4. International Workshop on
"Novel Developments and Applications in Sensor Technology"
12th – 14th of September 2012, Hofbräuhaus Coburg

Personalized Advanced Driver Assistance Systems (ADAS) using mobile phones and common surrounding sensors

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Topics

Introduction

ADAS Design

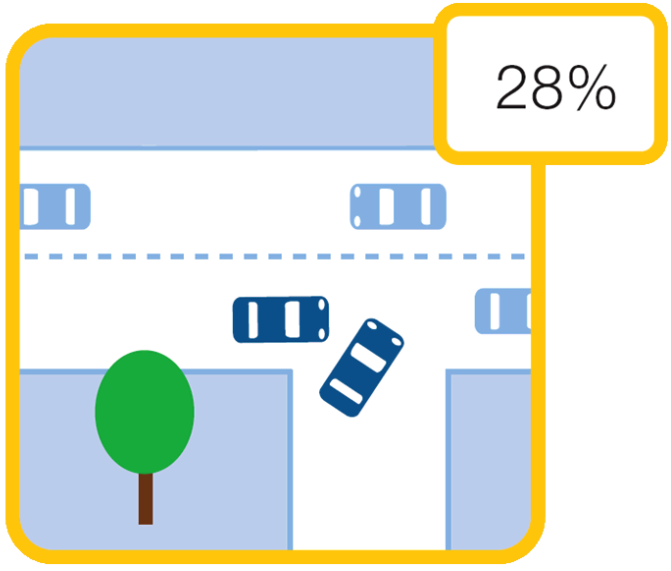
Advanced Study

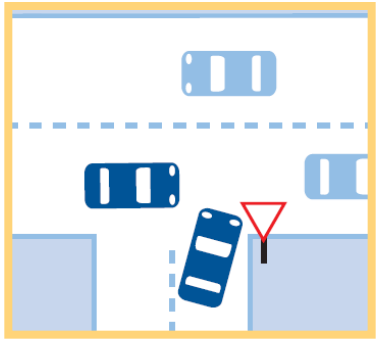
System Example

Concept of further development

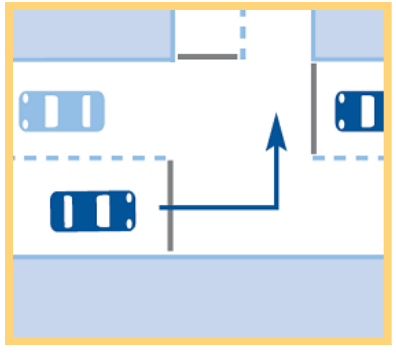
Outlook

Introduction - Necessity of Driver Assistance Systems





Traffic signal and right-of-way assistance



Turning and entering assistance

Approximately 60 % of accidents in **city traffic** and 28% of all accidents occur at intersections.

Failure to yield the right of way is frequently involved. A key underlying cause is the complexity of the traffic situation and hence the substantial increase in the burden on the driver's attention at intersections.

Here, driver assistance systems capable of reducing the driver burden and providing timely hazard warnings offer a considerable potential for preventing accidents.

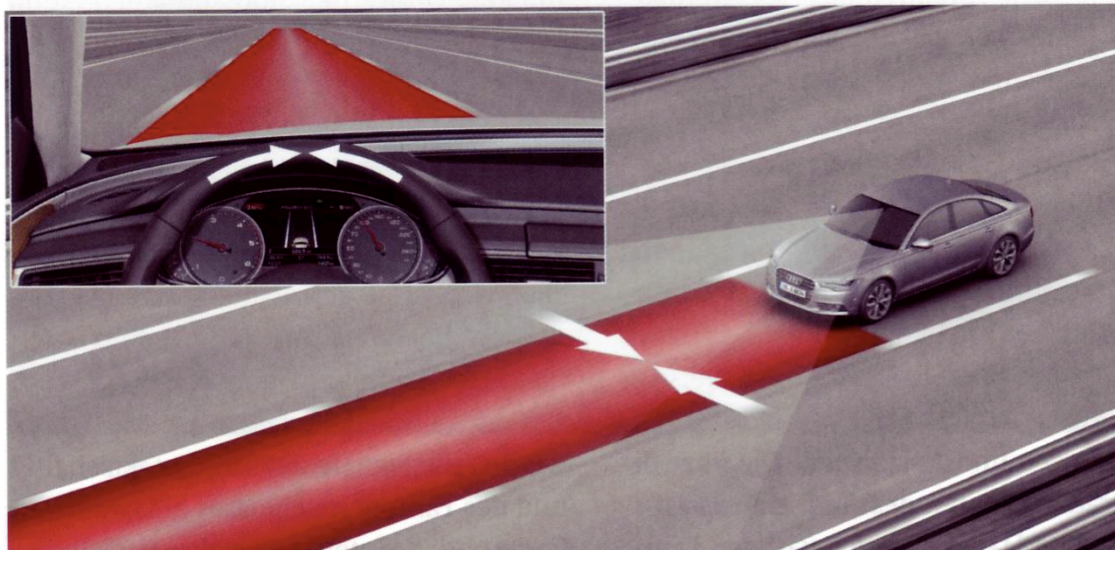
[source: www.invent-online.de]

Introduction – Roadmap of ADAS

DAS (mass product):
- ABS
- ESP

ADAS (High level class):
- ACC
- Lane Assist

Strong increase of complexity

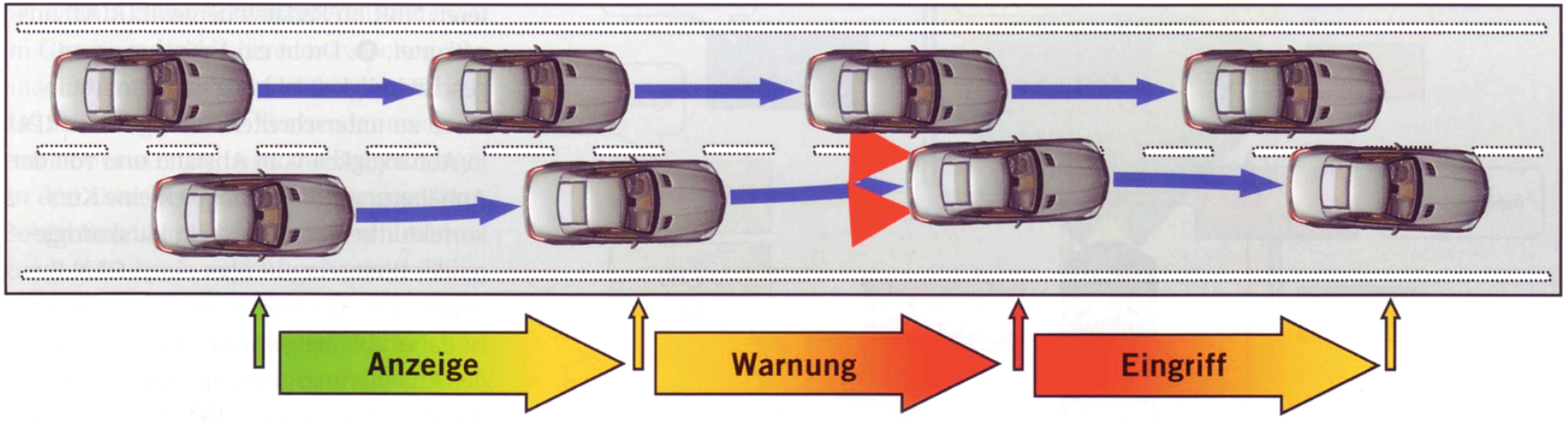


ADAS+ (in development):
- Intersection Assistance

Autonomous Driving:
- Fully automated vehicles, „Google-Car“

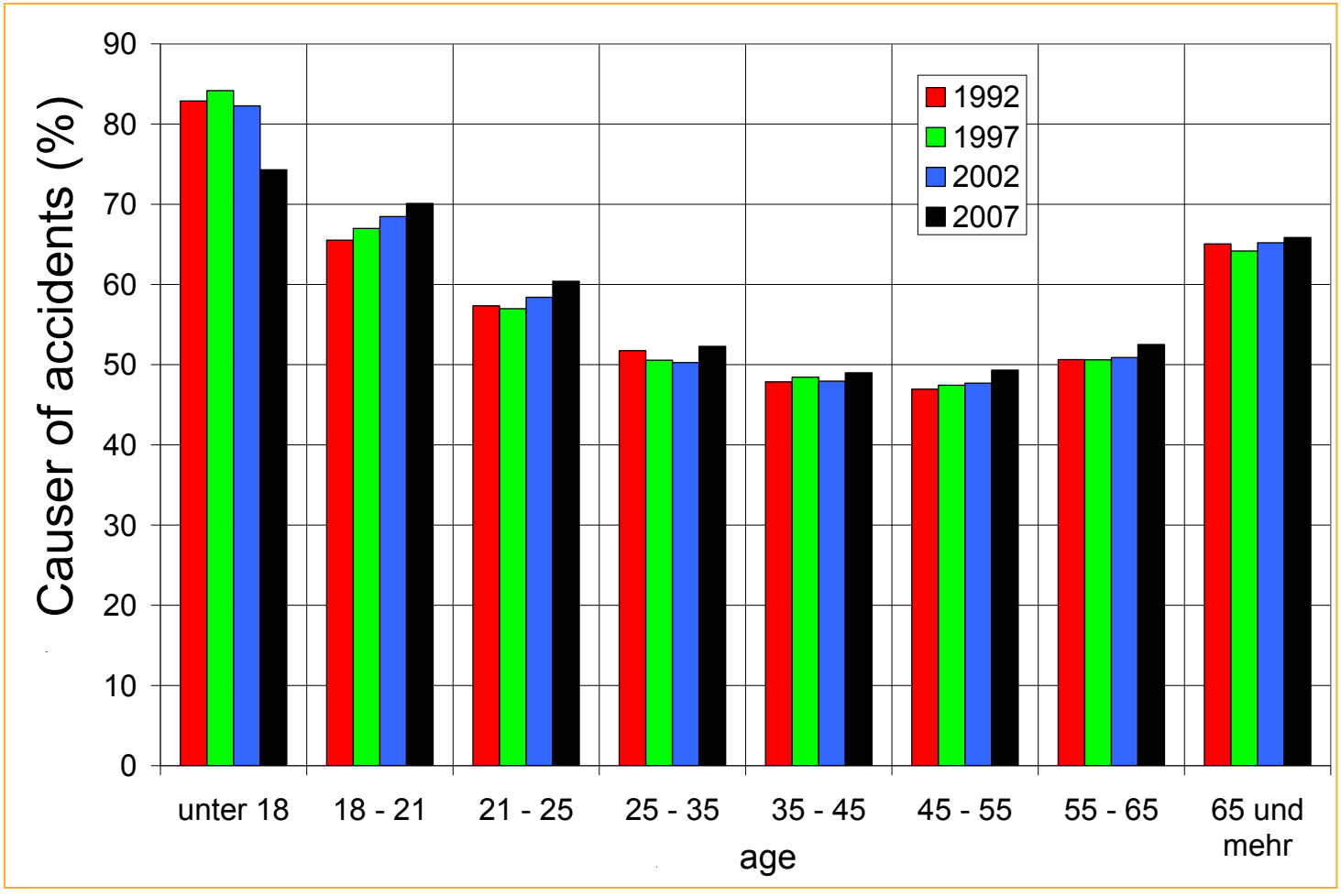
Introduction – Problem of Acceptance

Problem: acceptance of ADAS intervention



As earlier the warning/intervention, as higher the number of false alarms → Deactivation of ADAS

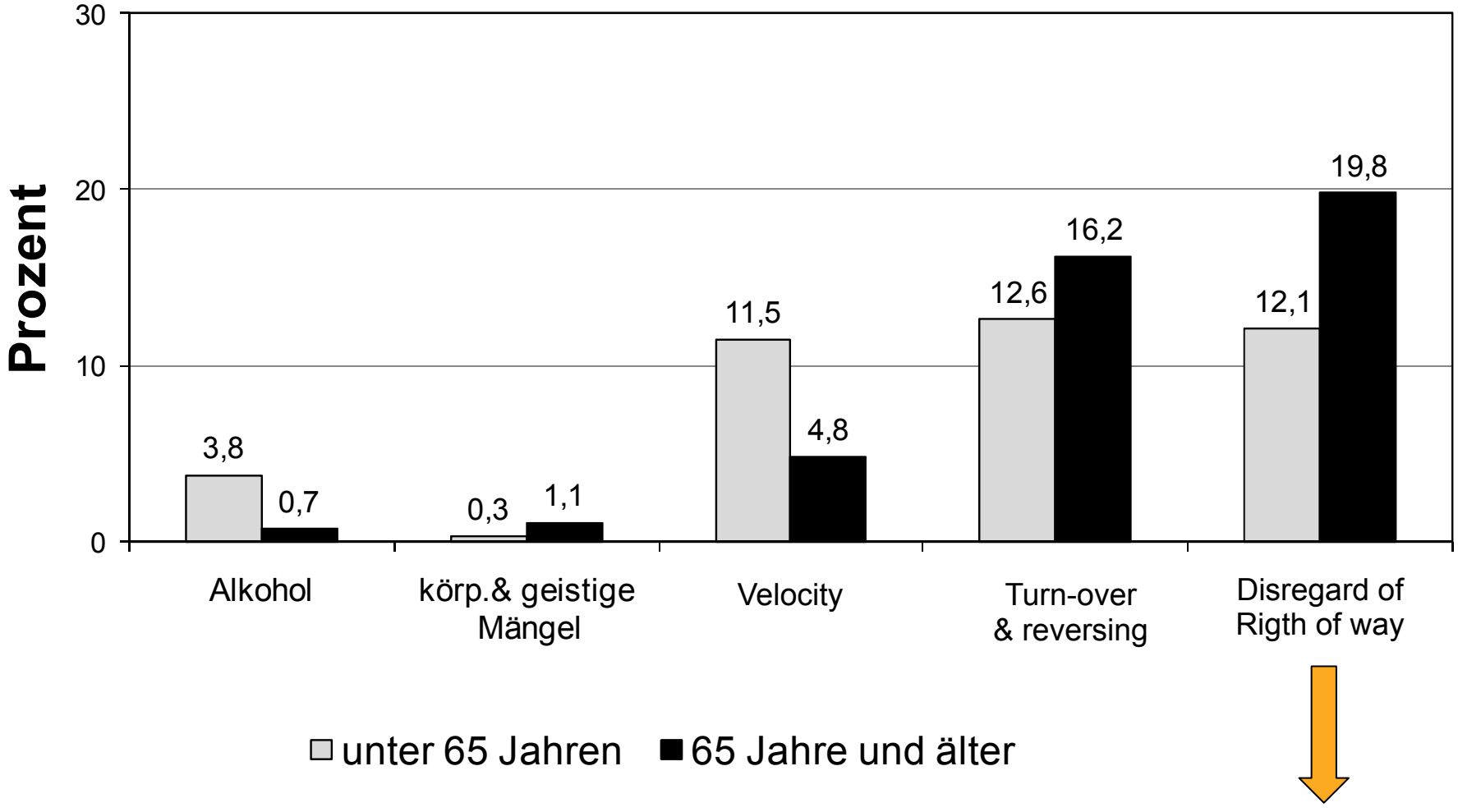
Introduction – Problems of elderly Drivers



Number of elderly drivers will increase !

Automotive industry focus on mass product – reduced offer of individual features and assistance

Introduction – Problems of elderly Drivers



Assistance for difficult situations is necessary

[source: BAST, 2012]

ADAS – Design of specialized Systems

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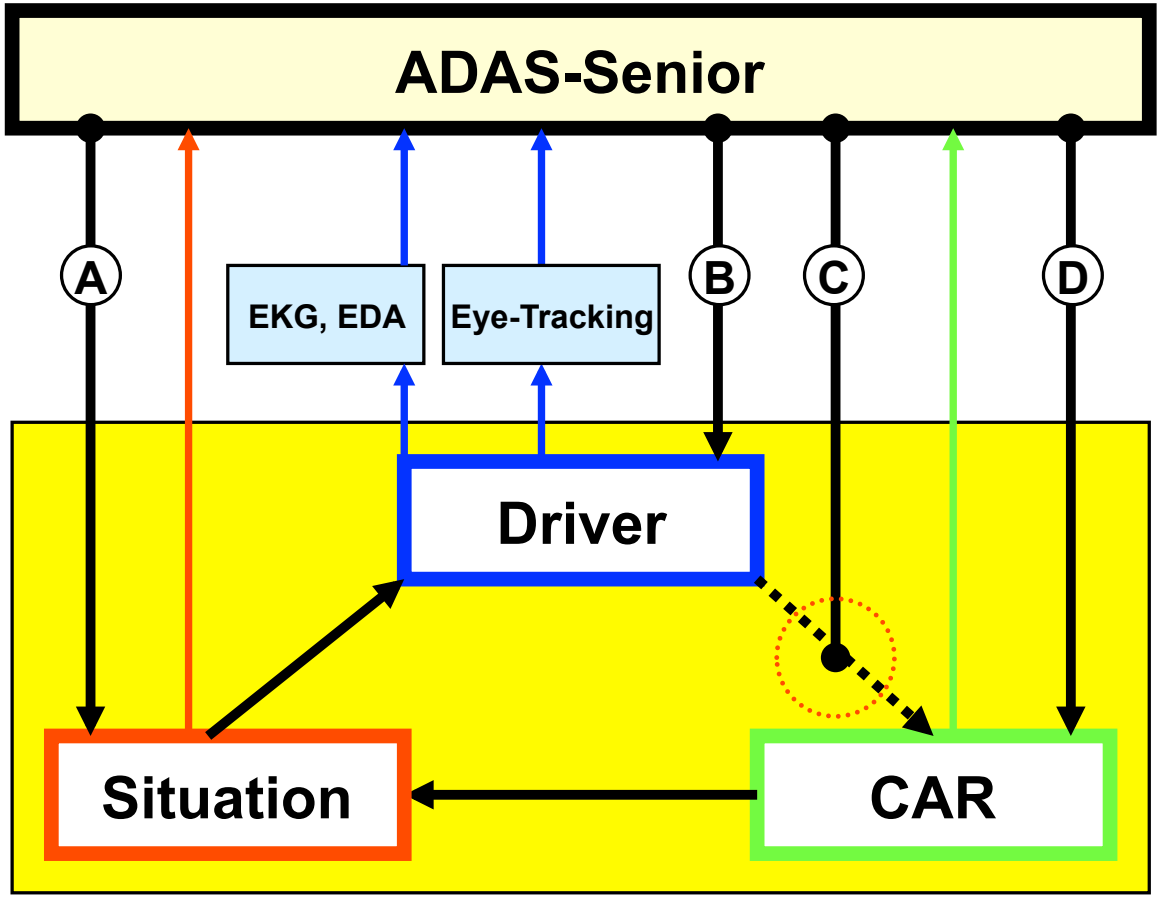


- **A - car-to-X Communication**
- **B - warning**
- **C - intervention**
- **D - autonomous driving**

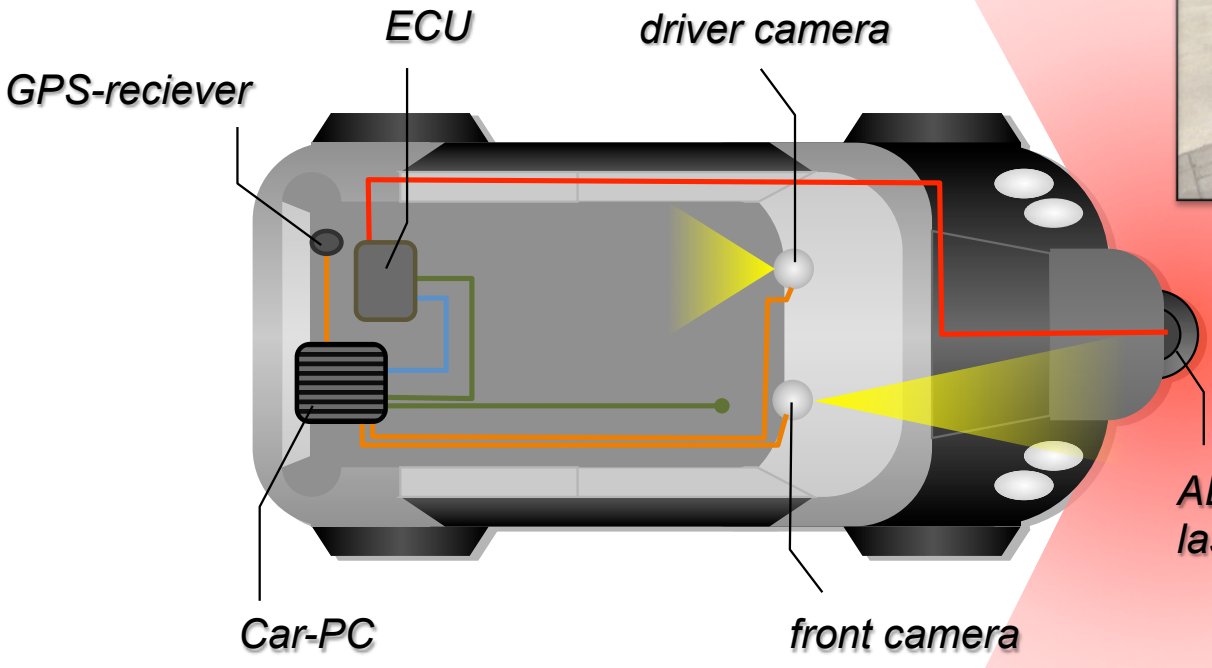
Surrounding sensor (Laserscanner, GPS)

Fitness to drive (heartbeat)

Car data

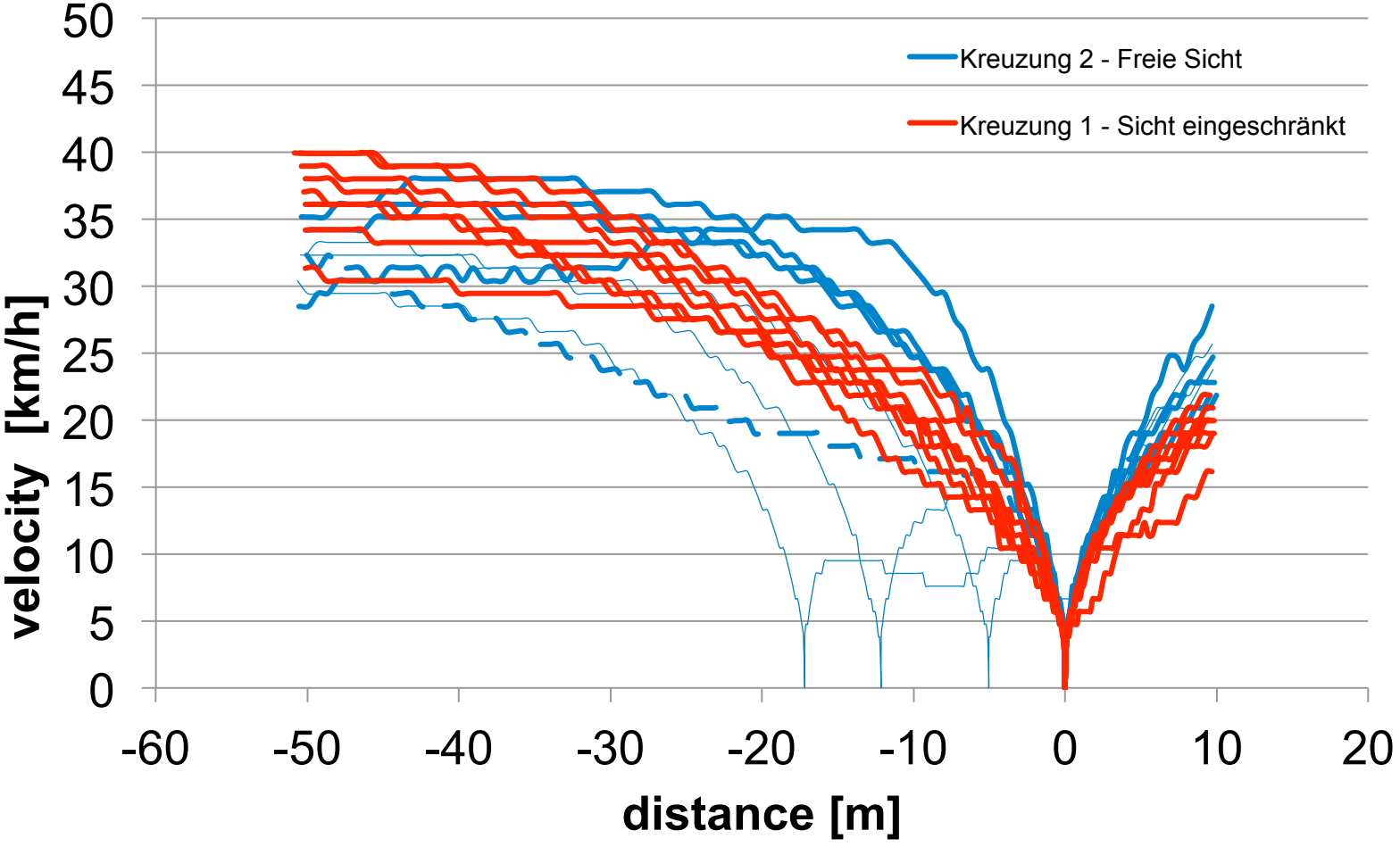
Advanced Study to determine critical situations for elderly drivers

Advanced Study - Equipment



Arcnet Ethernet CAN-Bus
USB

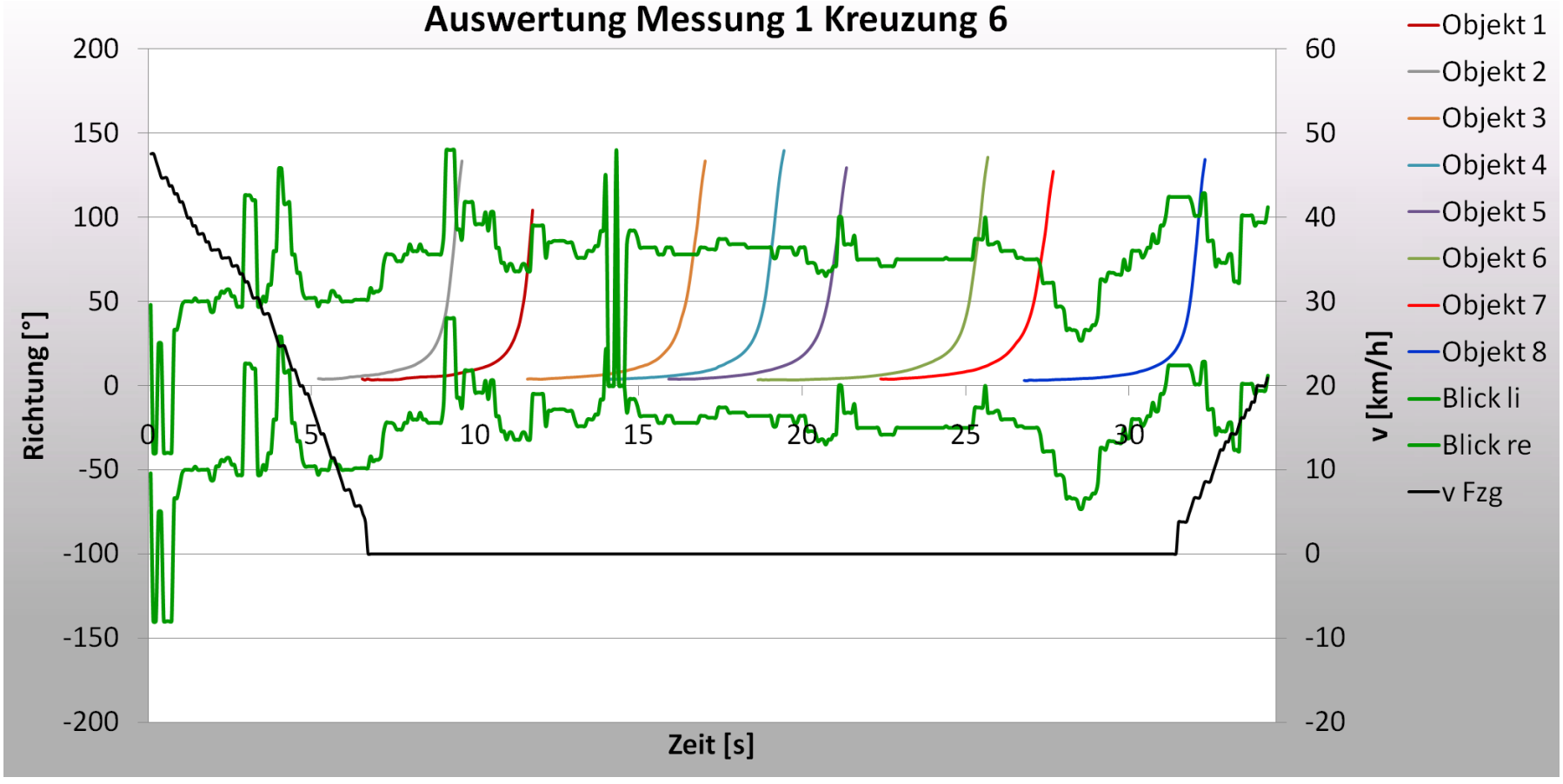
recognition of drivers velocity profile at intersection



[source: Gabriel, 2011]

Advanced Study – Example of Measurement

recognition of other cars by the driver



[source: Gabriel, 2011]

Advanced Study – Fitness Measurement

Heart beat
pCO_2

Blood pressure

Skin
conductivity

[source: Miersch, 2011]

Advanced Study – Fitness Measurement

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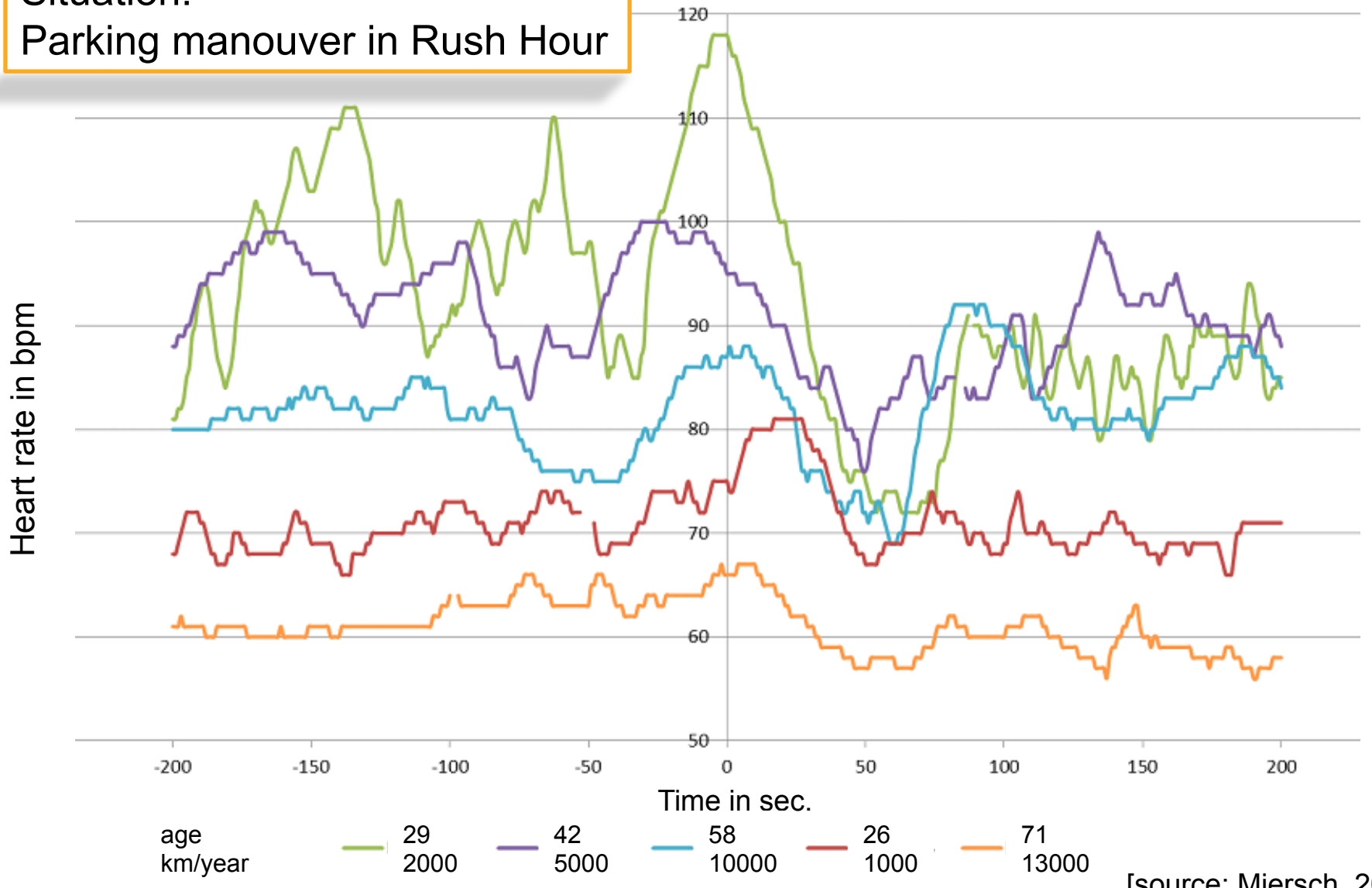
Situation:
Parking manouver in Rush Hour



[source: Miersch, 2011]

Advanced Study – Detailed Analysis

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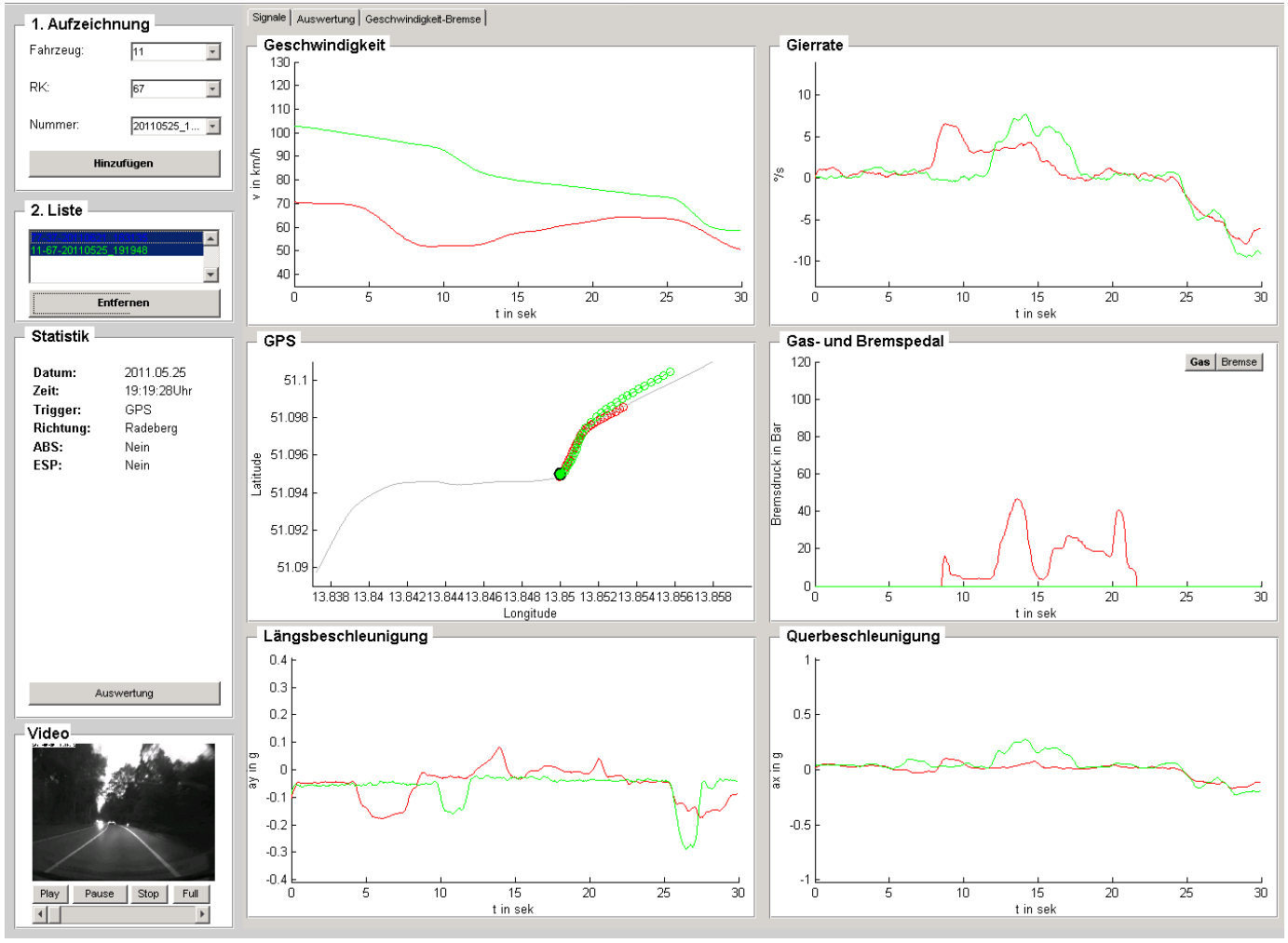
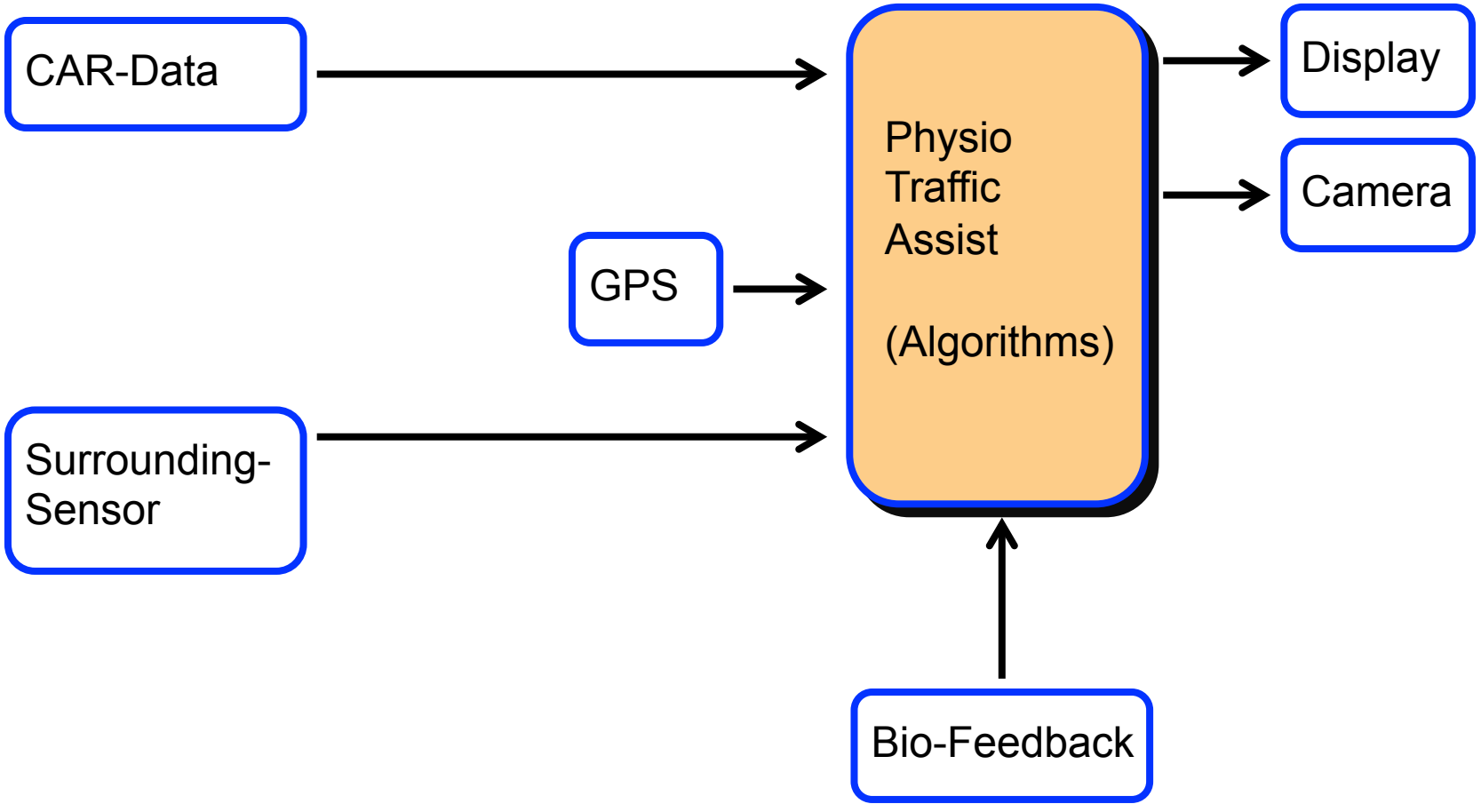
Situation:
Curve driving at „Dresdener Heide“



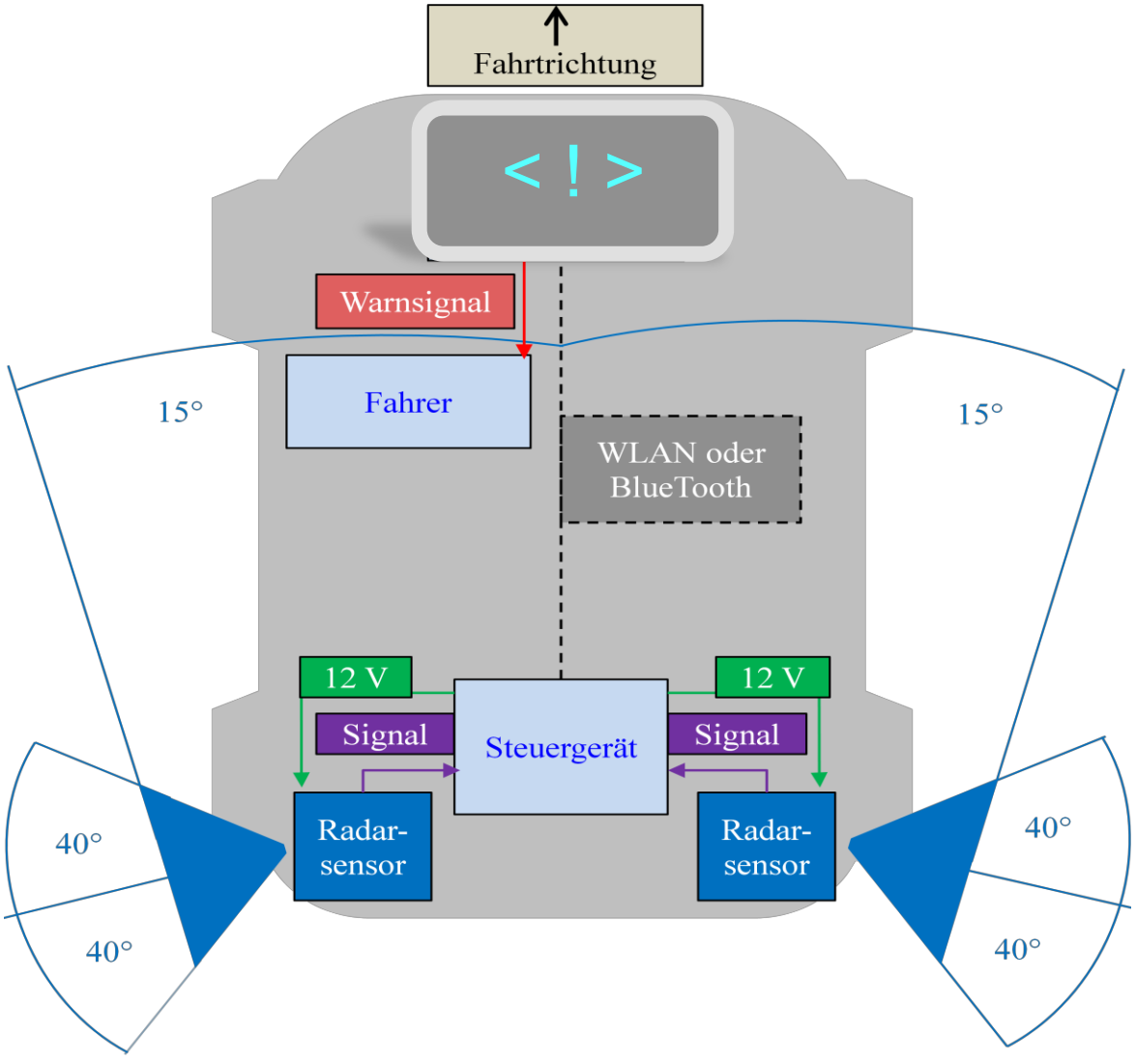
System Example – Concept



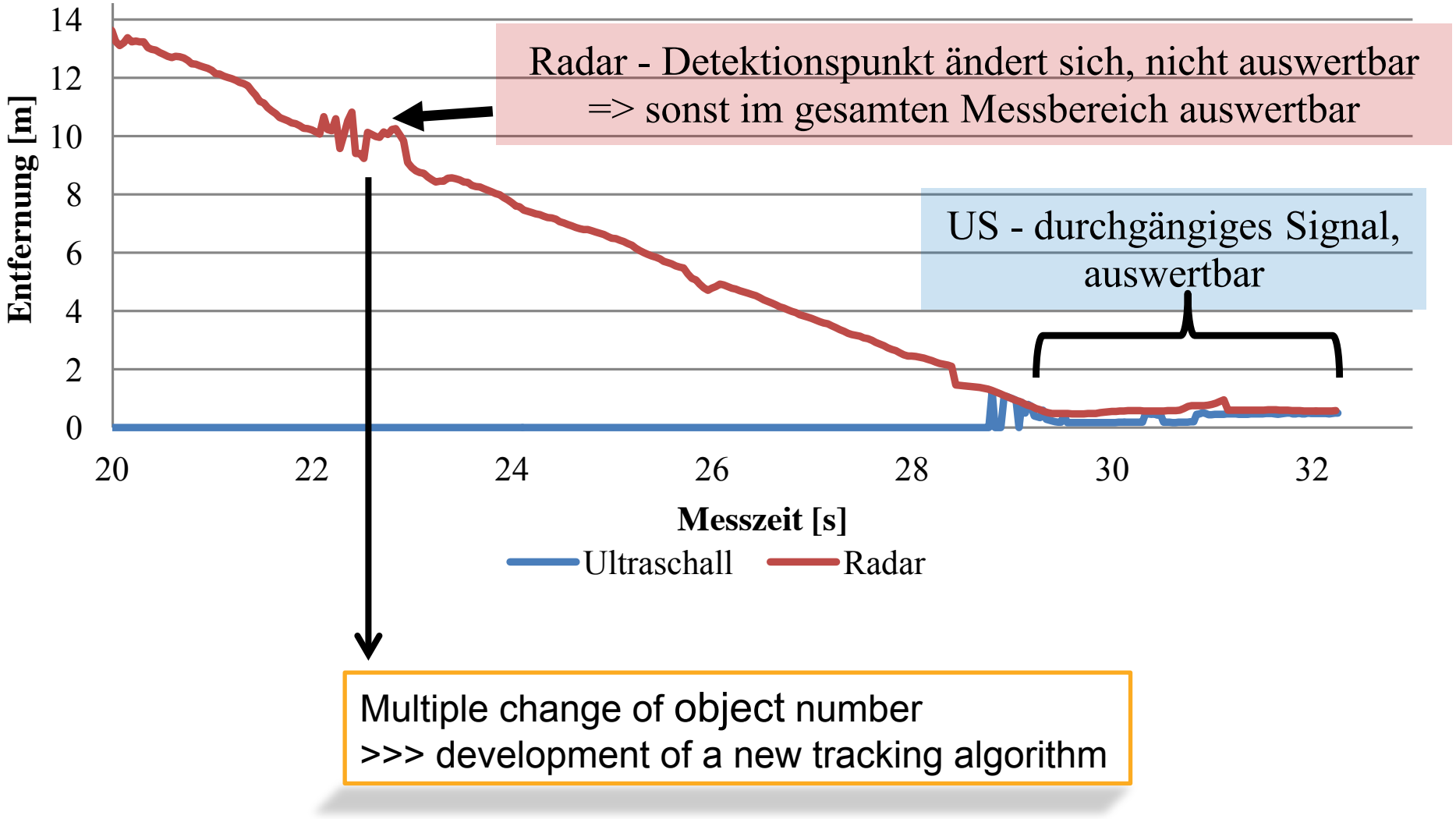
Prototypical development of algorithms for difficult situations

System Example – Detection of bicycles

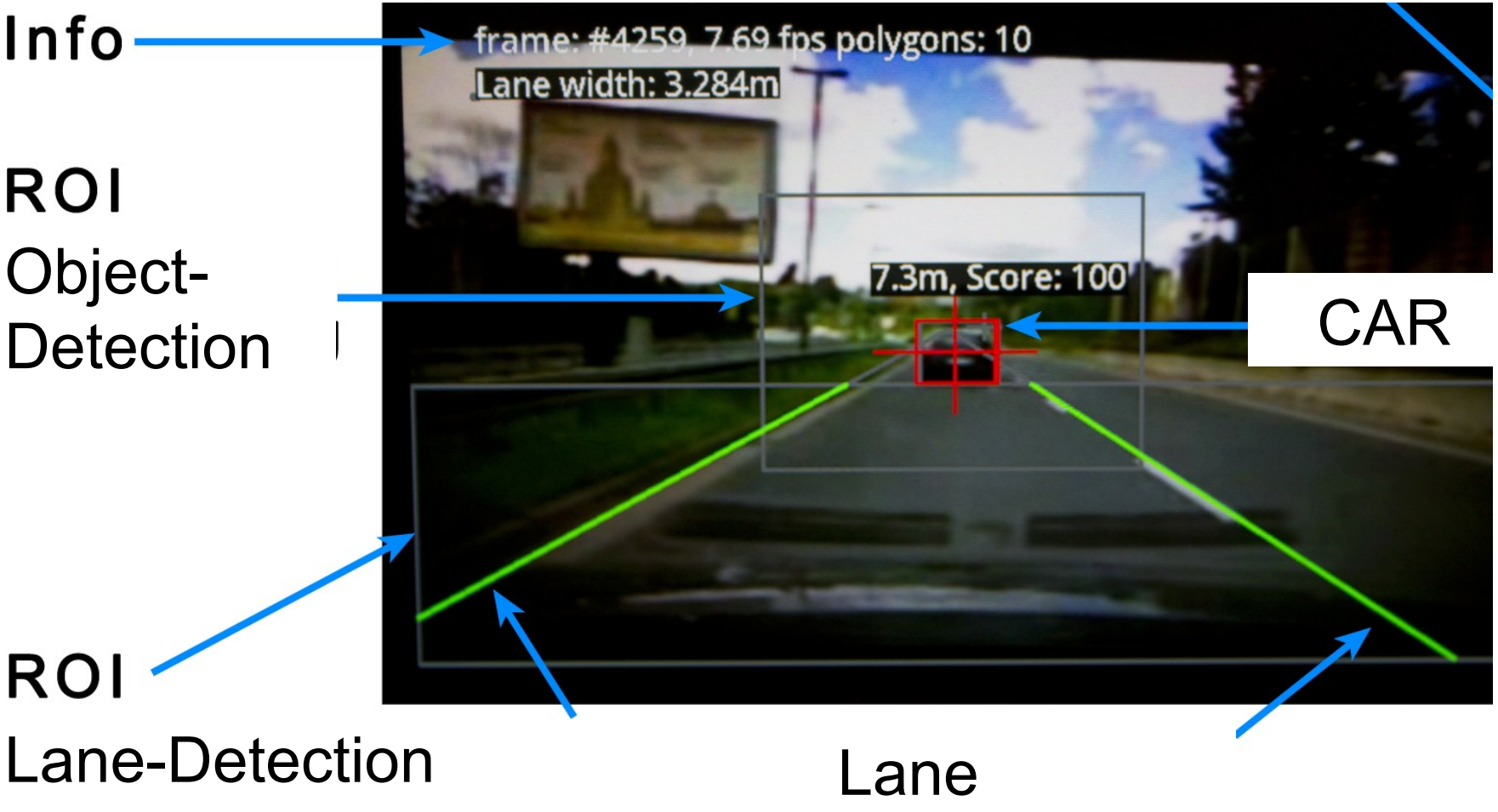
System Example – Sensors



System Example – Bicycle detection

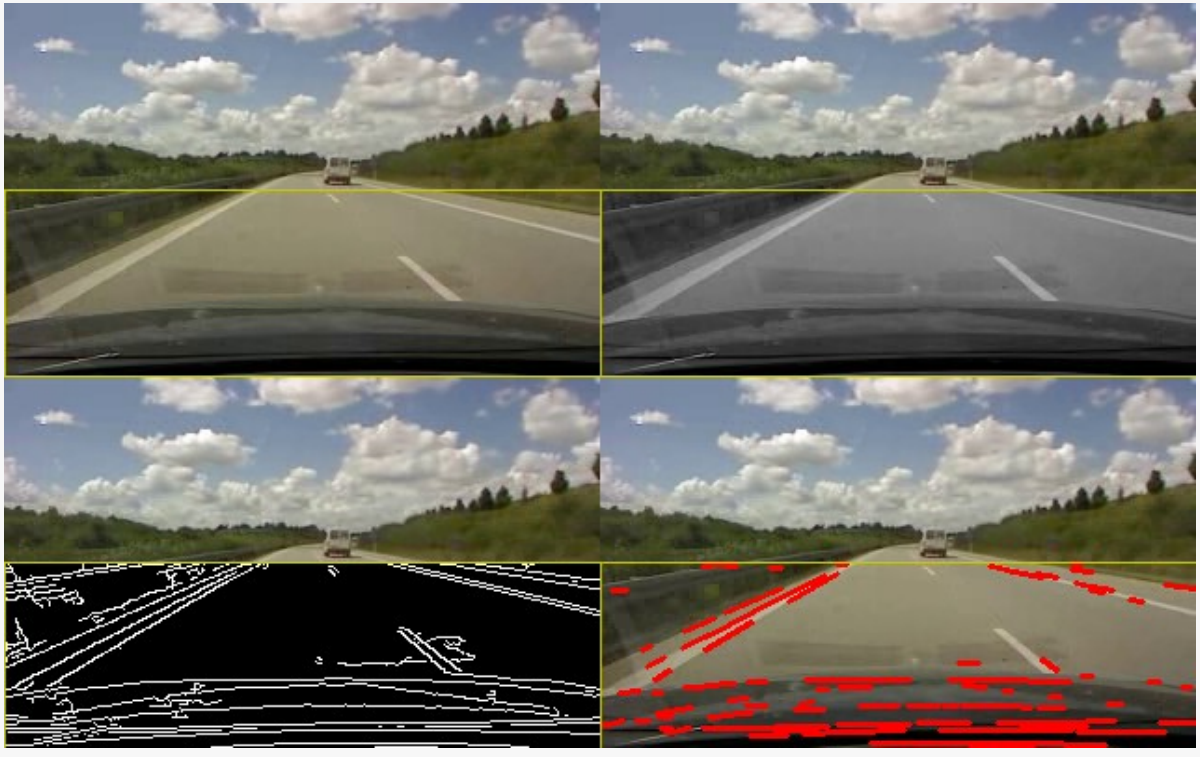


System Example – App for Lane Detection

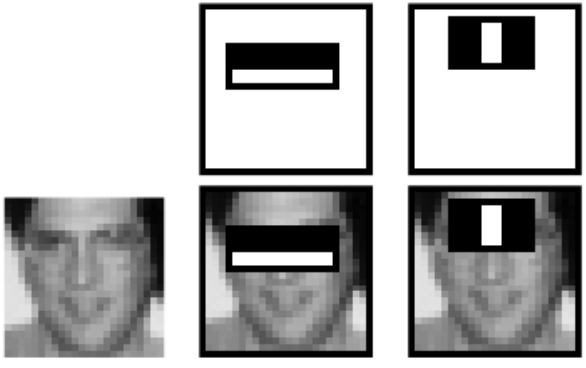


System Example – Algorithms

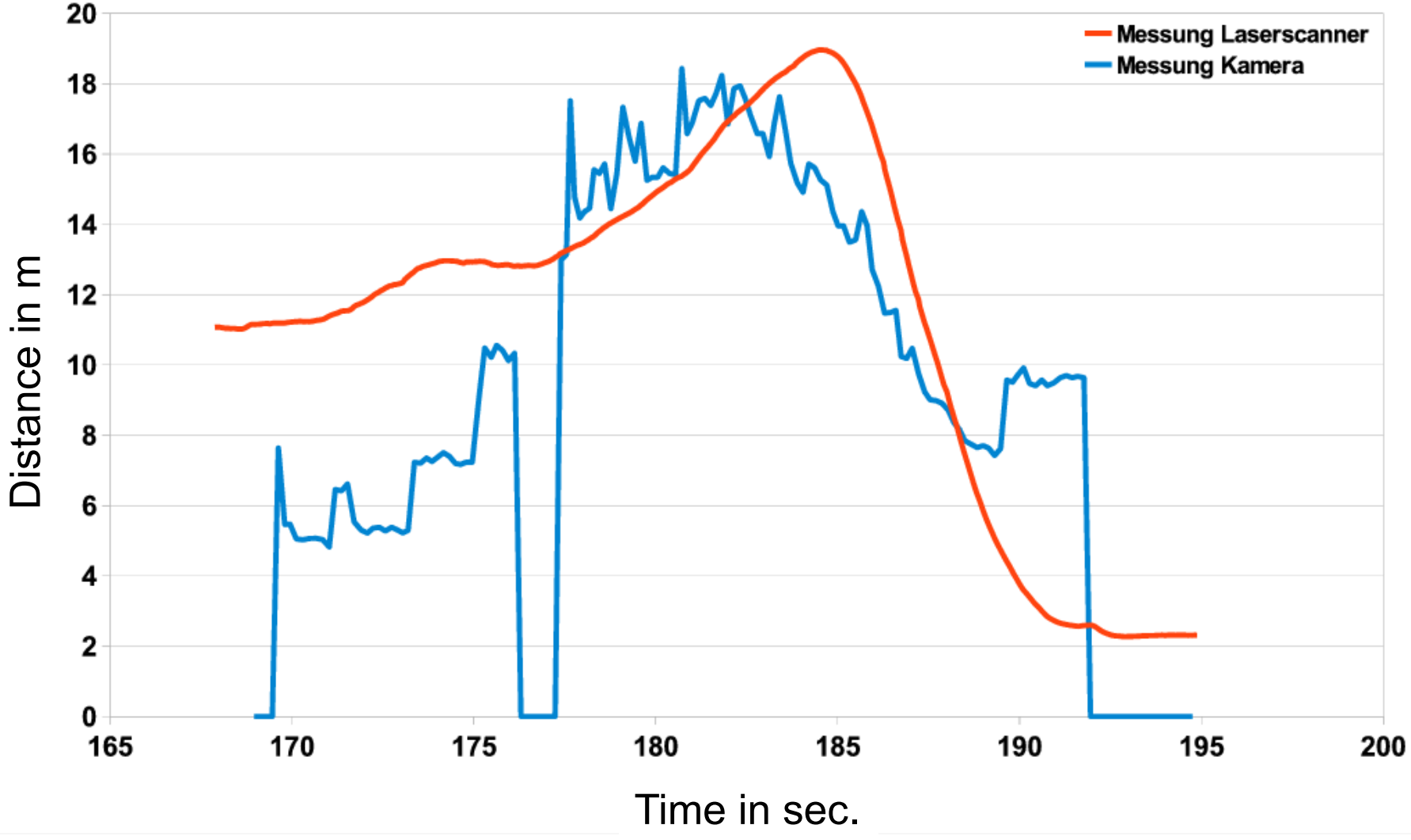
Algorithm Line/Lane-Detection



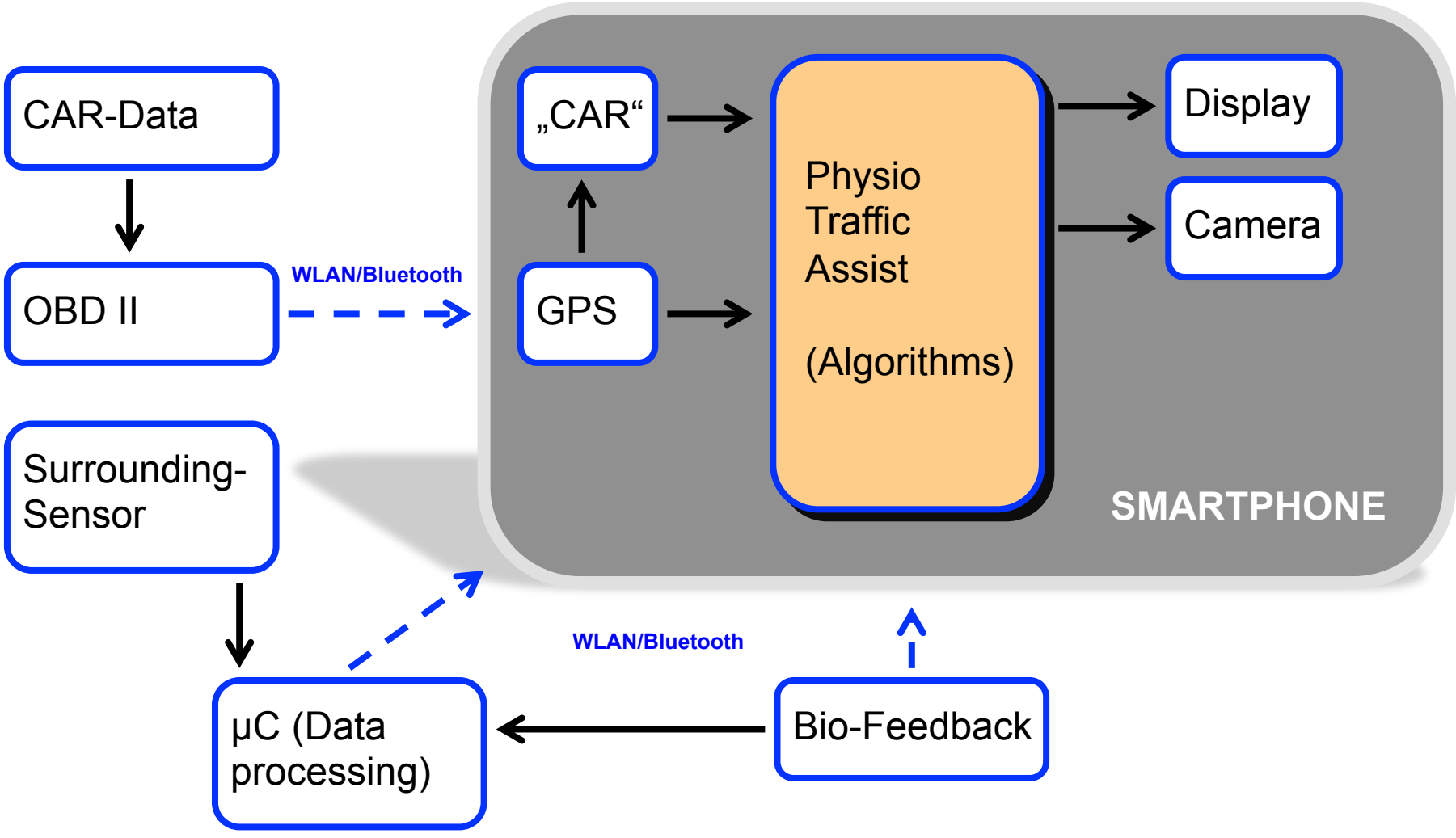
Algorithm Object-Detection



System Example – Results



Concept of further development



Outlook

- Development of „**simple**“ Apps for elderly drivers
  - Founding of start-up „Mechlab-Engineering“

- Studies of acceptance, then:
  - Enlargement/Modification of existing Apps
  - Development of special hardware
  - Development of business model