

1. Record Nr.	UNINA9910502655403321
Autore	Isermann Rolf
Titolo	Automotive Control : Modeling and Control of Vehicles
Pubbl/distr/stampa	Berlin, Heidelberg : , : Springer Berlin / Heidelberg, , 2021 ©2022
ISBN	3-642-39440-X
Descrizione fisica	1 online resource (647 pages)
Collana	ATZ/MTZ-Fachbuch Ser.
Soggetti	Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	304317_1_En_OFC -- 304317_1_En_BookFrontmatter_OnlinePDF -- Preface -- Contents -- Symbols -- 304317_1_En_1_Chapter_OnlinePDF -- 1 Introduction -- 1.1 Mechatronic Components and First Driver- Assistance Systems -- 1.2 Automatic Vehicle Control Developments -- 1.3 Contents of the Book -- 304317_1_En_1_PartFrontmatter_OnlinePDF -- blackPart I Electronic Architectures and Control Structures-1pt -- 304317_1_En_2_Chapter_OnlinePDF -- 2 Electrical and Electronic Architectures of Automobiles -- 2.1 Types of Network Architectures -- 2.2 Electronic Communication Networks -- 2.2.1 Network Nodes -- 2.2.2 Network Topologies -- 2.2.3 Bus Systems -- 2.2.4 Gateways -- 2.2.5 Electronic Network Architectures -- 2.3 Software Structure of the Electronic Control Units -- 2.3.1 Conventional Software Structure -- 2.3.2 Multilevel-Software Structure -- 2.3.3 AUTOSAR -- 304317_1_En_3_Chapter_OnlinePDF -- 3 Vehicle Control Structures -- 3.1 Overall Vehicle Control Structures -- 3.2 Control Structures of the Powertrain -- 3.2.1 Control Structure of Internal Combustion Engines -- 3.2.2 Control Structure of Hybrid Drives -- 3.3 Design of Vehicle Control Systems -- 3.3.1 Vehicle-Oriented Electronic Control Design -- 3.3.2 Model-Based Control-Function Development with Special Design and Simulation Tools -- 3.3.3 Control-Software Development -- 304317_1_En_2_PartFrontmatter_OnlinePDF -- blackPart II Modeling of Drive Dynamics-1pt -- 304317_1_En_4_Chapter_OnlinePDF -- 4 Vehicle Dynamics Modeling -- 4.1 Coordinate Systems -- 4.1.1

Definition of Coordinate Systems -- 4.1.2 Transformations -- 4.2 Model Building Approaches -- 4.2.1 Theoretical and Experimental Modeling -- 4.2.2 Semi-physical Models -- 304317_1_En_5_Chapter_OnlinePDF -- 5 Tire Traction and Force Transfer -- 5.1 Longitudinal Tire Forces -- 5.2 Lateral Tire Forces -- 5.3 Combined Longitudinal and Lateral Forces. 5.4 Lateral Tire Dynamics -- 5.5 Longitudinal Dynamic Wheel Models -- 5.6 Tire Forces for Aquaplaning -- 304317_1_En_6_Chapter_OnlinePDF -- 6 Longitudinal Vehicle Behavior -- 6.1 Vehicle Components for the Longitudinal Behavior of Vehicles -- 6.2 Internal Combustion Engine Models -- 6.2.1 Gasoline Engine -- 6.2.2 Diesel Engine -- 6.3 Drive Train with Friction Clutch and Shifted Transmission -- 6.3.1 Dry-Plate Friction Clutch -- 6.3.2 Shifted Transmission, Propeller Shaft, and Differential -- 6.3.3 Drive Shaft and Wheels -- 6.4 Drive Train with Automatic Hydrodynamic Transmission -- 6.5 Longitudinal Vehicle Model -- 6.5.1 Basic Longitudinal Vehicle Model -- 6.5.2 Simplified Vehicle Model with Stiff Powertrain (One-Mass System) -- 6.5.3 The Drive Train As a Two-Mass-System -- 6.5.4 Vertical Wheel Forces for Stationary and Dynamic Behavior -- 6.6 Acceleration Behavior -- 6.6.1 Simplified Acceleration Model -- 6.6.2 Acceleration Models with Variable Slip and Vertical Forces -- 6.7 Braking Behavior -- 6.7.1 Simplified Braking Model -- 6.7.2 Braking Models with Variable Slip and Vertical Forces -- 304317_1_En_7_Chapter_OnlinePDF -- 7 Lateral Vehicle Behavior -- 7.1 Kinematic Models for Lateral Behavior -- 7.2 Dynamic One-Track Models -- 7.2.1 Nonlinear One-Track Model -- 7.2.2 Linearized One-Track Model -- 7.2.3 Parameter Variations -- 7.2.4 Characteristic Velocity and Stability -- 7.2.5 Stationary Cornering -- 7.2.6 Comparison with Measurements -- 7.2.7 Wheel Slip Angle Difference Model -- 7.3 Dynamic Two-Track Models -- 7.3.1 General Two-Track Model -- 7.3.2 Simplified Two-Track Model, Even Road Plane -- 7.3.3 Two-Track Model with Road Gradients, Front and Rear Wheel Steering -- 7.3.4 Nonlinear One-Track Model with Road Gradients -- 7.3.5 Comparison of Different Lateral Vehicle Models -- 7.3.6 Effect of Parameter Variations on the Lateral Behavior. 304317_1_En_8_Chapter_OnlinePDF -- 8 Vertical Vehicle Behavior -- 8.1 Vehicle Suspensions -- 8.1.1 Driving Comfort and Safety -- 8.1.2 Suspension Components -- 8.2 Passive Suspension Models -- 8.2.1 Linear Suspension Model -- 8.2.2 Nonlinear Suspension Models -- 8.3 Parameter Identification of Semi-active Suspensions -- 8.3.1 Parameter Identification of a Quarter-Car Suspension -- 8.3.2 Parameter Identification of a Driving Vehicle -- 304317_1_En_9_Chapter_OnlinePDF -- 9 Roll and Pitch Dynamic Behavior -- 9.1 Roll Dynamic Model -- 9.2 Pitch Dynamic Model -- 304317_1_En_10_Chapter_OnlinePDF -- 10 Parameter and State-Estimation Methods for Vehicle Dynamics -- 10.1 Parameter-Estimation Methods -- 10.1.1 Method of Least Squares Parameter Estimation (LS), Discrete Time -- 10.1.2 Method of Least Squares Parameter Estimation (LS), Continuous Time -- 10.2 State Variable Estimation -- 10.2.1 State Observer, Continuous Time -- 10.2.2 Nonlinear State Observer, Continuous Time -- 10.2.3 State Estimation (Kalman Filter), Discrete Time -- 10.2.4 Extended Kalman Filter -- 10.2.5 Determination of Derivatives -- 10.3 Driving Maneuvers -- 304317_1_En_11_Chapter_OnlinePDF -- 11 Parameter Estimation (Identification) of Vehicle Dynamics -- 11.1 Vehicle Mass and Resistance Parameters -- 11.2 Center of Gravity Coordinates -- 11.3 Dynamic Rolling Tire Radius -- 11.4 Road Gradients -- 11.4.1 Longitudinal Road Gradient -- 11.4.2 Lateral Road Gradient -- 11.5

Understeer Gradient -- 11.6 Tire Model Parameters -- 11.6.1 Longitudinal Tire Model Parameters: Friction Coefficient Estimation -- 11.6.2 Lateral Tire Model Parameters: Cornering Stiffness Estimation -- 11.7 Mass Moments of Inertia -- 11.8 Roll and Pitch Dynamic Parameters -- 11.8.1 Roll Dynamic Parameters -- 11.8.2 Pitch Dynamic Parameters -- 304317_1_En_12_Chapter_OnlinePDF -- 12 State Estimation of Vehicles.

12.1 State Estimation of the Vehicle Position -- 12.1.1 Odometric Position Estimation for an Earth Fixed Coordinate System -- 12.1.2 Odometric Position Estimation for a Bent Road -- 12.2 State Estimation of the Ground Velocity with Kinematic Vehicle Models -- 12.2.1 Use of the Wheel Angular Velocities -- 12.2.2 Use of the Wheel Angular Velocities and the Acceleration -- 12.3 State Estimation for the Lateral Vehicle Behavior -- 12.3.1 Slip Angle Estimation for Special Driving Maneuvers with Kinematic Models -- 12.3.2 Slip Angle Estimation with State Observers (General Dynamic Driving Maneuvers) -- 12.3.3 Slip Angle Estimation with Kalman Filters -- 12.4 State Estimation of the Roll Angle and Pitch Angle -- 12.4.1 State Estimation of the Roll Angle -- 12.4.2 State Estimation of the Pitch Angle -- 12.5 Expanded Vehicle State Estimation with an Extended ... -- 12.6 Vehicle State Estimation with Additional 3D-GPS Measurements ... -- 12.6.1 Roll Angle and Yaw Angle Estimation -- 12.6.2 Vehicle State Estimation with a Two-Track Model -- 304317_1_En_3_PartFrontmatter_OnlinePDF -- blackPart III Dynamic Control of Chassis Components-1pt -- 304317_1_En_13_Chapter_OnlinePDF -- 13 Braking Control -- 13.1 Hydraulic Brake System -- 13.2 Models of a Hydraulic Brake Circuit -- 13.2.1 Pneumatic Brake Booster -- 13.2.2 Brake Circuit -- 13.3 Anti-lock Control with Switching Valves (ABS) -- 13.4 Electromechanical Brake Booster -- 13.5 Electro-Hydraulic Brake System (EHB) -- 13.6 EHB Slip Control with Proportional Valves -- 13.7 Electromechanical Brake (EMB) -- 13.7.1 Introduction -- 13.7.2 Electromechanical Brake Module -- 13.7.3 EMB-brake Model -- 13.7.4 Simplified EMB-brake Model -- 13.7.5 Simulation and Measurement -- 304317_1_En_14_Chapter_OnlinePDF -- 14 Steering Control Systems -- 14.1 Mechanical Steering Systems -- 14.1.1 Types of Steering Systems.

14.1.2 Stationary and Dynamic Behavior of Mechanical Steering Systems -- 14.1.3 Frequency Ranges of Interest -- 14.2 Power-Assisted Steering Systems -- 14.2.1 Kinematic Relations for Power Steering -- 14.3 Hydraulic Power Steering (HPS) -- 14.3.1 Basic Designs of HPS -- 14.3.2 Dynamic Models of HPS -- 14.4 Electrical Power Steering (EPS) -- 14.4.1 Basic Designs of EPS Systems -- 14.4.2 Components of EPS Systems -- 14.4.3 Dynamic Models of Electrical Power Steering Systems (EPS) -- 14.4.4 Fault-Tolerant EPS-Structures -- 304317_1_En_15_Chapter_OnlinePDF -- 15 Suspension Control Systems -- 15.1 Classification of Suspension Systems -- 15.2 Semi-active Suspensions -- 15.2.1 Semi-active Dampers -- 15.2.2 Load-Leveling System -- 15.2.3 Semi-active Spring -- 15.3 Control of Semi-active Suspensions -- 15.3.1 Parameter-Adaptive Semi-active Dampers -- 15.3.2 State Feedback Controlled Semi-active Suspensions -- 15.4 Active Suspensions -- 15.4.1 Active Suspension Principles -- 15.4.2 On Active Suspension Control -- 15.4.3 Active Hydraulic Suspension -- 15.5 Tire Pressure Monitoring with Wheel and Suspension Sensors -- 15.5.1 Comparison of Wheel's Speeds -- 15.5.2 Torsional Wheel Speed Oscillations -- 15.5.3 Vertical Wheel Acceleration -- 15.5.4 Comparison and Fusion of the Methods -- 304317_1_En_4_PartFrontmatter_OnlinePDF -- blackPart IV Driver-Assistance Systems-1pt -- 304317_1_En_16_Chapter_OnlinePDF -- 16

On Driver-Assistance Systems -- 16.1 Passive and Active Driver-Assistance Systems -- 16.2 Sensor Systems for Advanced Driver-Assistance Systems -- 16.3 Environment Representation -- 304317_1_En_17_Chapter_OnlinePDF -- 17 Advanced Driver Assistance Systems for Longitudinal and Lateral Guidance -- 17.1 Traction Control System (TCS) -- 17.2 Electronic Stability Control (ESC) -- 17.2.1 ESC for Oversteering -- 17.2.2 Simplified ESC for Over- and Understeering. 17.3 Lane Keeping Assistance (LDW/LKA).
