

Proceedings

Robotic Systems for Handling and Assembly

2nd International Colloquium of the
Collaborative Research Center SFB 562

Braunschweig | Germany
May 10-11, 2005

Edited by
P. Last, C. Budde, F. M. Wahl



Fortschritte in der Robotik Band 9

Shaker Verlag

Bibliographic information published by Die Deutsche Bibliothek

Die Deutsche Bibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data is available in the internet at <http://dnb.ddb.de>.

Copyright Shaker Verlag 2005

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publishers.

Printed in Germany.

ISBN 3-8322-3866-2

ISSN 1431-7222

Shaker Verlag GmbH • P.O. BOX 101818 • D-52018 Aachen

Phone: 0049/2407/9596-0 • Telefax: 0049/2407/9596-9

Internet: www.shaker.de • eMail: info@shaker.de

Contents

Preface

F. M. Wahl, P. Last.....	5
--------------------------	---

THEORETICAL ASPECTS

The Necessity of Optimal Design for Parallel Machines and a Possible Certified Methodology

J. P. Merlet.....	7
-------------------	---

Numerical and Experimental Analysis of the Stiffness Performances of Parallel Manipulators

M. Ceccarelli, G. Carbone	21
---------------------------------	----

The Morphology Design for a Parallel Schönflies-Motion Generator

J. Angeles	37
------------------	----

PROGRAMMING & CONTROL I

Towards Automated Robot Programming

U. Thomas, F. M. Wahl	57
-----------------------------	----

Control Structures for Implementing Skill Primitives

W. Schumacher, M. Kolbus, J. Maaß, T. Reisinger.....	77
--	----

Parallel Robot Specific Control Functionalities

J. Hesselbach, C. Bier, C. Budde, P. Last, J. Maaß, M. Bruhn	93
--	----

PROGRAMMING & CONTROL II

Kinematics, Dynamics and Control for a Class of Parallel Robots

B. Siciliano, L. Villani, F. Caccavale 109

A New Communication Architecture for Hard Realtime Robot Control

N. Kohn, J.-U. Varchmin, H. Michalik..... 123

Rigorous Tool-Supported Software Development of a Robot Control System

J. Steiner, K. Diethers, T. Mücke, U. Goltz, M. Huhn..... 137

INDUSTRIAL DEVELOPMENTS

Application-Oriented Development of Parallel Kinematic Manipulators with Large Workspace

T. Brogårdh, S. Hanssen, G. Hovland 153

Parallel Robots with Pneumatic Drives

R. Neumann, M. Göttert, A. Hartmann..... 171

PARALLEL ROBOT COMPONENTS

Analysis, Realization and Application of the Tendon-Based Parallel Robot SEGESTA

M. Hiller, S. Fang, C. Haß, T. Bruckmann 185

Adaptive Tools in Parallel Robotics

E. Breitbach, S. Algermissen, R. Keimer, M. Rose, C. Stachera..... 203

Knowledge Based Development Environment

H.-J. Franke, C. Wrege, C. Stechert, N. Pavlovic 221

**Development of Angular Joint-Sensors
and Application to Parallel Robots**

S. Büttgenbach, J. Güttler, P. Last, C. Bier, R. Otremba 237

DESIGN & APPLICATIONS**Lower Mobility PKM for Large Tilting Angles**

F. Pierrot, O. Company, V. Nabat, S. Krut 253

**Parallel Kinematics as a Potential for Boosting Efficiency
for Handling Equipment in Forming Machines**

R. Neugebauer, P. Blau, N. Lütz 269

High Precision Parallel Robots for Micro-Factory Applications

R. Clavel, P. Helmer, T. Niaritsiry, S. Rossopoulos, I. Verettas 285

Authors 297