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HIGHLY-AUTOMATED DRIVING – STATE OF THE ART AND FUTURE CHALLENGES

16. INTERNATIONAL TASK FORCE ON VEHICLE-HIGHWAY AUTOMATION, 21. OCTOBER 2012.



Rolls-Royce
Motor Cars Limited

HIGHLY-AUTOMATED DRIVING – STATE OF THE ART AND FUTURE CHALLENGES.

- **Highly-Automated Driving.**
- **Classification of Automated Driving Functions.**
- **Legal and Socio-Economic Issues.**
- **Future Challenges.**
- **Conclusion.**

THE BMW TRACKTRAINER – NORDSCHLEIFE 2009.



THE BMW TRACKTRAINER – BACKGROUND.

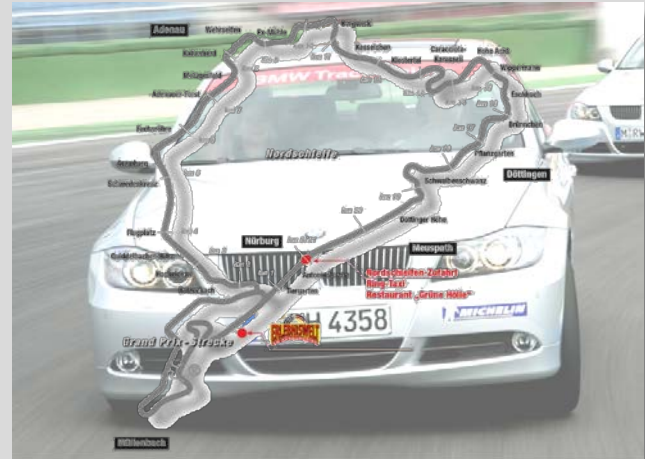
**Idea: intuitive learning of the ideal line on race tracks.
BMW driver training tool.**



**Used on the following racetracks:
Nürburgring, Zandvoort, Valencia,
Hockenheimring, Lausitzring**

**First highly automated lap on the Nordschleife
on 21.10.2009:**

- **Extreme conditions for the vehicle dynamics controller and localization technology**
- **Character of a rural road**



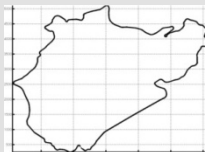
THE BMW TRACKTRAINER – TECHNOLOGY.



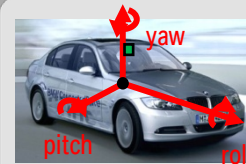
high-precision
GPS-system



camera based
„lane“ detection

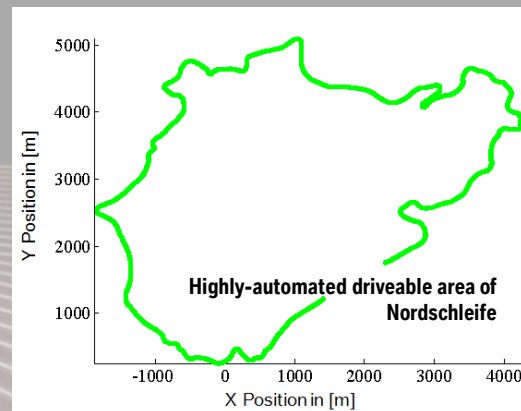
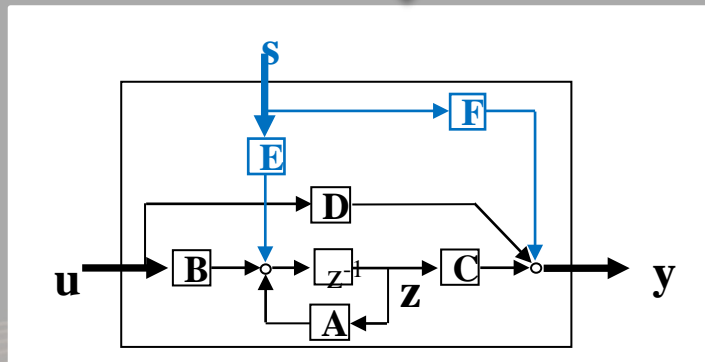


high-precision
digital map



vehicle dynamics
sensors

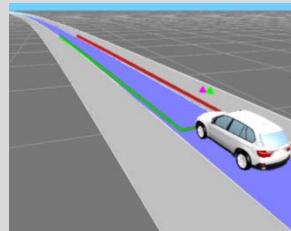
cm-precise, redundant and highly available localization



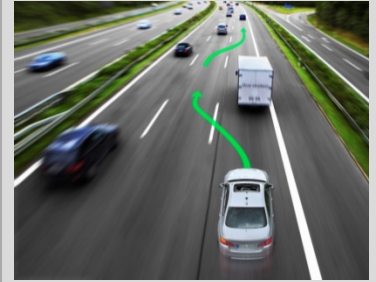
FROM RACE TRACKS TO PUBLIC HIGHWAYS.



Controller of the
BMW TrackTrainer



Localization



Driving strategy



Environment Perception

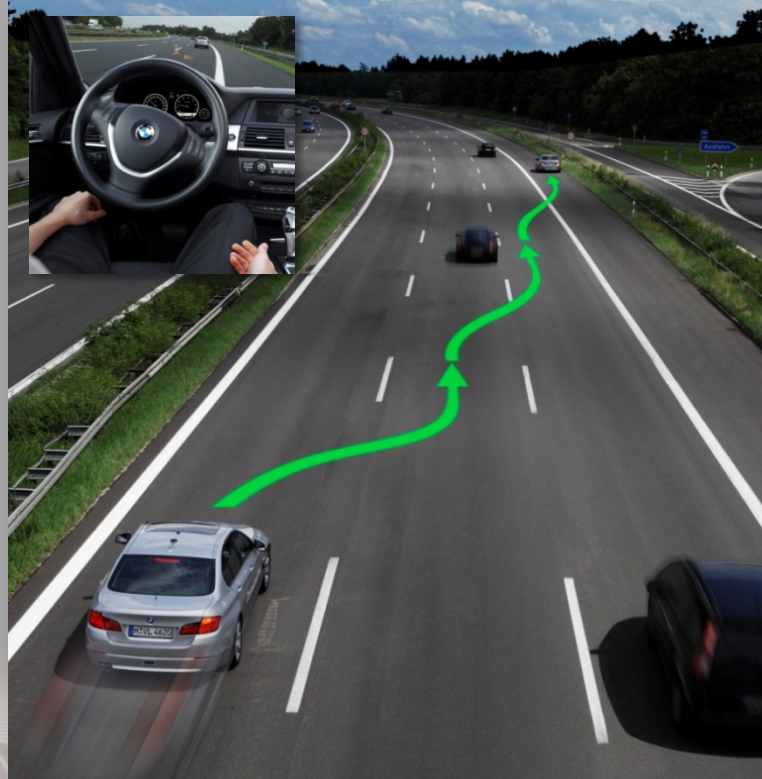
THE EMERGENCY STOP ASSISTANT.

Incapacitated
driver detected

Take over control
of the vehicle

Safely move the vehicle
to a secure location

Immediate notification of emergency
services



Bundesministerium
für Bildung
und Forschung

THE „AUTOBAHN“-PILOT – A RESEARCH STUDY.



TRAFFIC JAM ASSISTANT – BMW i3 CONCEPT.

Traffic Jam Assistant



Combination of Active Cruise Control
and steering assistance



CUSTOMER ACCEPTANCE.

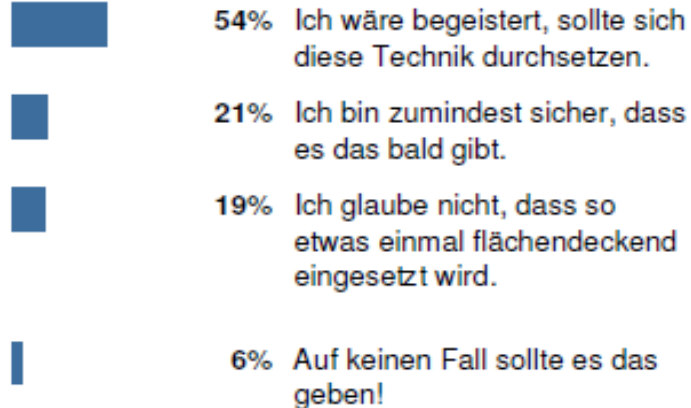
Das Auto der Zukunft braucht keinen Fahrer mehr. Sind Sie dafür?

1504 Stimmen wurden abgegeben.

33%	Nein, nicht mit mir. Ich lasse mir den Spaß nicht nehmen und fahre weiter selbst.	No
67%	Ja, find ich gut. Endlich kann ich die Zeit im Auto sinnvoll nutzen.	Yes

Quelle: <http://www.faz.net/> (Dec. 2011)

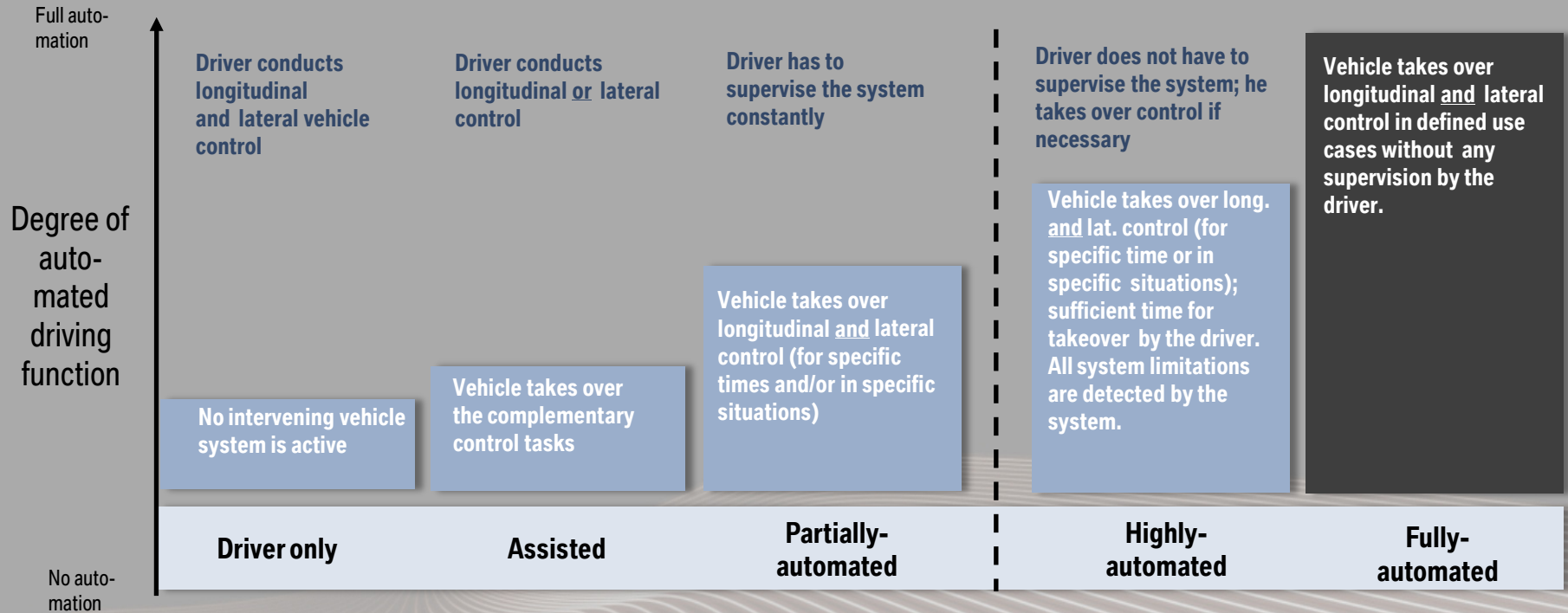
IHRE MEINUNG ZÄHLT!



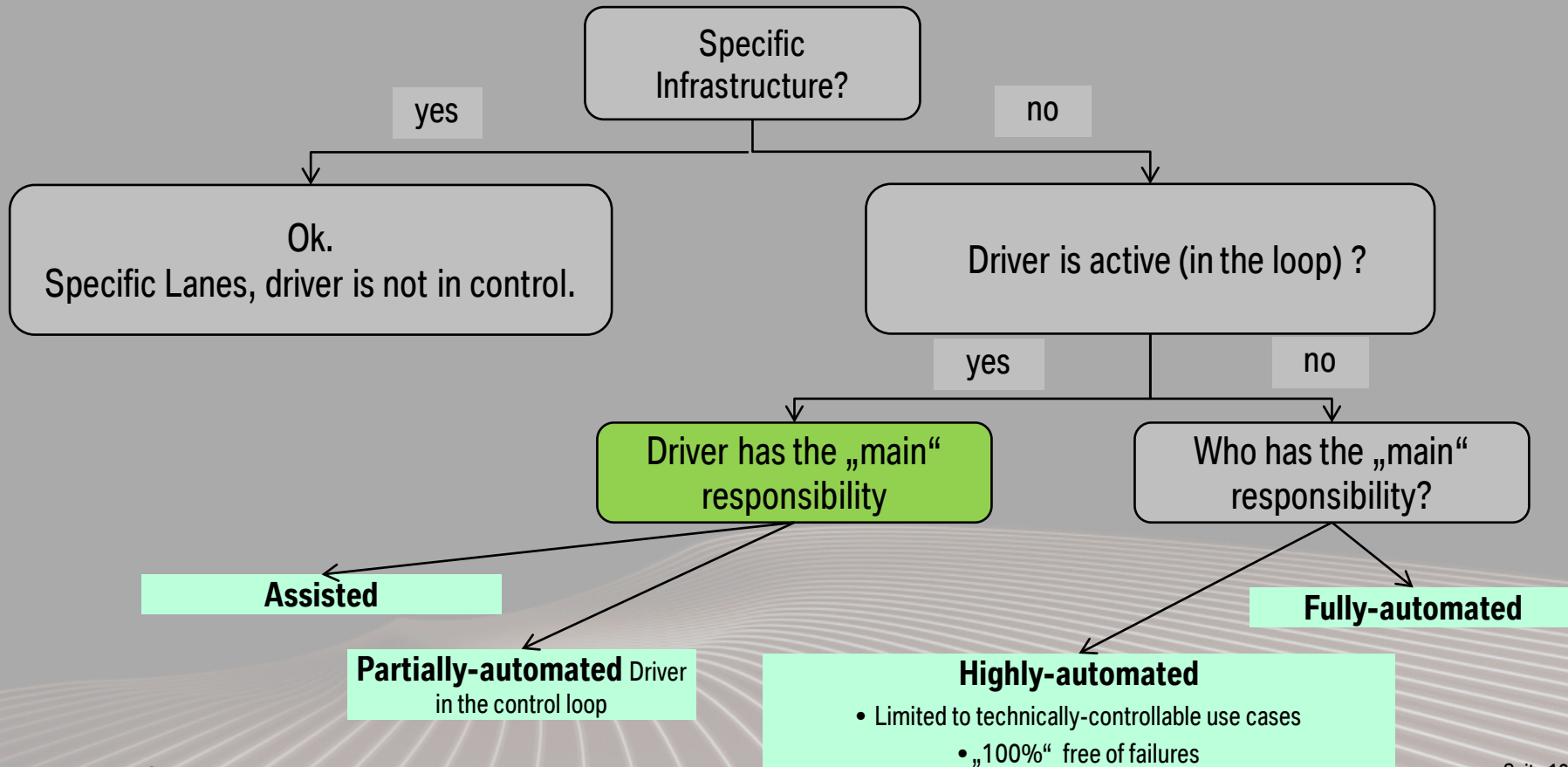
127 abgegebene Stimmen

Quelle: <http://www.sueddeutsche.de/digital> (Juli 2011)

CLASSIFICATION OF AUTOMATED DRIVING FUNCTIONS (COMP. BAST-WORKING GROUP).



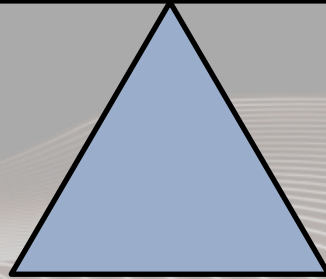
RESPONSIBILITY ISSUES – TODAY'S VIEW.



LIABILITY AND SOCIO-ECONOMIC-EFFECTS.

The car delivers the same
„overall performance“ as a
„perfect“ driver

The car delivers „statistically“
better performance than the
„average“ driver



CHALLENGES OF HIGHLY-AUTOMATED DRIVING.

Discussion of legal issues
(regulation, registration,
liability)

Evaluation of socio-
economic benefits

Driver: Understanding and
acceptance of new ways to
interact with the car



Discussion of scenarios to
introduce highly-automated
driving („mixed mode“)

Technological improvements (sensors, data
fusion, reliability of components,...)

New methods for testing
(e.g. controllability)

CONCLUSION – HIGHLY-AUTOMATED DRIVING.

- **Significant technical prerequisites achieved by numerous research projects.**
- **Dialogue between authorities and OEMs has already been initiated.**
- **Increasing awareness and acceptance by the customers.**

THANK YOU FOR YOUR ATTENTION.