CONTENTS

GREENHOUSE SYSTEMS

Optimal Control for Plant Production in Greenhouses HJ. TANTAU	1
Physical Modeling of Greenhouse Climate G.P.A. BOT	7
Reflections about Optimal Climate Control in Greenhouse Cultivation H. CHALLA, G. VAN STRATEN	13
Greenhouse Production in Engineering Aspects T. TAKAKURA	19
The Path to Dynamic Optimization of Carbon Dioxide in the Greenhouse W. DAY, Z.S. CHALABI, B.J. BAILEY, D. AIKMAN	23
Optimal Control of Greenhouse Climate E.J. VAN HENTEN, J. BONTSEMA	27
Self-adaptive and Self-tuning Control of a Nutrient Film Technique (NFT) System A. CHOTAI, P.C. YOUNG	33
True Digital Control of Glasshouse Systems A. CHOTAI, P.C. YOUNG, P. DAVIS, Z.S. CHALABI	41
Simulation Model to Estimate Fresh Mass of a Plant H. SHIMAJI, A. KANO	47
Performance of Zone Cooling System in Greenhouse: An Evaluation of Experimental Factors K. KOJIMA, T. MATSUOKA, H. SUHARDIYANTO	51
Introducing Dutch Substrate System to Japan T. TACHIBANA, T. YAMAGUCHI	57
Two Approaches to Environmental Control in Greenhouses - Heat Balance Analysis and System Identification in Heating System with Heat Pump H. NISHINA, I.H. CHO, Y. HASHIMOTO	63
Light Transmissive and Thermally Insulated Walls for Horticulture K. ABE, M. NARA	67
Optimal Greenhouse Temperature Trajectories for a Multi-state-variable Tomato Model I. SEGINER	73

PLANT FACTORY SYSTEMS

Fundamental Study of Plant Factories M. TAKATSUJI	81
Plant Factory and its Prospects S. NAKAYAMA	85
Measurement, Modelling and Control Problems for Biotechnical Processes A. MUNACK	93
Environmental Control in Plant Tissue Culture and its Application for Micropropagation T. KOZAI	99
Computer Integrated Plant Growth Factory for Agriculture and Horticulture Y. HASHIMOTO	105
Induced Lignification and Elicitors - A Case of Plant Host-Parasite Interactions Y. ASADA	111
Water and the Physiological Regulation of Growth in Controlled Environments J.S. BOYER, H. NONAMI	115
Physiological and Genetic Regulation in Plants A.W. NAYLOR	121
Environmental Control for Plant Growth in Plant Factory Operation and Greenhouse Management from Physiological Viewpoint H. NONAMI, Y. HASHIMOTO, J.S. BOYER	125
Micropropagation by Nutrient Mist Supply: Effects of a Mist Supply Period on Potato Plantlet Growth Y. IBARAKI, K. KURATA	131
"Roots Dividing Method" for Nutrient Supply in Soilless Culture K. KURATA	137
An Environmental Control System for Growing Plants Under Low Total Pressures E. GOTO, K. IWABUCHI, T. TAKAKURA	141
Application of Fuzzy Logic and Neural Network to the Process Control of Solution pH in Deep Hydroponic Culture T. MORIMOTO, H. HASHIMOTO	147
Root Temperature Effect on Hydraulic Characteristics of Roots in Hydroponics S. YOSHIDA, H. EGUCHI	153
Development of TS-style Plant Factory S. AKAGI, M. KIYOSAWA, T. KITAMOTO	159
POST-HARVEST TECHNOLOGY	
Classification of Apples with a Neural Network Based Classifier U. BEN-HANAN, PO. GUTMAN, K. PELEG	165

I. FARKAS	173
Crack Evaluation of Rice by Computer Vision System S. OSHITA, H. SHIMIZU, H. OTA	177
Modelling of Deep-bed Grain Drying S. MORIMOTO, K. TOYODA, R. TAKEUCHI, H. KOJIMA	183
Quality Evaluation of Rice and Coffee Grains by Using Near-infrared Rays M. MATUDA, K. KAGAWA	189
Quality Evaluation of Artificially Dried Rice by Tastemeter T. ABE, O.E. CHUKWUDI, Y. HIKIDA, J. YAMASITA	195
IYOKAN (Citrus iyo hort. ex Tanaka) Storage House with Air Circulating Unit T. TSURUSAKI, F. TARUI, Y. HIKIDA	201
ROBOTICS	
Mechanical Weed Control in Sugar Beet Growing: The Detection of a Plant in a Row J. BONTSEMA, T. GRIFT, K. PLEIJSIER	207
Automated Plant Handling and Processing in a Robotic Workcell W. SIMONTON	213
Automatic Guidance of Farm Vehicles T.G. NYBRANT	219
Robot for Masspropagation A. KINASE, H. WATAKE	225
Discriminating Robot System for Carnation Seedling with Fuzzy Logic H. FUJIWARA	231
Development of the Electric Driven Automatic Guided Vehicle for Use in Greenhouses and its Travelling Performance J. YAMASHITA, K. SATOU, M. HIKITA, T. IMOTO, T. ABE	237
Study on Grape Harvesting Robot N. KONDO	243
INFORMATION, COMPUTERS AND AI	
Computer Applications in Agriculture and Horticulture: A View W. DAY	247
Knowledge Acquisition and Learning for Expert Systems: Research Activities in Japan S. KOBAYASHI, R. MIZOGUCHI	253
Information Technology and Industrial Automation Trends in Agriculture	259

Analysis of Knowledge Involved in Greenhouse Climate Management - Application to the Determination of Daily Setpoints for a Tomato Crop T. BOULARD, B. JEANNEQUIN, R. MARTIN-CLOUAIRE	265
Determination of Climatic Setpoints by Constraint Satisfaction MJ. CROS, R. MARTIN-CLOUAIRE	271
An Object-oriented Environmental Control Model in Protected Cultivation T. HOSHI	277
Development of a Real Computer Integrated Cultivation Support System Y. NAKANISHI, T. UCHIDA, T. SAKANO	281
Identification of Water and Nutrient Supply to Hydroponic Tomato Plants by Using Neural Nets T. HONJO, T. TAKAKURA	285
A Time-continuous Quantitative Plant Growth Model Based on Neural Networks and Lotka-Volterra Equations M. HIRAFUJI	289
Agriculture Information Network Trend for the 21st Century N. IZUMI, S. FUJITA, H. IKEMOTO	295
Computer Support System for Tomato Cultivation in Plant Growth Factory K. HATOU, H. NONAMI, M. ITOH, I. TANAKA, Y. HASHIMOTO	301
MODELS AND CONTROL IN AGRICULTURE AND HORTICULTURE	
Identification, Estimation and Control of Glasshouse Systems P.C. YOUNG, W. TYCH, A. CHOTAI	307
Application of Signal Analysis and Nonlinear System Identification Methods to Modelling Dry Matter Production in Winter Wheat Z.S. CHALABI, P.W. GANDAR	317
Process Identification, A Markov Parameter Approach T. BACKX	321
Interactive Decision Support System for Multiobjective Programming in Agriculture M. TANAKA, T. TANINO	329
Mathematical Simulation of the Broiler Production - A Tool for Model Aided Control of the Process	335
K. GROßKOPF, D. HEIDE, M. FLECHSIG, E. MATTHAUS Kalman Filter Neuro-computing for Biological System Models Using Neural Networks	343
H. MURASE, N. HONAMI	
MEASUREMENTS IN CONTROLLED SYSTEMS	
Sensors and Intelligent Sensing Systems	

Development of an Ion Controlled Feeding Method in Hydroponics A. OKUYA, T. OKUYA	355
An Isfet-based Nutrient Sensor for Rockwool Culture I. AMEMIYA, H. YAGI, T. SAKAI	361
Dynamics of Plant Water Relations as Affected by Evaporative Demand M. KITANO, H. EGUCHI	367
Measurement of Bioelectric Potential on the Surface of Spinach Lamina T. UCHIDA, Y. NAKANISHI, T. SAKANO	373
Measurement of Plant Physiological Information for the Plant Factory K. IWAO	379
Image Diagnosis of Photosynthesis in Water-deficit Plants K. OMASA, S. MARUYAMA, M.A. MATTHEWS, J.S. BOYER	383
Identification of the Water Status of the Plant - Identification of AR Model T. TORII, T. OCHIAI, T. OKAMOTO, O. KITANI	389
Measurement of Elongation Rate of Plant H. SHIMIZU, S. OSHITA	395
Distribution of Electric Potential of Plant Surface Measured by New Potential Meter Y. KANO, Y. HAMAUZU, I. KAWAGUCHI, Y. KIDA	401
Application of Image Processing to Measurement of Total Length in Root System J. CHIKUSHI, S. YOSHIDA, H. EGUCHI	407
Improvement of Tomato Fruit Production by Nutrient Supply Management in Greenhouses H. NONAMI, T. FUKUYAMA, C.I. HWAN, Y. HASHIMOTO	413
Development of Ion Sensors for Hydroponics S. YAMASHITA, K. BABA, S. ITO, Y. ASANO	419
Non Dispersive Infrared Gas Analyzer for CO ₂ Control M. NAKANO	423
CONTROL IN IRRIGATION SYSTEMS	
Generalized Predictive Control of an Irrigation Canal Reach V.M. RUIZ-CARMONA, K. NAJIM	427
Automation of a Drip Irrigation System A. ARAYA, H. ORTIZ, E. VAN DER MEER, A. TORRES	433
A Short Irrigation Period by Means of Control Technics B. DE LEON MOJARRO	439
Author Index	443
Keyword Index	445