



TECHNISCHE HOCHSCHULE
OSTWESTFALEN-LIPPE
UNIVERSITY OF
APPLIED SCIENCES
AND ARTS

Autonomous Vehicles

Introduction

Prof. Dr.-Ing. habil. Ulrich Büker

Computer Science and Knowledge Based Systems

- Head: Professor Dr.-Ing. habil. Ulrich Büker, since August 2022
- Graduate computer scientist
- PhD and Habilitation, University of Paderborn, Department of Electrical Engineering and Information Technology on topics of image understanding and active vision
- Many years of experience in the development of automotive electronics at large, international automotive suppliers in leading positions
- Head of advanced development electronics, Hella KGaA, Lippstadt, Germany
- Head of worldwide advanced development Autonomous Driving, Aptiv, Wuppertal

Contact

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<https://www.th-owl.de/eecs/fachbereich/fachgebiete/wissensbasierte-systeme/>



Autonomous Vehicles

- Content
 - Technologies and applications to support the driver in the automobile
- Concept
 - Mixture of lecture and seminar
 - UB will give some introductory lectures
 - Students will work in small teams on various topics
 - Presentation during a lecture
 - Preparation of a seminar paper
 - Introductory literature will be provided
 - Further literature is to be researched independently
- Learning objectives
 - Getting to know some important areas of driver assistance systems and autonomous vehicles
 - Sensor technologies
 - Applications
 - Independent development of a concrete subject content
 - Practice of presentation and lecture techniques

Organisation

- eCampus (Ilias)

[FB 5 - Elektrotechnik und Technische Informatik](#)

> [- Lehrbereich Büker, Ulrich, Prof. Dr.-Ing. habil.](#)

> [Autonomous Vehicles](#)

- Password: AUV2023

Organisation

- Lectures
 - Duration per topic talk: approx. 45 min, followed by discussion
 - Send slides by email as PPT and PDF two days before the lecture date
 - Subject: Autonomous Vehicles Presentation *Topic*
 - Documents are made available via eCampus / Ilias

- Seminar paper
 - Length: 15 pages
 - Submission of the seminar paper until 15.08.2023
 - Send by email as PDF Subject: Autonomous Vehicles Paper *TOPIC*

- Examination
 - Presentation + seminar paper

Literature

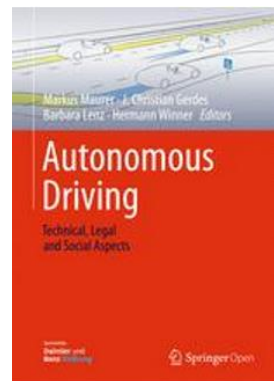
- Literature

Handbook of Driver Assistance Systems

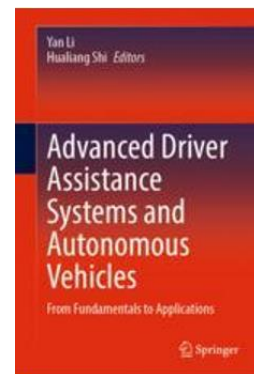
Hermann Winner, Stephan Hakuli, et al (Eds.)

Springer, 2016

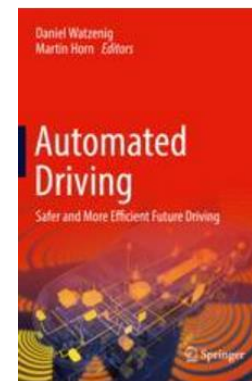
(also available in German)



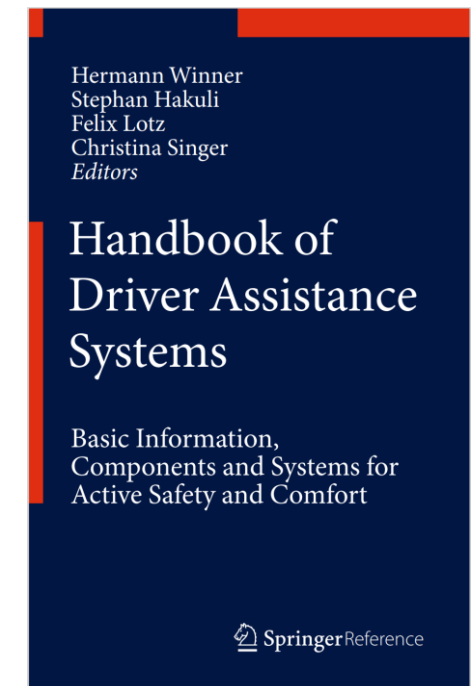
Autonomous Driving
Technical, Legal and Social aspects
Maurer, M. (et al.) (Eds.)
Springer, 2016



Advanced Driver Assistance Systems and
Autonomous Vehicles
Yan Li, Hualiang Shi
Springer, 2022

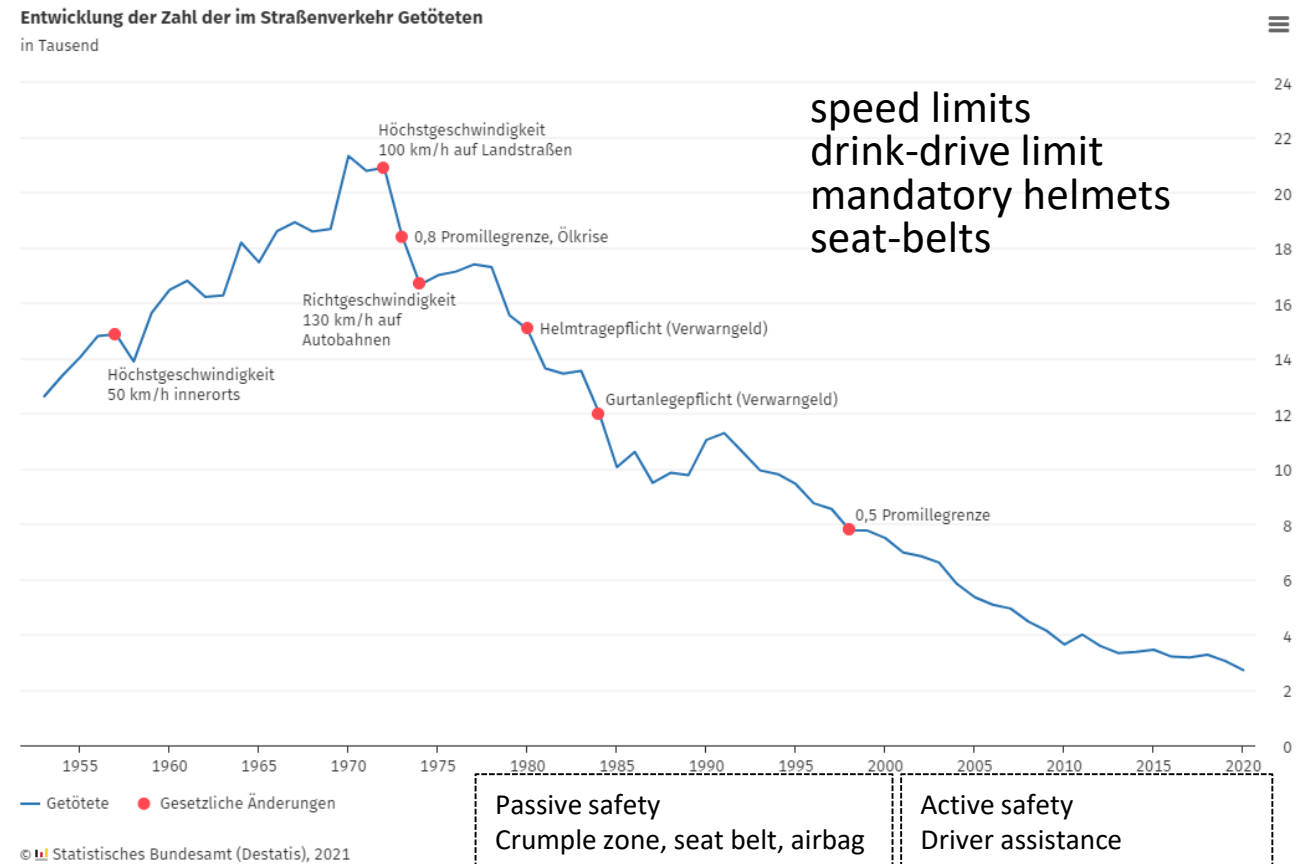


Automated Driving
Safer and More Efficient Future Driving
Daniel Watzenig, Prof. Dr. Martin Horn
Springer, 2017



Motivation for Driver Assistance: Comfort and Safety

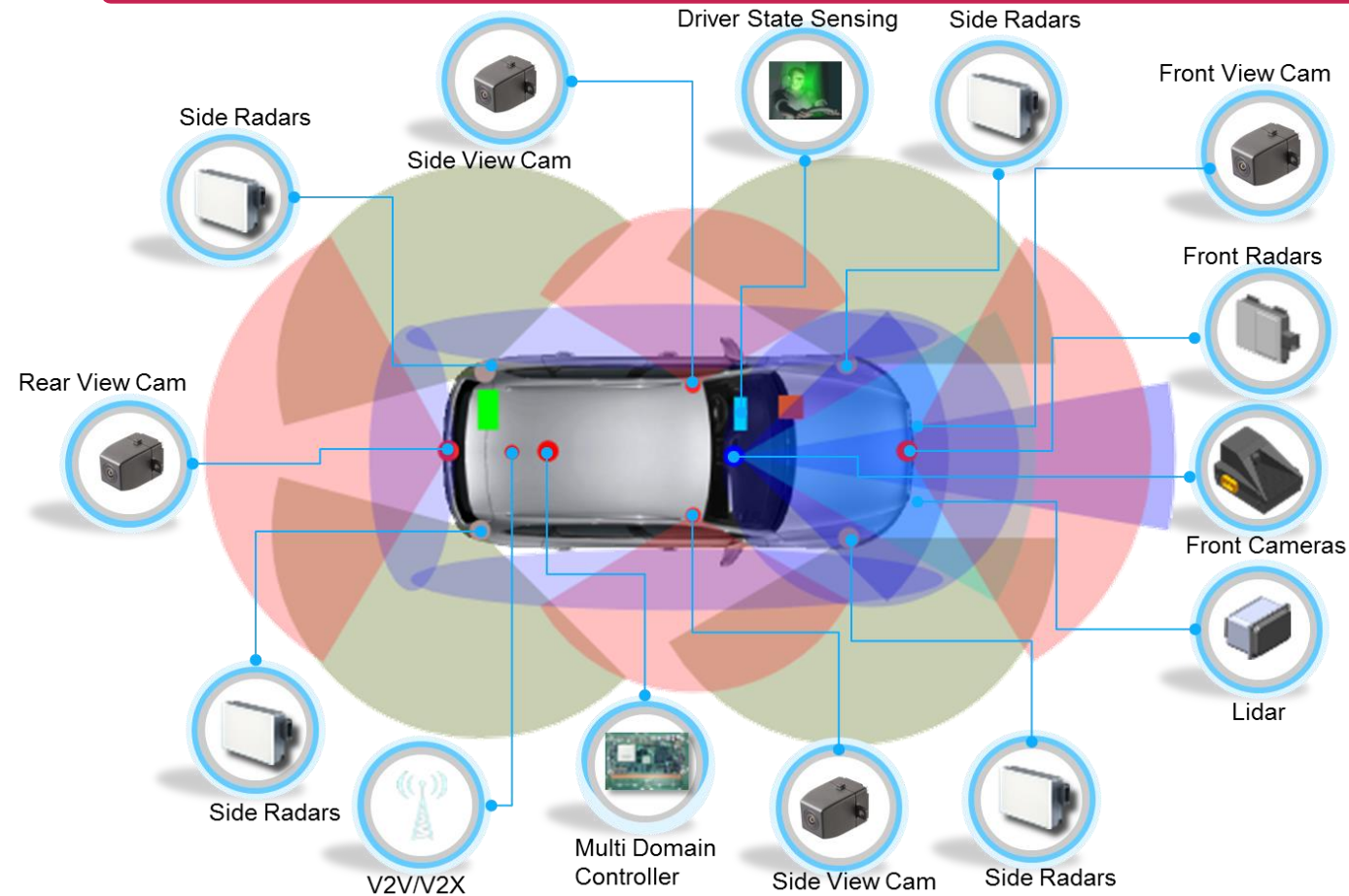
- Halving of traffic fatalities in the period 2000 - 2010
- Further halving from 2011-2020
- Long-term: Vision Zero



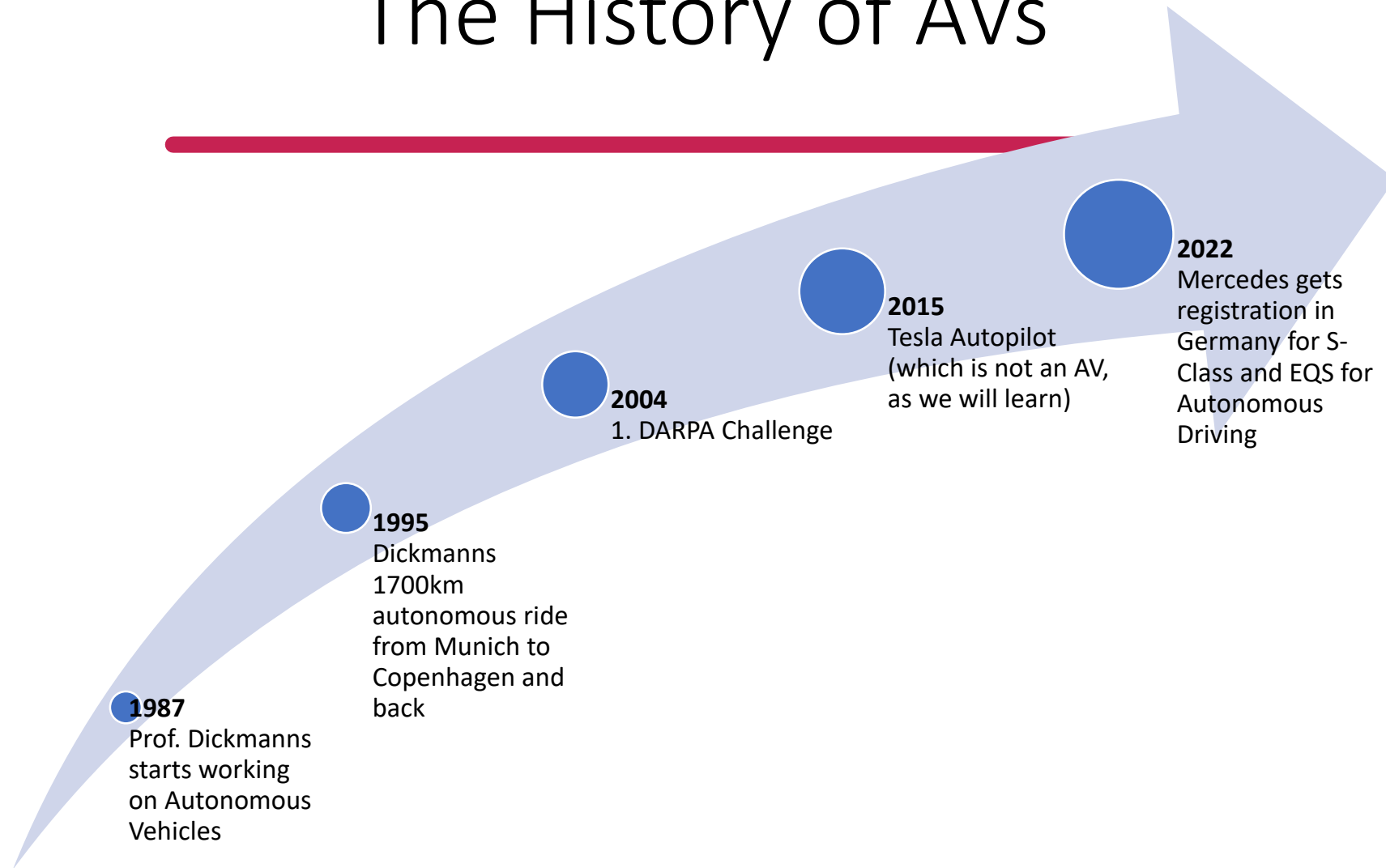
Targets for Autonomous Driving

- Total mileage: 757 billion km
- Mileage on freeways: 252.1 billion km
- Accidental deaths: 3046
- Fatalities per 1 billion km: 4
 - of which on highways: 1.7
- Target for autonomous vehicles: 10x better than humans
 - < 0.2 fatalities per 1 billion km on highways
 - < 1 fatality per 5 billion km on highways
 - System test: no potential fatalities on 20 times the distance, 100 billion km
 - ➔ enormous testing effort to validate the system!

ADAS and Autonomous Vehicle Sensors



The History of AVs





© Ernst D. Dickmanns

2007 DARPA urban challenge



Topics

General

Presentation techniques

Sensors

1. Ultrasonic
2. Radar
3. Lidar
4. Camera
5. Sensor fusion
6. Car2X - Communication

Driver Assistance Features

7. Object detection and recognition (Obstacles, Traffic signs)
8. Automated parking
9. Adaptive Cruise Control and Emergency braking
10. Blind Spot and Lane change assistance
11. Lane Departure Warning, Lane Keeping
12. Legal and ethical aspects

Interest in a field trip / company visit?