

Proceedings of the

Third Conference on Mechatronics and Robotics

**“From design methods to industrial
applications”**

October 4–6, 1995 Paderborn

Edited by Prof. Dr.-Ing. Joachim Lückel
Universität-Gesamthochschule Paderborn



UNIVERSITÄTSBIBLIOTHEK
HANNOVER
TECHNISCHE
INFORMATIONSBIBLIOTHEK

B. G. Teubner Stuttgart 1995

Table of Contents

I. Introduction

J. Gausemeier, D. Brexel, T. Frank, A. Humpert <i>Integrated Product Development - A New Approach to the Computer Aided Development in the Early Design Stages</i>	10
B. Gombert, G. Hirzinger, G. Plank, M. Schedl, J. Shi <i>Modular Concepts for the New Generation of DLR's Light Weight Robots</i>	30
E. Kallenbach, K. König, E. Saffert, Chr. Schäffel, M. Eccarius <i>Integrated Design of Shape and Function in Mechatronic Systems</i>	44

II. Software Engineering in Mechatronics

M. Anantharaman, B. Fink, M. Hiller, S. Vogel <i>Integrated Development Environment for Mechatronic Systems</i>	54
R. Kasper, W. Koch <i>Object-Oriented Behavioural Modelling of Mechatronic Systems</i>	70
J. Bielefeld, G. Pelz, G. Zimmer <i>Analog Hardware Description Languages for Modeling and Simulation of Microsystems and Mechatronics</i>	85

III. Drive Systems

K. Nishibori, S. Okuma, H. Obata <i>Driving Characteristics of Robot Hand with Fingers using Langevin-Type Ultrasonic Motors</i>	94
P. Ph. Robet, M. Gautier, C. Bergmann <i>Experimental Identification of DC Electric Drives</i>	105
R. Scheidl, D. Schindler, G. Riha, W. Leitner <i>Basics for the Energy-Efficient Control of Hydraulic Drives by Switching Techniques</i>	118
P. Van den Braembussche, J. Swevers, H. Van Brussel, P. Vanherck <i>Motion Control and Identification Techniques for Machine Tool Axes</i>	132

IV. Robot Control

B. Siciliano <i>A Unified Framework for the Design of Interaction Control Schemes for Robot Manipulators</i>	146
P. Fraisse, F. Pierrot, P. Dauchez <i>Robust Control of a Two-Arm Robot: an Efficient Implementation in a DSP-based Controller</i>	162
R. Neumann, W. Moritz <i>Robot Path Control with a Decentral Structure</i>	176
G.-W. van der Linden <i>Design and Implementation of a Model-Based Nonlinear Controller for an Experimental Hydraulic Robot</i>	190

V. Robot Applications

C. Uhrhan, R. Roshardt, G. Schweitzer <i>User-Oriented Automation of Flexible Sheet Bending</i>	202
P. Drews, D. Matzner <i>Smart Welder - A Mechatronic Application for Automated Shipbuilding</i>	212
W. Roddeck, H.-J. Rehbein <i>Autonomous Tool-Mover for Laser-Cutting with Industrial Robots</i>	226
N. Ahlbehrendt, H. Diesing, S. Jakobi <i>Interactive Robot Master Slave System for Deburring Large Cast Iron</i>	235

VI. Mobile Robots

E. Kreuzer, F.C. Pinto <i>Remotely Operated Vehicle - A Mechatronic System</i>	248
P. Alexandre, A. Preumont <i>A Free Gait Algorithm for Improved Mobility Control of Walking Machines</i>	262
M. A. Busetti de Paula, M. C. Zanella <i>Application of a Simulation with Hardware-in-the-Loop Environment in Automated Guided Vehicles</i>	276
Fr.-W. Bach, J. Seevers, M. Hahn, M. Rachkov <i>Wall-Climbing Robots for Inspection and Maintenance</i>	286

VII. Modelling and Simulation

O. Enge, G. Kielau, P. Maißer <i>Modelling and Simulation of Discrete Electromechanical Systems</i>	302
M. Kaltenbacher, F. Lindinger <i>Software Environment for the Computer Modeling of Magnetomechanical Systems</i>	319
H. Freudenberg, P. A. Tuan <i>Modeling and Simulation of a Flexible Shuttle-Robot</i>	331
H. Hesse, J. Wallaschek <i>Optimization of the Dynamic Behavior of a Wire Bonder Using the Concept of Mechatronic Function Modules</i>	341

VIII. Vehicles

R. Busch <i>Development of the Control of a Fully Automated Hybrid Drive</i>	356
A. Daberkow, M. Koch, N. Ott <i>Mechatronic System Elements for Traction Control of Light Railway Vehicles</i>	372
M. Hahn, J. Richert, J. Seuss <i>Mechatronic Object-Oriented Modelling and Control Strategies for Vehicle Convoy Driving</i>	385
A. Rükgauer, U. Petersen, W. Schiehlen <i>Mechatronic Steering of a Convoy Vehicle</i>	403

IX. General Aspects in Mechatronics

T. Fukuda, K. Shimojima <i>Fuzzy-Neuro-GA Based Intelligent Control</i>	418
T. Raste, P. C. Müller <i>Modeling and Control of Mechatronic Systems by Decentralized Descriptor Systems</i>	432
W. Brockherde, D. Hammerschmidt, B. J. Hosticka <i>Silicon Microsystems for Mechatronic Applications</i>	446

X. Real-Time Processing

E. G. M. Holweg, G. Honderd, W. Jongkind <i>Transputer Software Tool for Robot Control Applications</i>	458
U. Honekamp, R. Stolpe <i>Design and Application of a Distributed Simulation- and Runtime-Platform for Mechatronic Systems in the Field of Robot Control</i>	471
J. Pfefferl <i>MERKUR: A Real-Time and Fault-Tolerant Communication System for Mechatronic Applications</i>	485

XI. Robots - General Aspects

O. Khatib, A. Bowling <i>Optimization of the Inertial and Acceleration Characteristics of Non-Redundant Manipulators</i>	500
R. Caracciolo, F. Fanton, A. Gasparetto, A. Rossi <i>A Laser-Based 3D Correlation Procedure for the Execution of a Biomedical Task in Robotized Cell.</i>	511
J. Möckel, M. Berger, J. Schönherr <i>Servodrive Equipped Linkages to Generate Exactly Defined Flexible and Adaptable Movements</i>	525
M. Schlemmer, R. Finsterwalder, G. Grübel <i>Avoiding Singularity Problems of Manipulators with Redundant Kinematics by On-line Dynamic Trajectory Optimization.</i>	538