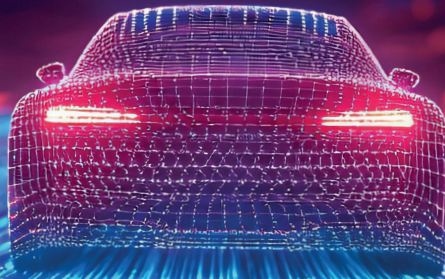


The Connected Autonomous Vehicle and its Environment

An Introduction to Real and
Reduced-Scale Autonomous Vehicles



Jacques Ehrlich

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Contents

Preface	11
Chapter 1 • Introduction	13
1.1 Purpose of this Book	14
1.2 Target Audience	15
Chapter 2 • Introduction to Intelligent Transportation Systems.	16
2.1 Introduction	16
2.2 ITS	16
2.3 ITS Domains	17
2.4 Stakeholders	18
2.5 An Example: Traffic Information	18
2.6 CAV in ITS	19
2.7 Harmonization and Framework Architecture for ITS	19
Chapter 3 • A Brief History of Autonomous Vehicles	21
3.1 The Autonomous Car: An Old Story	21
3.2 A Chronicle Marked by Ups and Downs	21
3.3 Evolution of Customers’ Expectations	22
3.4 The “Google Car” Effect	22
3.5 Twenty Years Later... Where Do We Stand?	23
Chapter 4 • From Driver Assistance Systems to Driverless Cars	24
4.1 Advanced Driver Assistance Systems (ADAS): Why?	24
4.2 Driver Assistance Systems to Address Road Safety Challenges	24
4.3 Active Safety (or Primary) vs. Passive Safety (or Secondary)	25
4.4 A Brief Review of Driver Assistance Systems	26
4.5 What Business Model for Driver Assistance Systems?	30
4.6 The “Euro NCAP” Effect	30
4.7 Towards the CAV	31
Chapter 5 • Classification of Autonomous Vehicles	32
5.1 Introduction	32
5.2 The J3016 Recommendation in Brief	32
5.3 Features	33

- 5.4 Conclusion 35
- Chapter 6 • From the Driving Task to the CAV Key Functions 37**
- 6.1 Case Study: Managing a Risky Situation. 37
- 6.2 The Driving Task: A Four-Step Sequential Model 38
- 6.3 The Driving Task: Sensorimotor Aspects. 40
- 6.4 From Driving Task to CAV Key Functions. 41
- 6.5 Key Functions of the CAV 42
- Chapter 7 • KF1: Macroscopic Localization 45**
- 7.1 Absolute Localization 45
- 7.2 Absolute Localization Failure 46
- 7.3 Dead Reckoning 46
- 7.4 Map-Matching 47
- 7.5 Applications of Macroscopic Localization to CAVs 49
- Chapter 8 • KF2: Microscopic Localization 52**
- 8.1 Functional Architecture of a Lane Marking Detection System. 53
- 8.2 Region of Interest (ROI). 54
- 8.3 Pre-processing 55
- 8.4 Features Extraction 55
- 8.5 Lane Marking Estimation 56
- 8.6 Mapping on a Road Model. 57
- Chapter 9 • KF3: Obstacles Detection 58**
- 9.1 Sensors 58
- 9.2 Cameras. 59
- 9.3 Obstacle Detection by Radar 60
- 9.4 Obstacle Detection by LiDAR 64
- 9.5 Data Fusion 65
- Chapter 10 • KF4: Path Planning at the Operational Level 69**
- 10.1 Optimal Control and Robust Control 69
- 10.2 Tire-Road Interaction: The Pacejka Model. 70
- 10.3 Vehicle Dynamics Modeling 71
- 10.4 Control Laws 73

10.5 Conclusion	74
Chapter 11 • KF5: Path Planning at the Tactical Level.	75
11.1 Sampling-based Methods	76
11.2 Path Planning on Highways and Expressways	77
11.3 End-to-End Path Planning Based on AI	81
11.4 Conclusion on Tactical Path Planning	83
Chapter 12 • KF6: Path Planning at the Strategic Level	84
12.1 Classic Path Planning using Graph-Based Methods	84
12.2 From Predefined Routes to Real-Time Environment Mapping	87
12.3 SLAM-based Strategic Path Planning	87
Chapter 13 • KF7: Cooperative Awareness and Local Dynamic Map	90
13.1 Cooperative Awareness	90
13.2 Local Dynamic Map (LDM).	90
13.3 Examples	93
Chapter 14 • KF8: Driver Monitoring	94
14.1 Causes of Reduced Vigilance	94
14.2 Human Performance Estimation.	95
14.3 Measurement Methods	95
14.4 Driver Warning	97
14.5 Response to the Driver’s Lack of Reaction: the Minimal Risk Maneuver.	97
Chapter 15 • Connected Vehicles and Cooperative Systems	99
15.1 The Major Challenges of Connectivity	99
15.2 ITS Communications Architecture	103
15.3 Communications Media	105
15.4 The ITS Station	106
15.5 Implementation in ITS Subsystems	110
15.6 Messages	111
15.7 Services and Applications	114
15.8 Deploying C-ITS: the European C-ROADS Platform	115
15.9 Conclusion	116
Chapter 16 • The Infrastructure	118

- 16.1 New Mutual Expectations for ADAS and CAVs 118
- 16.2 Floating Car Data (FCD) 119
- 16.3 High-level of Service Roads. 122
- 16.4 ODD: Operational Design Domain 122
- 16.5 ISAD: Infrastructure Support Level for Automated Driving 123
- 16.6 Conclusion 124
- Chapter 17 • Introduction to Distributed Architectures 125**
- 17.1 Background. 125
- 17.2 Architecture Components 128
- 17.3 What is On-board Electronics Architecture?. 128
- 17.4 Introduction to Multiplexing 129
- 17.5 Two Examples 130
- Chapter 18 • Electronic Control Units 133**
- 18.1 Hardware Architecture 133
- 18.2 Interfaces between Calculators and Data Producers/Consumers 135
- 19.3 Software Architecture. 139
- Chapter 19 • Buses 145**
- 19.1 Protocols 145
- 19.2 Communication Mode. 145
- 19.3 Media Access. 145
- 19.4 Comparison of Buses and Their Main Uses 146
- 19.5 Linear or Star Topology 147
- 19.6 Topology of Architecture 147
- Chapter 20 • Design Methodology: a Case Study. 154**
- 20.1 Introduction 154
- 20.2 Case Study: the Adaptive Speed Limiter. 154
- 20.3 Users’ Needs. 155
- 20.4 Project Level 156
- 20.5 Functional Specifications. 159
- 20.6 Functional Architecture. 161
- 20.7 Hardware Design Architecture (HDA) 170

20.8 Last step: Mapping the FDA on the HDA	173
Chapter 21 • Introduction to Preliminary Hazard Analysis	174
21.1 Some PHA definitions	174
21.2 ASIL Integrity Levels	175
21.3 Case Study: PHA Applied to ISA	177
21.4 Formalizing in EAST-ADL	182
Chapter 22 • Deployment Roadmap	184
22.1 Introduction	184
22.2 A Three-stage Roadmap	184
22.3 Technology Targets and Use Cases	185
22.4 Moving Forward to 2050	192
Chapter 23 • MINI-CAV	193
23.1 Introduction	193
23.2 MINI-CAV Objective and Use Cases	194
23.3 Acknowledgement	195
23.4 The Test Track	195
23.5 Vehicle Selection and Construction	197
23.6 On-board Electronics	198
23.7 Functional Architecture	205
23.8 Physical Architecture	207
23.9 Conclusion	207
Afterword	209
Appendix A • Neural Networks and CNN	211
A.1 Physiological Neuron Function	211
A.2 The Formal Neuron	211
A.3 The Multilayer Perceptron	213
A.4 Convolutional Neural Networks (CNN)	214
Appendix B • Understanding SOTIF in the Context of ADAS and CAV	217
B.1 What is SOTIF?	217
B.2 The Gap SOTIF Fills: Beyond Functional Safety	217
B.3 Key Objectives of ISO/PAS 21448 – SOTIF	218

- B.4 SOTIF vs ISO 26262: Key Differences 218
- B.5 Complementary Nature of the Two Standards 218
- B.6 Implications for ADAS and Autonomous Vehicle Development 219
- B.7 Challenges and Ongoing Work 219
- B.8 Conclusion 220
- Appendix C • Equivalent Energy Speed, AIS, and MAIS 221**
- C.1 EES 221
- C.2 MAIS 221
- C.3 Link between EES and AIS/MAIS 222
- Appendix D • Mobility as a Service (MaaS) 223**
- D.1 Components of MaaS 223
- D.2 Technical Challenges 223
- D.3 Future Trends in MaaS 224
- D.4 Conclusion 224
- Appendix E • Controlling a Servo Motor using PWM 225**
- E.1 Hardware Setup 225
- E.2 GPIO Pin Configuration 225
- E.3 Code in C 225
- E.4 Code Compilation and Execution 226
- E.5 Conclusion 227
- Appendix F • Resources and Bibliography 228**
- Glossary 234**
- Index 236**

Preface

The rise of autonomous and connected vehicles is part of a fascinating yet complex technological and societal landscape. These vehicles are not merely standalone systems; they are integral components of a broader ecosystem known as Intelligent Transport Systems. This systemic nature necessitates a multidisciplinary approach, where engineering sciences play a central role while also considering the crucial contributions of human and social sciences. Acceptability, regulation, and deployment strategies are non-technical dimensions that directly influence the future of these technologies.

Providing a comprehensive overview of this field is a significant challenge. This book, therefore, focuses primarily on the technological aspects while also offering insights into the roadmap for deploying autonomous vehicles. It is the result of over fifteen years of experience within a research laboratory dedicated to Advanced Driver Assistance Systems (ADAS) and Connected and Autonomous Vehicles (CAV), drawing on the expertise of a team of researchers specialized in key disciplines.

Intended for technicians, engineers, and innovation enthusiasts, this book serves as an introduction to complex concepts, aiming to make them accessible without oversimplification. The topics covered are diverse: understanding human driving behavior, which can be used as a model for autonomous vehicles; the necessity of vehicular communications; key technical functions; embedded electronic implementation; failure analysis; and, finally, a proposal for designing a scaled-down (1:10) autonomous vehicle. This last element, both entertaining and educational, provides a valuable platform for experimentation and research.

One of the essential aspects that cannot be overlooked is the growing relationship between autonomous vehicles and infrastructure. These vehicles can no longer be conceived as independent objects. As automation levels increase, so do the safety imperatives, making collaboration with infrastructure a critical factor. There are significant win-win synergies to be leveraged between automotive manufacturers and road operators. Effective coordination between these stakeholders will be key to ensuring the seamless and secure integration of autonomous vehicles into the transportation network.

The structure of this book is inspired by courses taught in the “Smart Mobility” Master’s program at Institut Polytechnique de Paris, as well as training sessions designed for engineers in the automotive industry. Presenting this content to a diverse audience, especially industry professionals, has helped confirm its relevance and alignment with current industry trends.

May this book provide readers with a clear and in-depth understanding of the challenges surrounding autonomous and connected vehicles and inspire them in their own technological and scientific explorations.

Finally, my sincere gratitude goes to all those who accompanied me on this professional journey, as well as to those who contributed to improving this book through their valuable insights, careful review, and help with editing. Their support and expertise have been instrumental in refining this work — their dedication is deeply appreciated.

Jacques Ehrlich