

Preface

The purpose of this book is to present operational and practical issues of automotive mechatronics with special emphasis on the heterogeneous automotive vehicle systems approach.

The book is intended as a graduate text as well as a reference for scientists and engineers involved in the design of automotive mechatronic control systems.

As the complexity of automotive vehicles increases, so does the dearth of high competence, multi-disciplined automotive scientists and engineers. This book provides a discussion of the type of mechatronic control systems found in modern vehicles and the skills required by automotive scientists and engineers working in this environment.

Divided into two volumes and five parts, **Automotive Mechatronics** aims at improving automotive mechatronics education and emphasises the training of students' experimental hands-on abilities. The author hopes that this can stimulate and promote the education programme in students' experimental hands-on experience among high education institutes and produce more automotive mechatronics and automation engineers.

Contents

❖ VOLUME I

- Part 1 - RBW or XBW unibody or chassis-motion mechatronic control hypersystems;
- Part 2 - DBW AWD propulsion mechatronic control systems;
- Part 3 - BBW AWB dispulsion mechatronic control systems;

❖ VOLUME II

- Part 4 - SBW AWS conversion mechatronic control systems;
- Part 5 - ABW AWA suspension mechatronic control systems.

The book was developed for undergraduate and postgraduate students as well as for professionals involved in all disciplines related to the design or research and development of automotive vehicle dynamics, powertrains, brakes, steering, and shock absorbers (dampers). A basic knowledge of college mathematics, college physics, and knowledge of the functionality of automotive vehicle basic propulsion, dispulsion, conversion and suspension systems is required.

Individuals new to the subject matter of RBW or XBW unibody, space-chassis, skateboard-chassis or body-over-chassis motion mechatronic control systems, will benefit most from the material. This manual is not compulsory for individuals with a basic background in, or knowledge of DBW AWD propulsion, BBW AWD propulsion, SBW AWD conversion and ABW AWA suspension mechatronic control systems. Into the bargain, please notice that because of proprietary considerations, this book does not present details of algorithm design, algorithm performance, or algorithm application.

I am the sole author of the book and all text contained herein is of my own conception unless otherwise indicated. Any text, figures, theories, results, or designs that are not of my own devising are appropriately referenced in order to give acknowledgement to the original authors. All sources of assistance have been assigned due acknowledgement.

All information in this book has been obtained and presented in accordance with academic rules and ethical conduct. I also wish to state declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this book.

I wish to express my sincere gratitude to Professor Spiros Tzafestas for his interest in the preparation of this book in the Intelligent Systems, Control, Automation, Science and Engineering book series (ISCA). My gratitude is also due to Ms Nathalie Jacobs and Ms Johanna F. A. Pot of Springer for their persistence in making this book a reality.

I am grateful to the many authors referenced in this book from whom, during the course of writing, I learned so much on the subjects which appear in the book. I am also indebted to my national and international colleagues who indirectly contributed to this book.

Most of all I wish to express thanks the following consortia and institutions: ABIresearch, ABResearch, ACURE Dynamics, ADAMS, ADVISOR, ADwin, AEG, Air Force Research Lab. (AFRL), AIRMATIC, AirRock, AKA Bose Corp., AMESim, AMI Semiconductor, AMT, AMTIAC, AR&C, AROQ Ltd., Audi AG, AUDIAG, AutoPro, AUTOSAR, AUTOTECH, Avio Pro, AVL, Bertone, BizWire, Bobbs-Merrill Co., BMW, BOSCH GmbH, Bridgestone Corp., Cadillac, CAFS, California Linear Devices, Carnegie Mellon, Centro Recherche FIAT, CFC, Challenge Bibendum, Chalmers University of Technology, Climatronic, Cleveland State University, Cracow University of Technology, Continental TEVES Inc., Cosc/Psych, Cracow University of Technology, CRL, Chrysler, Daimler-Benz, DaimlerChrysler AG, D&R, DAS, DECOMSYS, Delco Electronics, Delco-Remy, Delphi, Delft Center for Systems and Control, DJH, DLR RoboDrive, DRDC, dSPACE GmbH, Dynamic Structures & Materials LLC, Energen Inc., ERFD, ER Fluid Developments Ltd. UK, eSTOP GmbH, FAA US DoT, FACE International Corp., FHWA-MC Fiat, Fichtel & Sachs, FlexRay Consortium, FMA, FortuneCity, FPDA, US DoT, Ford Europe, Ford Motor Co., Ford SRL, Freescale Semiconductor Inc., FUJI Microelectronics Inc. (FMA), FUJITSU, GM Chevrolet, GM Opel, General Motors Corp., German Aerospace

Centre (DLE e.V.), Gothorum Carolinae Sigillium Universita, Graz University of Technology (TUG), Haskell, Hitachi Co., Honda, How Stuff Works, Hunter, I-CAR, IEC, IEEE, IMechE, Intel, Institute of Robotics and Mechatronics, Intelligent Transportation Society (ITS), ISO, IPC website, IPG Automotive GmbH, Istanbul Technical University, Jäger GmbH, JB, JUST-AUTO.COM, Kalmar, Kinetic Suspension Technology, Lexus, Kungl. Tekniska Högskolan (KTH), Land Rover, Lord, Lotus Engineering, Lund Institute of Technology, Magneti Marelli, Magnet Motor, Mazda, McCormick, Mechanical Dynamics, Inc., Mecel, Messier-Bugatti, MICHELIN, MILLENWORKS, MIT Hatsoupulos Microfluid Lab., Mitsubishi Corporate, MOST Net-services., MOTOROLA, NI, NASA Langley Research Center, National Highway Traffic Administration (NHTSA), Nissan, Office of Naval Research (ONR), Norwegian University of Science and Technology, Oldhams Ltd., OSEK-WORKS, Packard, PACIFICA Group Technologies Pty Ltd., PEIT, PHILIPS, PITechnology, Polski FIAT, Porsche, PSA PEUGEOT CITROËN, Purdue School of Engineering and Technology, SAAB, SAE, Scania, Sensormag, Siemens VDO Automotive, SKF, Star, Studebaker, Subaru, Radatec Inc., Southwest Research Institute (SwRI), Racelogic, Radatec Inc., Renault, Research Team for Technology (CAMELS), Ricardo, RMSV, Robert Bosch GmbH, Rodmillen, SCANIA, Seoul National University, TACOM TARDEC, Technische Universität Darmstadt, Universität Koblenz, Universität Regensburg, TENNECO Automotive, The Motor Industry Research Association (MIRA), The New York Times, The University of Michigan, Toyota, TRIDEC, Triumph, TRW Automotive Inc., TTPbuild, TTPnode, TTTech Computertechnik AG, Università 'di Bologna, Universität Salzburg, University of California Berkeley, University of Leicester, University of Limerick, University of Pennsylvania, University of Queensland, University of Sussex, University of Texas at Austin, University of York (UK), Uppsala University, US Army Research Office, US DLA, US DoD, US DoE, UT-CEM, Valentin Technologies Inc., Valeo, Van Doorne Transmissie BV, VCT, Vienna Institute of Technology, VOLKSWAGEN (VW), VOLVO, Wongkwang University, ZF Sachs AG, and XILINX for their text, figures, or designs included in this book in order to give them due credit and acknowledgement as well as to present their contemporary achievements in automotive mechatronics.

The book is full of advanced statements and information on technology developments of the automotive industry. These statements can be written and may be recognizable by terms such as *'may be'*, *'will'*, *'estimates'*, *'intends'*, *'anticipated'*, *'expects'* or terms with analogous sense. These statements are derived from presuppositions with reference to the developments of the technology of Europe, the Americas and Asia-Pacific countries, and in particular of their automotive industry, which I have prepared based on information accessible to me and which I think to be realistic at the time of going to press.

The estimates specified implicate a degree of risk, and the actual development may differ from those forecasts.

If the presuppositions underlying any of these statements prove incorrect, the actual results may noticeably differ from those expressed by or embedded in such statements.

I do not update advanced statements retrospectively. Such statements are of most value on the date of publication and can be superseded.

Anyone who has attempted to write such a book in their spare time knows how many weekends and vacation days go into it. I dedicate this book to my family for their continual encouragement, constant care, and assistance and infinite patience in making the writing of this book possible, as well as the generous understanding they have always shown me.

Cracow, November 2010

BOGDAN THADDEUS FIJALKOWSKI

Automotive Mechatronics: Operational and Practical
Issues

Volume II

Fijalkowski, B.T.

2011, XIV, 526 p., Hardcover

ISBN: 978-94-007-1182-2