

CONTROL OF DISTRIBUTED PARAMETER SYSTEMS 1989

v R N 6681

*Selected Papers from the 5th IFAC Symposium, Perpignan, France,
26-29 June 1989*

Edited by

M. AMOUROUX and A. EL JAI

*Laboratoire d'Automatique,
University of Perpignan, France*

Published for the

INTERNATIONAL FEDERATION OF AUTOMATIC CONTROL

by

PERGAMON PRESS

Member of Maxwell Macmillan Pergamon Publishing Corporation
OXFORD · NEW YORK · BEIJING · FRANKFURT
SÃO PAULO · SYDNEY · TOKYO · TORONTO

CONTENTS

PLENARY SESSIONS

Sentinels with Special Sensitivity J.L. LIONS	1
Linear Quadratic Tracking Problems in Hilbert Space: Application to Optimal Active Noise Suppression H.T. BANKS, S.L. KEELING, R.J. SILCOX, C. WANG	5
Some Results on Exact Controllability A. BENSOUSSAN	11
Time and Frequency Domain Methods for Infinite-dimensional H^∞ -control R.F. CURTAIN	17
Compensator Design for Stability Enhancement with Co-located Controllers A.V. BALAKRISHNAN	23
Shape Analysis and Optimization in Distributed Parameter Systems M.C. DELFOUR	35

SYSTEM ANALYSIS

Controllability of Damped Flexible Systems L. BERRAHMOUNE	45
Stabilization of Second Order Evolution Equations by Unbounded Nonlinear Feedback F. CONRAD, J. LEBLOND, J.P. MARMORAT	51
Stability of Perturbed Linear Distributed Parameter Systems: A Lyapunov Equation Approach L. PANDOLFI	57
Stabilizability of Distributed Parameter Systems with Unbounded Controls R. REBARBER	63
Weak Asymptotic Stability for Discrete Linear Distributed Systems C.S. KUBRUSLY, P.C.M. VIEIRA	69
Time-domain Feedback Control of Distributed Parameter Systems Using Approximate Models - An Operational Approach C.R. MACCLUER, Y. CHAIT	75

Exact Controllability and Optimal Control of Distributed Systems A. BEL FEKIH	79
On Some Mathematical Tools for Local Controllability D. AZE, C.C. CHOU	85
The Edge Theorem and Graphical Tests for Robust Stability of Neutral Time-delay Systems M. FU, A.W. OLBROT, M.P. POLIS	89
Remarks on the Homogenization and Boundary Control of Distributed Systems M. AVELLANEDA	93
On Hilbert Uniqueness Method: A Semigroup Approach L. BERRAHMOUNE, A. EL JAI	97
Stability and Structural Properties of Infinite Dimensional Balanced Realizations R. OBER	103
Open Loop Stabilizability, A Research Note H. ZWART	111
Robustness Optimization for Abstract, Uncertain Control Systems: Unbounded Inputs and Perturbations A.J. PRITCHARD, S. TOWNLEY	117

APPLICATIONS

On-line Parameter Identification of the Rhine River Calamity Model M. VAJTA, A. BAGCHI	123
Control of Distributed Parameter Bioreactors Via Orthogonal Collocation D. DOCHAIN, J.P. BABARY	129
Parameter Estimation in Stochastic Hydraulic Models P.G.J. TEN BRUMMELHUIS	135
Optimal Control of a Non-linear System J. BURGER, J. TAOUD	141
Pareto Optimal Birth Control of Age-dependent Populations W.L. CHAN, GUO BAO ZHU	147
Optimal Control of a Nonlinear Thermal System M. EL BAGDOURI	153
Identification of the Plasma Current Density in a Tokamak J. BLUM, Y. STEPHAN	159

PARAMETER ESTIMATION IN DPS

Two-dimensional Inverse Scattering Methods in Ultrasound Computer Tomography A.K. LOUIS	165
--	-----

A Numerical Method for Parameter Estimation in Moving Boundary Problems K.A. MURPHY	169
The Role of Growth Rates for Gauss-Newton Methods and Parameter Identification Problems M. HEINKENSCHLOSS, E.W. SACHS	175
Determining the Nonlinearity in a Parabolic Equation from Boundary Measurements T.I. SEIDMAN	181
A Computational Method for Electrical Impedance Imaging F. SANTOSA, M. VOGELIUS	187
Multiscale Parametrization for the Estimation of a Diffusion Coefficient in Elliptic and Parabolic Problems G. CHAVENT, J. LIU	193
Error Estimation for Determination of Unknown Coefficients in Parabolic Equations R.E. EWING, T. LIN	203
On-line Identification of the State of the Surface of a Material Undergoing Thermal Processing A. AFSHARI, C. BENARD, C. DUHAMEL, B. GUERRIER	209

MOVING DOMAIN AND SHAPE OPTIMISATION

Computation of the Shape Hessian by a Lagrangian Method M.C. DELFOUR, J.P. ZOLESIO	215
Shape Acceleration: A Second Order Accurate Incremental Method for Big Deformations T. TIIHONEN, J.P. ZOLESIO	221
On Shape Sensitivity Analysis for Visco-Elastic-Plastic Problems J. SOKOLOWSKI, J.P. ZOLESIO	225
Dynamical Actuators for the Heat Equation P. CANNARSA, G. DA PRATO, J.P. ZOLESIO	229
Static Shape Estimation and Failure Detection in Large Spaceborne Antennas Via Computer Vision P.K.C. WANG, NAI-JIAN WANG	233
Relaxation Methods for the Study of Domain Optimization Problems R.B. GONZALEZ DE PAZ	241
Stabilization of Wave Equation by Periodical Moving Actuators J.P. ZOLESIO	245

ALGORITHMIC ASPECTS IN PARAMETER ESTIMATION

Shape Identification Technique for a 2-D Elliptic System by Boundary Integral Equation Method F. Kojima	249
---	-----

Gradpack: A Symbolic System for Automatic Generation of Numerical Programs in Parameter Estimation J. LIU	255
Sequential Quadratic Programming for Parameter Identification Problems D.M. HWANG, C.T. KELLEY	259

OPTIMAL CONTROL

The LQCP with a Terminal Inequality Constraint and Unbounded Input and Output Operators Z. EMIRSAJLOW	265
Boundary Control Approach to the Regularization of a Cauchy Problem for the Heat Equation F. FLANDOLI	271
How to Tune a Multivariable PI-controller for Heat Exchangers Using H_{∞} -methods I. LATTI, S. POHJOLAINEN	277
Tracking and Regulation of Periodic Systems A. ICHIKAWA	283
Geometric Theory of Dynamic Systems with Control (CDS) A.G. BUTKOVSKIY	289
An Analytical Approach of Optimal Control for Multi-scale Distributed Parameter Systems I. ZAMBETTAKIS, G. DAUPHIN-TANGUY, F. ROTELLA	295
Boundary Control of the Timoshenko Beam with Viscous Internal Dampings K. ITO, N. KUNIMATSU	303

FLEXIBLE SYSTEMS

Modeling and Control of a Flexible Orbiting Spacecraft Y. SAKAWA, K. SATO	309
Non-linear Programming Applicable for the Control of Elastic Structures E. SCHNACK, G. IANCU	315
On Properties of Transfer Functions of a Flexible Structure H. KANOH	321
Experimental Study on Feedback Control of Coupled Bending and Torsional Vibrations of Flexible Beams Z.H. LUO, F. MATSUNO, Y. SAKAWA	327
The Response of a One-link, Flexible Arm to Variable Structure Control Using Sliding Surfaces T.D. LOOKE, M. FAROOQ, M.M. BAYOUMI	333
Control of Flexible Structures Subject to Random Disturbance A. OHSUMI, Y. SAWADA	339

Eigenstructure Assignment Approach to the Reconfiguration of Flexible Structure Control Systems H. OKUBO, K. SUNOHARA, Y. MUROTSU	345
The Q-Parameter Method Applied to the Control of a Flexible Beam R. PICHE, S. POHJOLAINEN	351
Position and Vibration Controls of Flexible Systems by Means of Tendon Mechanism K. YOSHIDA	355
 COMPUTATIONAL METHODS FOR ESTIMATION IN DPS	
Optimal Weighting for Improving Practical Identifiability in DPS Parameter Estimation Problems J. HENRY, F. GUYON, J.P. YVON	361
Statistical Methods for Parameter Identification and Model Selection in Distributed Systems H.T. BANKS, B.G. FITZPATRICK	367
Identification of Degenerate Distributed Parameter Systems P.K. LAMM, C.K. LO, I.G. ROSEN	371
Identification of Coefficients in Distributed Parameter Models D.J. INMAN, H.T. BANKS	377
Estimation of Parameters in Age/Size Structure Population Models H.T. BANKS, L.W. BOTSFORD, F. KAPPEL, C. WANG	383
 INVERSE TECHNIQS IN DPS	
Comparison of Space Marching Finite Difference Technique and Function Minimization Technique for the Estimation of the Front Location in Nonlinear Melting Problem M. RAYNAUD	389
An Observer-based Solution of an Inverse Heat Transfer Problem in Transition Boiling W. MARQUARDT, H. AURACHER	395
An Inversion Method to Evaluate the Control Law of a Ceramic Kiln E. WEILAND, J.P. BABARY	401
 NONLINEAR SYSTEMS	
Optimal Control of Industrial Sterilization of Canned Foods A. BERMUDEZ DE CASTRO, A.M. MARTINEZ VARELA	405
Maximum Principles in the Optimal Control of Semilinear Elliptic Systems J.F. BONNANS, E. CASAS	411
A Boundary Control Approach to an Optimal Shape Design Problem D. TIBA, R. MAKINEN, P. NEITTAANMAKI, T. TIIHONEN	415

Nonlinear Analysis of Dynamics and Control of Interconnected Systems with Distributed Parameters V.M. MATROSOV	419
Control of Nonlinear Distributed Parameter Systems Using Fixed Point Theorems: Some New Techniques J.A.M. FELIPPE DE SOUZA	427
Quadratic Cost Control for a Class of Non Linear Distributed System N. EL ALAMI	433

DELAY SYSTEMS

Controllability of Hereditary Differential Functional Systems J. KARRAKCHOU	439
Commensurate Delay Methods Extended to Independent Delay Problems J.E. MARSHALL, K. WALTON	445

NUMERICAL TECHNIQS

A Coke Oven Battery Modelization for Transient Operating Conditions C. BENARD, S. BEREK DAR, M.M. ROSSET, M. DEPOUX	451
Multilayer Simulation of Heat Flow in a Submerged Arc Furnace Used in the Production of Ferroalloys E.K. JUUSO	459
Numerical Approach for Exact Pointwise Controllability of Hyperbolic Systems A. EL JAI, J. BOUYAGHROUMNI	465
On Numerical Results for Shape Optimization C.E. PEDREIRA, R.B. VINTER	473

SENSORS AND ACTUATORS

Sensors Location Problem for Stochastic Non-linear Discrete-time Distributed Parameter Systems J. KORBICZ, P. GAWLOWICZ	479
Optimization of Sensor and Actuator Locations and Their Sensitivity Analysis S. OMATU, J.H. SEINFELD	485

ESTIMATION

A Posteriori Estimation for One Phase Stefan Problem with Noisy Boundary Input S.I. AIHARA	491
Observers for Distributed-Parameter Systems A.B. KURZHANSKI, A. YU KHAPALOV	497

MODELLING

Modelling and Stability Analysis of a Boundary Controlled 2-D Diffusion System L. DEKKER, S.W. BROK	501
Modeling and Control of Distributed Parameter Systems Using a Functional Approximation Structural Approach M.B. HADJIISKY, S.D. PATSOFF	507
Author Index	511
Keyword Index	513