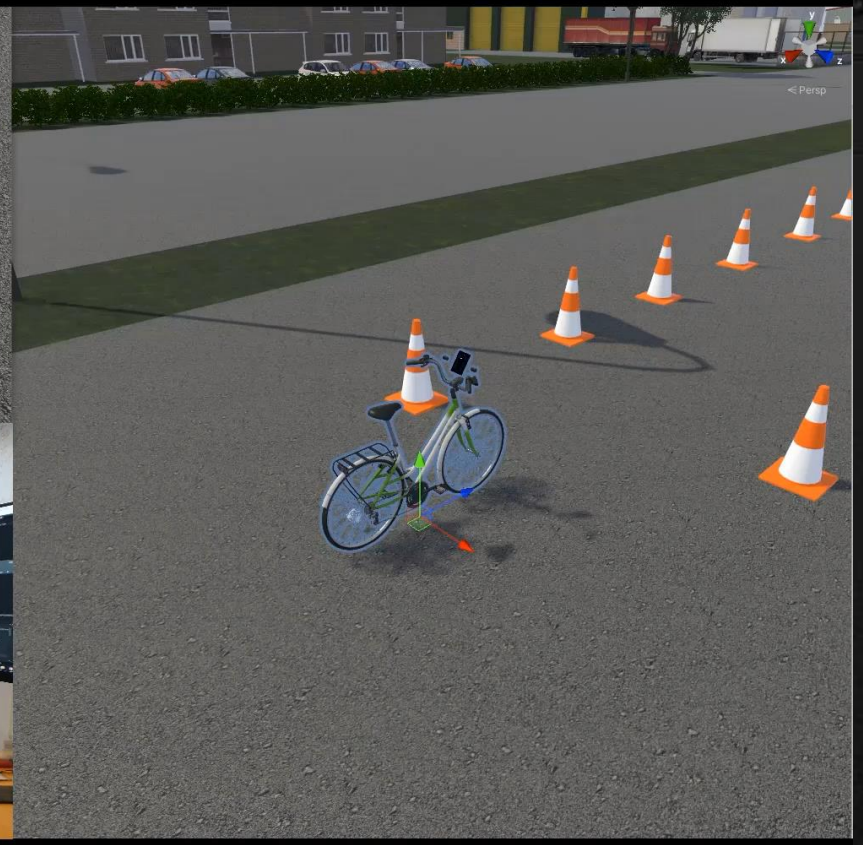
HANDLE & AdvICE

The simulator


Persp

unity

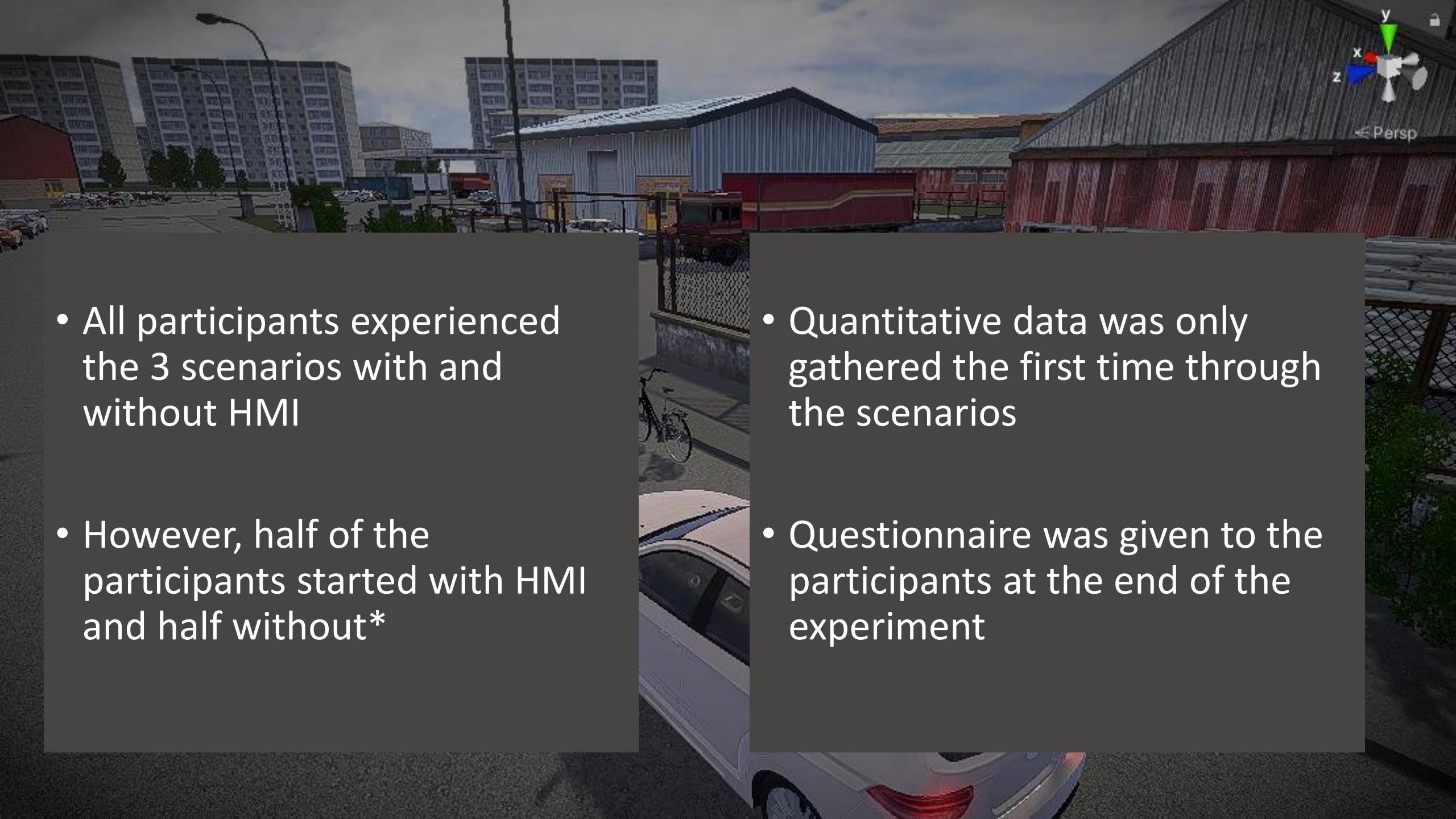
The virtual environment

The handlebar in VR

Scenario 1, car driving straight

Scenario 2, truck turning right

Scenario 3, approaching a pothole



- All participants experienced the 3 scenarios with and without HMI
- However, half of the participants started with HMI and half without*

- Quantitative data was only gathered the first time through the scenarios
- Questionnaire was given to the participants at the end of the experiment

- 24 participants
  (2 aborted due to sickness)
- Mostly students
  (average age of 28)
- 16 men and 8 women

Scenario 2, truck turning right with HMI

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validation

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z
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SUperSAFE

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SUperSAFE

SUrrogate measures for SAFE autonomous and connected mobility

ERC Starting Grant 2021

- Carmelo D'Agostino -

LUND UNIVERSITY

European Research Council

Established by the European Commission

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Selection of use cases and critical sites (WP1)

Real world

Design of the experiments in virtual environment (WP1 - WP2)

Virtual Environment

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Experiments at the driving simulator and virtual reality (WP2)

Experiments

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Randomization of parameters (WP3)

Agent based
Micro simulation

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Project validation in real world (WP3)

Real world validation

With SUperSAFE we aim to…

- Fully explain the interactions considering the *behavioural adaptation*

✓ Enable safe Automated vehicle deployment

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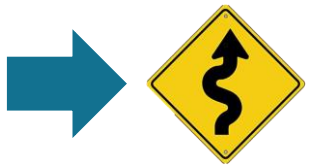
With SUperSAFE we aim to…

- Fully explain the interactions considering the *behavioural adaptation*
- Conduct safety analysis based on *non accident indicators*



- ✓ Enable safe Automated vehicle deployment
- ✓ Save human lives by evaluating safety of infrastructures

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“SUperSAFE will ultimately save human lives by allowing automated vehicles deployment as part of the safe system paradigm”

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Standing on the groundbreaking SUperSAFE knowledge advancement