51 ST CIECA CONGRESS TBILISI
5-8 JUNE 2019

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The International Commission
for Driver Testing

Meaningful Human Control over Automated Driving Systems:
Consequences for Driver Training and Testing

Contents

Introduction

- Who am I?
- How did I end up in Georgia?

Automotive automation vs drivers' training & testing

The paradox of technological innovation

- The Meaningful Human Control project
- The complexity of automation in drivers training and testing: example

Conclusions and discussion

Traffic Safety expert
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- MSc Transport Planning (TU Delft)
- Master Thesis: Introducing ADAS in drivers' training and testing

- Work keywords:

ITS, ADAS, automated vehicles, driver's behavior, impact, safety, driver's perception

Automation vs drivers' training & testing

2040
SAE 4-5

2030
SAE 3

2019
SAE 1-2

not so long ago
SAE 0

The paradox of technological innovation

**How do we best prepare the driver to safely drive these cars?**

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Vehicle automation VS driver's workload

Automation	SAE 0	SAE 1	SAE 2	SAE 3	SAE 4	SAE 5
Human	No automation	Driver assistance	Partial automation	Conditional automation	High automation	Full automation
Skill	128	127-114	114	43	40-0?	39-0?
Rule	254	255-250	250	69*-66	51-29?	29-0?
Knowledge	64	64-80	80	33?!	0-?!	0?

446

444

Heikoop et al. 2019

Blind spot detection system
Lane keeping (assistance) system
Adaptive Cruise Control

operator

driver
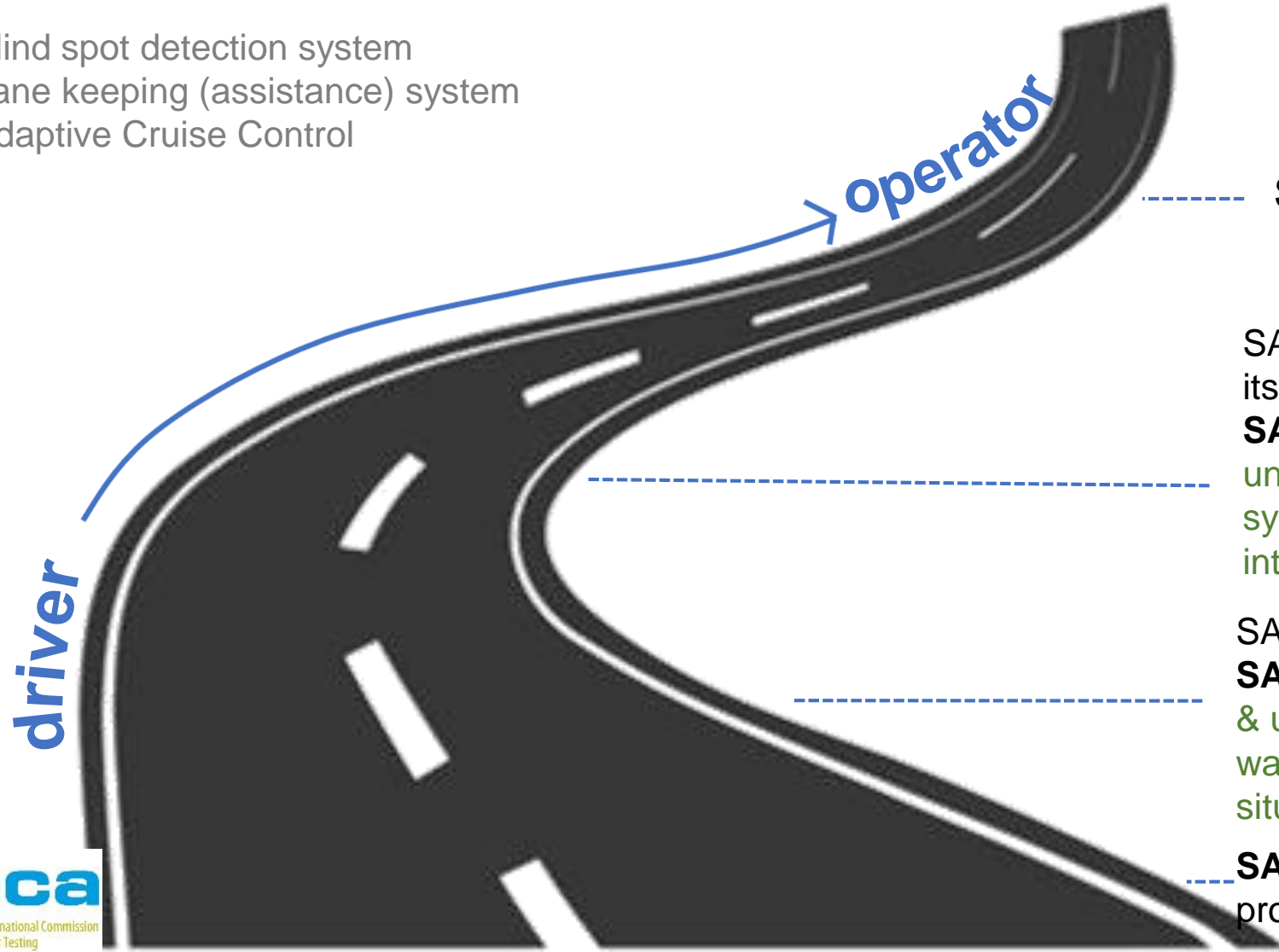
SAE 4-5 **???**

SAE 3 (car carries out overtaking itself):
SAE 0 driving tasks + understanding & monitoring system's operation (interface), intervention

SAE 1-2 (assisted SAE 0 driving):
SAE 0 driving tasks + receiving & understanding system warnings, double checking traffic situation

SAE 0: sensing/detection, perception, projection, decision, execution

Conclusions & Discussion

- Innovation solves challenges

- Innovation brings challenges

- Change in roles: From DRIVER to OPERATOR

- Training & testing: Bigger responsibility than ever

Thank you for your attendance!

> *By 2040, 95% of new vehicles sold will be fully autonomous.*
>
> Wow. 😮

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Appendix

- MHC in relation to GDE matrix
- MHC: impact on driver's training and testing
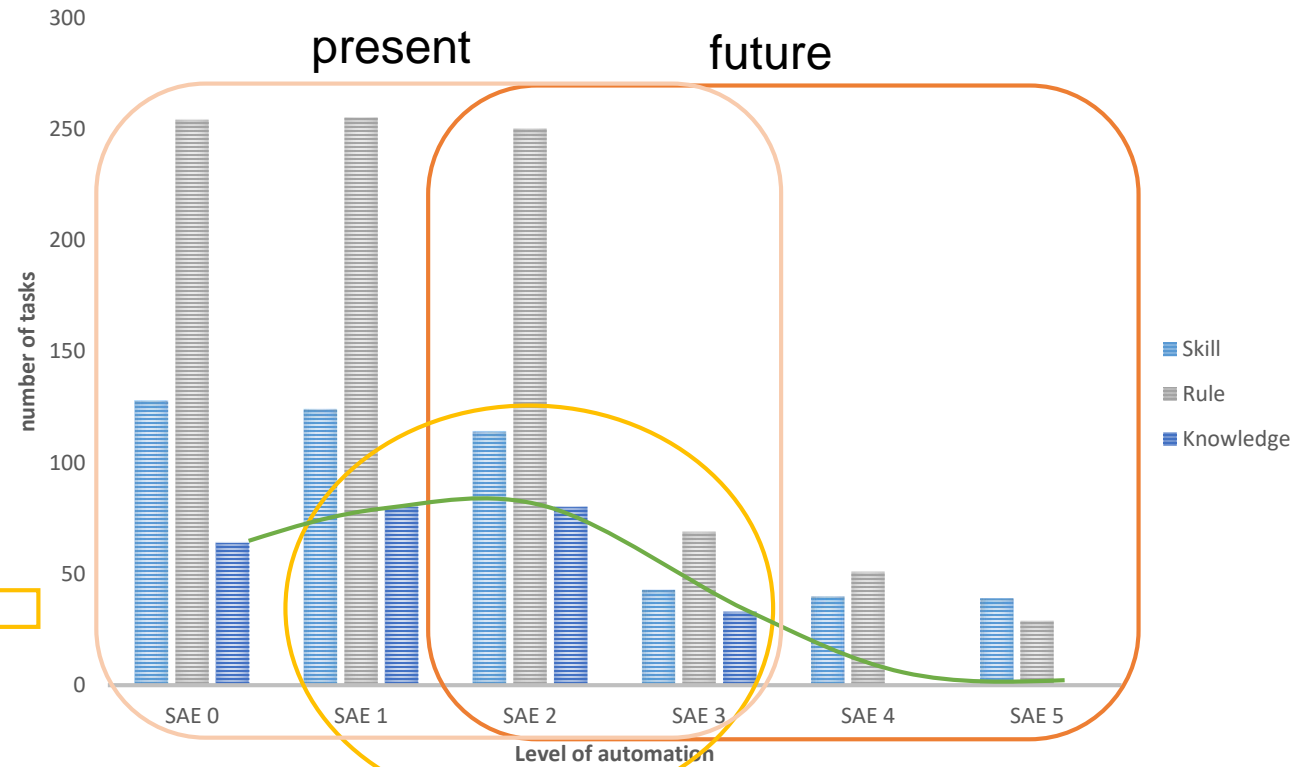
MHC in relation to the GDE matrix

Where in the GDE matrix?

SAE 1-3: The driver as a fall back mechanism

SAE 4-5: ?

Other knowledge based behavior?

MHC: Impact on driver's training and testing

present

future

Driver as
fall-back mechanism

Heikoop et al. 2018