# CONTENTS

### VOLUME 3

PΙ	FM	ΔΙ	$\mathbf{v}$	DΔ	PFR

Incentives and Control in Economic Organizations R. Radner	1091
COLLOQUIUM ON LARGE-SCALE SYSTEMS: THEORY, METHODOLOGY AND NON-STANDARD APPLICATIONS	
Analysis and Decomposition of Complex Systems	
The Mathematical Notion of Complexity L. Lovász	1105
Comparison Principle of the Discrete Large-scale Systems in the Theory of Stability and its Applications Feng En-bo	1111
Overlapping Decentralized Control with Input and Output Inclusion M. Ikeda and D.D. Šiljak	1117
Use of Subsystems Eigenstructure in Dynamically Interconnected Systems for Eigenvalue Assignment  A. El-Kashlan and M. El-Geneidy	,1123
Theory of Dynamic Games and its Applications in Large Scale Systems Design and Optimization	1205
T. Başar	1127
Two-level Structural Cooperative Large Scale Systems $P.P.$ Groumpos	1133
Decentralized Observers and Controls	
Multi-time Scale Systems A.J. Fossard	1139
Convergence Analysis of Distributed Asynchronous Iterative Processes $D.P.$ Bertsekas	1145
Decentralized Observers for State and Coupling Variables of Interacting Subsystems  D. Konik and H.D. Wend	114
Decentralized State Observers for Large-scale Systems P. Ficklscherer and P.C. Müller	115:
A Parameter Optimization Approach to the Design of Structurally Constrained Regulators for Discrete-time Systems	1159
R. Scattolini and N. Schiavoni	112
Design of Decentralized Controllers Incorporating Integral Action for Large-scale Linear Systems  Z. Uskokovic and J. Medanic	116
Decentralized Control	
Further Results on the Structure of the Robust Decentralized Regulator G. Guardabassi, A. Locatelli and N. Schiavoni	117

1171

Information Reduction in Optimally Controlling Composite Systems K. Uchida	1177	
New Characterizations of Decentralized Fixed Modes and their Applications Hu Yang-zeng and Jiang Wei-sun	1183	
Some Problems in Decentralized Control in Presence of Fixed Modes L. Trave, A.M. Tarras and A. Titli	1189	
Robust Servo Problems for Decentralized Control Systems with Partial Parameter Perturbations S. Hara	1195	
On Optimal Decentralized Stochastic Control R. Krtolica	1201	
Complex System Methodology Applications		
Problems of Classifications in Diagnostics and Control of Complex Systems  J. Spal and L. Madarász	1205	
Hierarchical Methods and Application to Water Systems M. Brdyś	1211	
Coordinated Decentralised Integrated Optimisation and Parameter Estimation of Large-scale Processes  J.E. Ellis, H. Michalska and P.D. Roberts	1217	
An Approach to the Modelling and Control of Feedback Queueing Systems  B. Bengtsson	1223	
Control of Arrivals to an Exponential Congestion System by Diffusion J. Filiplak	1229	
Large Scale Systems Applications M.G. Singh, M.S. Mahmoud and M.F. Hassan	1235	
Non-standard Applications of Large-scale Systems	*	
Hierarchical Command, Control and Coupled Bilinear Systems R.R. Mohler, W.J. Kolodziej and F.J. Bugnon	1243	
An LQG Design for Large Sparse Systems M. Hodžić and D.D. Šiljak	1249	
An Overview of Modeling and Control of Large Flexible Space Structures J.M. Santiago, W.J. Lange, Jr. and M. Jamshidi	1255	
Control Structure Selection in the Control of Large Scale Systems E.J. Davison and A. Solomon	1261	
Smoothing in a Large Scale Intelligent Database using Psychological Data Similarity  K. Nakamura, A.P. Sage and S. Iwai	1267	\
Optimal Operation of Large-scale Time-delay Systems with Applications to Water Resources M. Jamshidi and C.W. Wang	1273	
COLLOQUIUM ON APPLICATION OF LARGE-SCALE TECHNIQUES TO HUMAN DECISION MAKING AND MANAGEMENT		
Hierarchical Decision Systems — I		
Application of Hierarchical Optimal Control Method to Dynamical Input-Output Analysis Zhao Chunjun, Kia Shaowei and Jiang Shan	1281	
On the Methodology of Societal-Economic Systems Engineering Liu Bao and Zhang Shi-ying	1285	
Modelling of Large-scale Socio-economic Systems and Policies  R. Kulikowski	1289	
On Some Principles of Planned Economy Management V.N. Burkov, A.M. Cherkashin, N.I. Gorelikov, A.V. Tolstykh, V.V. Tsyganov, A.K. Yenaleev and V.A. Zimokha	1295	

### Hierarchical Decision Systems — II

Modelling, Analysis and Control of Large-scale Interconnected Economic	
Systems B.J. Petrović and M.J. Petrović	1301
Environment Friendliness - A New Requirement for R&D Strategy P. Gerencsér and Á. Vészi	1307
International Trade, and Freight Rate Trend Models for the Shipping Industry $L.F. \ Pau$	1311
Decision Support Systems	
Decision Support Systems for Office Automation M.G. Singh	1315
Pre-design Computer-aided Decision Making B.A. Berezovskiy, P.S. Krasnoshchyokov and V.V. Fyodorov	1323
Knowledge-based Expert System for Futures Research Field $\it R.A.$ Waśniowski	1329
Computing Technology in the Development of the USSR Merchant Marine Transportation Management Information System O.I. Aven and A.F. Volkov	1333
Managing Technological Turbulence: Strategies for Neoteny in Technology-based Corporations M.L. Baba, B.P. Zeigler and R.G. Reynolds	1339
Multiobjective Optimization and Decision Making	
Satisficing Trade-off Method for Multiobjective Programming and its Applications H. Nakayama and Y. Sawaragi	1345
Iterative Negotiations on Multiple Objectives in Large Scale Systems F. Gomide, K. Tarvainen and Y.Y. Haimes	1351
Common Theory for Individual and Group Decision Making N. Stanoulov	1351
Analysis of Procedures in Collective and Multi-Criterial Decision Making F.T. Aleskerov and V.I. Vol'skiy	136
On Incomplete Knowledge in Decision Making under Risk $T_{\bullet}$ Takeguchi and $H_{\bullet}$ Akashi	1369
COLLOQUIUM ON TEAM AND GAME THEORY  Team and Game Theory	
An Approach to solve the Role Ambiguity Problem in Aerial Combat Zhang Si-Ying, Wu Han-Sheng and Wang Jing-Cai	137
On the Incentive Problems with Uncertainties  Zheng Ying-ping	138
Robust Incentive Policies for Stochastic Decision Problems in the Presence of Parametric Uncertainty T. Başar and D.H. Cansever	138
On Adaptive Processes in Problems of Guaranteed Control A.B. Kurzhanskii and O.I. Nikonov	139
Group Consensus Formation Support Systems introducing Distance between Priority Rankings N. Honda, M. Tanaka, S. Aida and M. Tamaki	140

xii Contents

Singular Perturbations for Deterministic Control Problems

A. Bensoussan

## COLLOQUIUM ON MATHEMATICAL SYSTEMS THEORY

#### Linear and Stochastic Systems

Lie Brackets and Optimal Nonlinear Feedback Regulation M. Fliess  Variational System Theory (II) M. Shima and Y. Isurugi  Linearization of Nonlinear Control Systems by Recursive Transformations: an Algebraic Approach L. Hsu and E. Kaszkurewicz  Explicit Solution of Bilinear Systems with and without Time Delays by Lie Algebraic Approach and its Application to Controllability K. Terashima and H. Akashi	1489 1495 1501
M. Fliess  Variational System Theory (II)  M. Shima and Y. Isurugi  Linearization of Nonlinear Control Systems by Recursive Transformations: an Algebraic Approach  L. Hsu and E. Kaszkurewicz	1495
M. Fliess Variational System Theory (II)	
	1489
Approximate Controllability of Abstract Control System with a Nonlinear  Disturbance  Hong Xing Zhou	1483
Comparison Theorems and Vector V-functions for Stability of Discrete Systems ${\it Xu~Daoyi}$	1479
Nonlinear Systems	
Optimal Location of a Control in a Parabolic Equation J.P. Zolésio	1475
On Pseudo-rational Linear Input/Output Maps Y. Yamamoto	1469
State Estimation in Resolution Spaces J.L. Aravena	1463
The Regulator Problem of Pointwise Control for Parabolic Systems  Yao Yunlong	1457
Exact and Admissible Controllability of Viscoelastic Systems with Boundary Controls K. Narukawa	1451
Periodic Output Feedback Stabilization of Infinite-dimensional Systems J.R. Zavgren, Jr and Tzyh-Jong Tarn	1445
Infinite Dimensional Systems	
Level Hitting Probabilities for Random Walks with Internal States A. Krámli and D. Szász	1439
On Strong Solutions and Pathwise Stochastic Bang-Bang Control for a Non-linear System Situ Rong	1433
Towards a Fuzzy Geometric Theory of Linear Multivariable Control H. Sira-Ramires	1427
Free Response Characterization via Flow Invariance M. <i>Voicu</i>	1421
Zhao Keyou, Chen Zhaokuan and Cheng Zhaolin	1415
Complete Controllability for Linear Constant Systems with Control Constraints	

1515

Contents	xiii
Energy-modelled Climb and Climb-dash - The Kaiser Technique S.R. Merritt, E.M. Cliff and H.J. Kelley	1521
Singular Perturbations in Stochastic Control  A. Bensoussan and G.L. Blankenship	1525
Multimodel Strategies under Random Disturbances and Imperfect Partial Observations 2. Gajic and H. Khalil	1531
Approximating Multiple Itô Integrals with "Wide-band Width" Processes, and Application to Filtering Theory H.J. Kushner and Hai Huang	1537
The Effects of Small Noise on Non-linear Dynamical Systems S.S. Sastry	1543
Modelling and Stability via Singular Perturbation Methods	
Total and Robust Asymptotic Stability in Singular Perturbation Problems $P.\ Habets$	1549
A Hierarchical Principle of the Control System Decomposition based on Motion Separation V.I. Utkin, S.V. Drakunov, D.E. Izosimov, A.G. Lukyanov and V.A. Utkin	1553
Adaptive Control of Linear Systems with Several Time Scales  A. Halanay	1559
Aggregation and Decomposition in Control of Large Systems (Asymptotic	
Approach) A.A. Pervozvansky and V.G. Gaitsgory	1563
Modelling and Model-reduction of the Synchronous Machine through Singular Perturbation Methods L.F. López and H.A. Nour Eldin	1569
Disturbance-resistibility of Singularly Perturbed Linear Systems Zhang Weijiang, He Huanxi, Ma Xiaoyun, Han Mu and Wang Jing	1575
CÓLLOQUIUM ON CONTROL APPLICATIONS OF NONLINEAR PROGRAMMING	
Control Applications of Nonlinear Programming — I	
A Method for State and Control Constrained Linear Quadratic Control Problems	
T. Glad and H. Jonson  A Numerical Method for the Solution of Large Scale State-constrained	1583
Continuous Optimal Control Problems  R.V. Mayorga and V.H. Quintana	1589
Aircraft Trajectory Optimization using Quaternions - Comparison of a	
Nonlinear Programming and a Multiple Shooting Approach K.H. Well and U.A. Wever	1595
A Multiple Shooting Algorithm for Direct Solution of Optimal Control Problems	
H.G. Bock and K.J. Plitt	1603
A Heuristic Method for Searching Global Maximum of Multimodal Function K. Kame $i$ and K. Inoue	1609
Control Applications of Nonlinear Programming — II	
On the Design of Linear Control Systems with Plant Uncertainty via Nondifferentiable Optimization E. Polak and D.M. Stimler	1615
An Algorithm for Optimization Problems with Singular Values of Control Systems $K.C.$ Kiwiel	1619
Existence and Error Bound of Solution in Optimization Problems by Penalty Function Method $T.\ Tsuji$	1625

xiv

Six-volume Contents

### Contents

Consideration of Optimal Control Problems Specificity on Generalizing Mathematical Programming Algorithms R. Gabasov and F.M. Kirillova	1631
New Decomposition Method for Nonconvex Separable Optimization Problems A. Tanikawa and H. Mukai	1637
Application of the Multiplier Method on Solving State Space Constrained Optimal Control Problems  J. Hirvonen	1643
CASE STUDIES	
A Microcomputer-network Based Decision Support System for Health-care Organizations P. Bakonyi, A. Békéssy, J. Demetrovics, P. Kerékfy and M. Ruda	1651
Computer Applications in the Hungarian Agriculture A. Békéssy, J. Demetrovics, I. Horváth Gaudi, L. Hannák, G. Buvár and Cs. Balogh	1659
A New Theoretical and Algorithmical Basis for Estimation, Identification and Information P. Kovanic	1667
Author Index	
Subject Index	