Preface

The ambitious goals of climate protection, energy efficiency, air quality, and road safety in combination with current trends in society and economy require restless innovation in sustainable and inclusive road transport solutions. Recent breakthroughs in electric and electronic components and systems, clean propulsion, automation, connectivity, IT-driven business models, and user-centric design promise viable opportunities for the automobile to meet those challenges.

However, it is foreseeable that additional principles will even further transform mobility in the next 5–10 years: Big data analysis, e.g., is already crucial for automation and will further enable cities to better respond to traffic issues, the Internet of Things will improve connected driving and together with blockchain facilitate mobility-as-a-service, robots and artificial intelligence will make human drivers obsolete not only in passenger cars but also potentially in all road vehicles, 3D printing will not only allow the production of novel vehicles but also change the demand for transport by making it possible to replace shipping products by shipping materials and local production, virtual and augmented reality may reduce the need to travel physically, and carbon fiber structures may make the automobile extremely lightweight and efficient. Moreover, maybe in 10–15 years, even more technical revolutions will arise not only creating completely new opportunities from integration and synergetic combinations of these various technologies with electrification, automation and sharing concepts that impact the demand for road transport but also widen the possibilities for road vehicles.

Currently, one of the main topics raising considerable attention of politicians and engineers alike are connected and automated vehicles and their enabling technologies. At the same time, governments are debating on the legal and infrastructural preconditions of automated driving and about how to harmonize the necessary investments. This field faces two major challenges.

First, R&I efforts need to be shifted from proof-of-concept to proof-of-reliability on the system level of automated driving technology. For instance, the performance envelope of sensors, data fusion, and object recognition systems has been pushed considerably in recent years, but does still not cover the complexity that a vehicle encounters in everyday life. Particularly for applications in urban environments and

at higher levels of automation, perception of the driving environment is a challenging task to be mastered in a robust fashion. Smart systems integration and connectivity have to play an important role in this domain, with functional safety, fail-operational capabilities and user comfort being of primary concerns.

Second, it is obvious that the economically viable large-scale rollout of driving automation requires agreements on framework conditions between a large and heterogeneous group of stakeholders encompassing the automotive, IT, and telecom sectors as well as road infrastructure providers, public authorities and users.

To this end, two EU-funded Coordination and Support Actions "Safe and Connected Automation of Road Transport (SCOUT)" and "Coordination of Automated Road Transport Deployment for Europe (CARTRE)" are supporting the involvement of different stakeholders and will develop cross-sectorial roadmaps regarding the implementation of high-degree connected and automated driving in Europe. These may serve as blueprints for research and innovation funding and regulatory actions as well as support European Technology Platforms and a wide range of activities regarding connected and automated driving.

The International Forum on Advanced Microsystems for Automotive Applications (AMAA) has been exploring the technological foundations of new paradigms for many years. Consequently, the topic of the twenty-first edition of AMAA, held in Berlin on September 25 and 26, 2017 was "Smart Systems Transforming the Automobile". The AMAA organizers, VDI/VDE Innovation + Technik GmbH together with the European Technology Platform on Smart Systems Integration (EPoSS), greatly acknowledge the support given for this conference.

The papers in this book, a volume of the Lecture Notes in Mobility book series by Springer, were written by leading engineers and researchers who have attended the AMAA 2017 conference to report their recent progress in research and innovation. The paper proposals were peer-reviewed by the members of the AMAA Steering Committee. As the organizers and the chairman of the AMAA 2017, we would like to express our great appreciation to all the authors for their high-quality contributions to the conference and also to this book. We would also like to gratefully acknowledge the tremendous support we have received from our colleagues at VDI/VDE-IT.

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