6th IFAC Symposium on Modeling and Control in Biomedical Systems 2006

Reims, France
20 – 22 September 2006

ISBN: 978-1-61567-149-6

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571
www.proceedings.com

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© 2006 by Elsevier Science Ltd.
All rights reserved.

Printed by Curran Associates, Inc. 2009

For permission requests, please contact Elsevier Science Ltd.
at the address below.

Elsevier Science Ltd.
The Boulevard
Langford Lane
Kidlington, Oxford 0X5 1GB
United Kingdom

Phone: 441-865-474-140
Fax: 441-865-474-141

www.elsevier.com

TABLE OF CONTENTS

KEYNOTE PAPERS

Dynamic Modeling in Diabetes: from Whole Body to Genes 1
Claudio Cobelli

LIDCO – from the Laboratory to Protocolized Goal Directed Therapy 3
Terry O'Brien

Elastic Scattering Spectroscopy for Noninvasive Detection of Cancer 5
Irving J. Bigio

Clinical Decision Support in Monitoring and Information Systems 6
Lorenzo Quinzio

OPTICAL METHODS FOR IN-VIVO DIAGNOSIS/CLINICAL DIAGNOSIS BY IMAGE PROCESSING

Acousto-optic Imaging Techniques for Optical Diagnosis 10
M. Lesaffre, F. Jean, A. Funke, P. Santos, M. Atlan, B. C. Forget, E. Bossy, F. Ramaz, A. C. Boccara, M. Gross, P, Delaye, G. Roosen

Improvement of the Contrast in Cancer Detection by Autofluorescence Bronchoscopy Using a Narrow Spectral Violet Excitation : a Preliminary Study 15
Baise Lovisa, Tanja Gabrecht, Snezana Andrejevic, Pierre Grosjean, Alexandre Radu, Philippe Monnier, Bernd-Claus Weber, Hubert van den Bergh, Georges Wagnieres

Fuzzy Clustering on Abdominal MRI for Adipose Tissue Quantification 21
Vincent Roullier, Christine Cavaro-Menard, Christophe Aube, Guillaume Calmon

Retinal Angiogram Registration By Estimation of Distribution Algorithm 27
Johann Dreo, Jean-Claude Nunes, Pierre Truchetet, Patrick Siarry

Automatic Multimodal Registration of Gated Cardiac PET, CT, and MR Sequences 33
Xavier Baty, Christine Cavaro-Menard, Jean-Jacques Le Jeune

Diffuse Reflectance Spectroscopy Monte-Carlo Modeling: Elongated Arterial Tissues Optical Properties 39
Emilie Pery, Walter C. P. M. Blondel, Cedric Thomas, Jacques Didelon, Francois Guillemin

Three-Dimensional Coherent Optical Diffraction Tomography of Transparent Living Samples 45
Bertrand Simon, Matthieu Debailleul, Vincent Georges, Olivier Haeberle, Vincent Lauer

A Portable Raman Prome for In Vivio Pathological Tissues Characterization 51
Olivier Piot, Ali Tfayli, Sylvain Rubin, Frank Bonnier, Ganesh Sockalingum, Sylvie Derancourt, Philippe Bernard, Michel Manfait

IDENTIFICATION AND SIGNAL PROCESSING IN BIOMEDICAL SYSTEMS

Analysis of Double-Tracer Glucose Kinetics in Humans During Oral Glucose Tolerance Test 55
Karl Thomaseth, Amalia Gastadelli, Allessandra Pavan, Rachele Berria, Leonard Glass, Ralph DeFronzo

Towards a Reliable Posture Estimation for Standing in Paraplegia 61
Gael Pages, Nacim Ramdani, Philippe Fraisse, David Guiraud

Clinical Cardiovascular Identification with Limited Data and Fast Forward Simulation 67
Christopher E. Hann, J. Geoffrey Chase, Geoffrey M. Shaw, Steen Anreassen, Bram W. Smith

Modeling of Haemodialyssi in Limiting Serum Free Light Chains in Patients with Renal Failure 73
N. D. Evans, J. Hattersley, C. Hutchison, Y. Hu, K. R. Godfrey, A. R. Bradwell, G. P. Mead, M. J. Chappell

Extraction of Reproducible Epileptic Patters on Scalp Egg 79
Matthieu Caparos, Valerie Louis, Fabrice Wendling, Jean-Pierre Vignal, Didier Wolf

Multiple Strategies for Parameter Estimation via a Hybrid Method: A Comparative Study 85
H. Alonso, H. Magalhaes, T. Mendonca, P. Rocha

Multi-lead T Wave End Detection Based on Statistical Hypothesis Testing 91
Alfredo Illanes Manriquez, Qinghua Zhang, Claire Medigue, Yves Papelier, Michel Sorine

Structural Identifiability of Parallel Pharmacokinetic Experiments as Constrained Systems 97
S. Y. Amy Cheung, James W. T. Yates, Leon Aarons

Separation of Arterial Pressure Into Solitary Waves and Windkessel Flow 103
Taous-Meriem Laleg, Emmanuelle Crepeau, Michel Sorine

Multi Variable Event Detection in Intensive Care Units 109
Sylvie Charbonnier

Knowledge Extraction About Sleep/Wake Stages Using Data Driven Methods 115
Lukas Zoubek, Sylvie Charbonnier, Suzanne Lesecq, Alain Buguet, Florian Chapotot

Isometric Muscle Contraction Induced by Repetitive Peripheral Magnetic Stimulation 121
Bernhard Angerer, Michael Bernhardt, Martin Buss, Dierk Schroder, Albrecht Struppler

Needle Insertions Modeling: Indentifiability and Limitations 127
L. Barbe, B. Bayle, M. de Mathelin, A. Gangi

Single Black-Box Models for Two-Point Non-Invasive Temperature Prediction 133
C. A. Teixeira, M. Graca Ruano, A. E. Ruano, W. C. A. Pereira, C. Negreira

3D Heart Motion Estimation Using Endoscopic Monocular Vision System 139
Mickael Sauvee, Philippe Poignet, Jean Triboulet Etienne Dombre, Ezio Malis, Roland Demaria

Investigation on Biomedical Measurement Accuracy in Electrode-Skin Tests 145
W. Wang, L. Wang, B. Tunstall, M. Brien, D. W. Gu

Identification of Regulatory Pathways of the Cell Cycle in Fission Yeast 151
F. Amato, M. Bansal, C. Cosentino, W. Curatola, D. di Bernardo

Reduced Model for Forced Expiration and Analysis of its Sensitivity 157
Janusz Mroczka, Adam G. Polak

A Model of Free Fatty Acid Kinetics During Intravenous Glucose Tolerance Test 163
Alessandra Pavan, Karl Thomaseth, Giovanni Pacini, Attila Brehm, Michael Roden

Modeling The Effects of The Electrode Position on The Surface EMG Characteristics 169
Jeremy Terrien, Sandy Rihana, Jean Gondry, Catherine Marque

Multiparametric Human Liver Fibrosis Identification from Ultrasound Signals 175
Mahmoud Meziri, Wagner C. A. Pereira, Christiano B. Machado, Bouzid Boudjema, Pascal Laugier

Human Skin Thermal Properties Identification by Periodic Method in The Frequency Domain 180
C. Lormel, L. Autrique, L. Perez, M. Gillet

Modeling and Analysis of HRV Under Physical and Mental Workloads 186
J. Zhang, A. Nassef, M. Mahfouf, D. A. Linkens, E. El-Samahy, G. R. J. Hockey, P. Nickel, A. C. Roberts

System Identification of Photosensitiser Uptake Kinetics in Photodynamic Therapy 192
T. Bastogne, L. Tirand, M. Barberi-Heyob, A. Richard

On The Modeling of Paraffin Through Raman Spectroscopy 198
Valeriu Vrabie, Regis Huez, Cyril Gobinet, Olivier Piot, Ali Tfayli, Michel Manfait

Insulin Sensitivity Index Also Accounting for Insulin Action Dynamics: Importance in Diabetes 204
Gianluigi Pillonetto, Andrea Caumo, Claudio Cobelli

Postural Time-series Analysis of Elderly and Control Subjects Using Entropy 210
Hassan Amoud, Madhur Agrawal, Uday Bandaru, David Hewson, Michel Doussot, Jacques Duchene

A Comparison Between Two Fractional Multimodels Structures for Rat Muscles Modeling 216
Laurent Sommacal, Pierre Melchior, Arnaud Dossat, Julien Petit, Jean-Marie Cabelguen, Alain Oustaloup, Auke Jan Ijspeert

Characteristic Phase Plane Pattern of Human Postural Sway 222
S. Gurses, B. E. Platin, S. T. Tumer, N. Akkas

The Glucose Minimal Model: Population vs. Individual Parameter Estimation 228
Alessandra Bertoldo, Paolo Vicini, Claudio Cobelli

BIOMEDICAL FUNCTIONAL IMAGING

Methods for Improving Reliability of GLLS for Parametric Image Generation 233
Hon Chit Choi, Lingfeng Wen, Stefan Eberl, Dagan Feng

Medical Image Segmentation Techniques for Virtual Endoscopy 238
Laszlo Szilagyi, Balazs Benyo, Sandor M. Szilagyi, Zoltan Benyo

Fuzzy Fusion System for Brain MRI Image Segmentation 244
Su Ruan, Weibei Dou, Daniel Bloyet, Jean-Marc Constans

Tumor Segmentation From PET/CT Images Using Level Set Method 250
Sonia Khatchadourian, Stephane Lebonvallet, Michel Herbin, Jean-Claude Liehn, Su Ruan

A Study of Partial Volume Effects on Clustering-Aided Parametric Images 256
Lingfen Wen, Stefan Eberl, Dagan Feng, Michael Fulham

Efficient and Automatic Abdominal Image Registration Based on Active Contour 262
Xiu Ying Wang, Cherry Ballangan, David Feng

A Novel Integrative Bioinformatics Environment for Encoding and Interrogating Timelapse Microscopy Images 268
I. A. Khan, C. J. Hedley, N. S. White, R. Ali, M. J. Chappell, N. D. Evans, L. Campbell, N. Marquez, J. Fisher, P. J. Smith, R. J. Errington

Method for Analysis of Volume Progression Tissues in Hemiplegic Subject 274
Antonio Pinti, Patrick Hedoux, Abdelmalik Taleb-Ahmed

GA-Backpropagation Hybrid Training and Morphometric Parameters to Classify Breast Tumors on Ultrasound Images 279
Andre Victor Alvarenga, Wagner C. A. Pereira, Antonio Fernadno C. Infantosi, Carolina M. De Azevedo

2-D Panoramas From Cystoscopic Image Sequences and Potential Application to Fluorescence Imaging 285
Yahir Hernandez Mier, Walter Blondel, Christian Daul, Didier Wolf, Genevieve Bourg-Heckly

Parametric Imaging of Acetyl Cholinesterase Activity with PET: Evaluation of Different Methods 291
Giampaolo Tomasi, Alessandra Bertoldo, Claudio Cobelli

BIOMEDICAL SYSTEM CONTROL

Bolus Tracking Using Local Density Information 297
Z. Cai, J. Bennett, D. Lu, J. Liu, M. Sharafuddin, H. Bai, G. Wang, E. Bai

Fuzzy Advisor Algorithm for Glucose Regulation in Type-1 Diabetic Patients on a Multi-Doses Regime 303
D. U. Campos-Delgado, M. Hernandez-Ordonez, R. Femat, E. Palacios

An FES-Assisted Gait Training System for Hemiplegic Stroke Patients Based on Inertial Sensors 309
N. O. Negard, T. Schauer, R. Kauert, J. Raisch

Control Architecture of a 3-DOF Upper Limbs Rehabilitation Robot 315
Alexandre Deneve, Said Moughamir, Lissan Afilal, Jeremy Lesieur, Jana Zaytoon

Adaptive Control of Computed Tomograph Angiography 321
R. McCabe, H. Bai, J. Bennet, T. Potts, M. Sharafuddin, J. Halloran, M. Vannnier, G. Wang, E. W. Bai

Nonlinear Control of HIV-1 Infection with a Singular Perturbation Model 327
M. Barao, J. M. Lemos

Insulin + Nutrition Control for Tight Critical Care Glycaemic Regulation 333
J. Geoffrey Chase, Jason Wong, Jessica Lin, Aaron LeCompte, Thomas Lotz, Timothy Lonergan, Michael Willacy, Christopher E. Hann, Geoffrey M. Shaw

Stochastic Insulin Sensitivity Models for Tight Glycaemic Control 339
J. Geoffrey Chase, Jessica Lin, Dominic S. Lee, Jason Wong, Christopher E. Hann, Geoffrey M. Shaw

Strategies for Haemodynamic Control of Extra Corporeal Circulation 345
Berno J. E. Misgel, Jurgen Werner, Martin Hexamer

The Benefits of Using Guyton's Model in Hypotensive Control System 351
Chi-Ngon Nguyen, Olaf Simanski, Ralf Kahler, Agnes Schubert, Bernhard Lampe

Kinematic Trajectory Generation in a Neuromusculoskeletal Model with Somatosensory and Vestibular Feedback 357
Kamran Iqbal, Anindo Roy

A Nonlinear Model for Vasoconstriction 363
John Ringwood, Violeta Mangourova, Sarah-Jane Guild, Simon Malpas

Inertial Gait Phase Detection: Polynomial Nullspace Approach 369
Otakar Sprdlik, Zdenek Hurak

A Supervisor for Volume-Controlled Tidal Liquid Ventilator Using Independent Piston Pumps 375
R. Robert, P. Micheau, H. Walti

A Real-Time Predictive Scheme for Controlling Hygrothermal Conditions of Neonate Incubators 381
Gustavo H. C. Oliveira, Mardson F. Amorim, Carlos Pacholok

Modeling and Analysis of Physiological Motor Control Using Bond Graph 387
Asif M. Mughal, Kamran Iqbal

Towards Modeling the Human Sensory Motor System 393
David Guiraud, Christine Azevedo, Ken Yoshida, Philippe Poignet, Mohammed Samer, Hassan El Makssoud

Joint Torques Estimation in Human Standing Based on a Fuzzy Descriptor Unknown Inputs Observer 399
Kevin Guelton, Sebastien Delprat, Thierry Marie Guerra

MODELING, PHYSIOLOGICAL SYSTEMS, BIOINFORMATICS AND HEALTH CARE

A Preliminary Study on Metabolism Modeling with Capillary 405
Huiting Qiao, Jing Bai

Neuromuscular Blockade Advisory System Randomized, Controlled Clinical Trial: Preliminary Results 411
Terence J. Gilhuly, Alex Bouzane, Stephan K. W. Schwarz, Bernard A. MacLeod, Guy A. Dumont

Deterministic Modeling of Interferon-Beta Signaling Pathway 417
Jarslaw Smieja, Mohammad Jamaluddin, Allan Brasier, Marek Kimmel

Physiological Modeling and Analysis of the Pulmonary Microcirculation in Septic Patients 423
M. A. Denai, M. Mahfouf, O. King, J. J. Ross

Modeling an Enzymatic Diffusion-Reaction Process in One Dimensional Space 429
J. Santos, R. Lozano, A. Friboulet, E. Castellanos, S. Mondie

Garch Models for Drug Effects on Patient Heart Rate, During General Anesthesia 435
Susana Bras, Catarina S. Nunes, Pedro Amorim

Modeling Drugs' Pharmacodynamic Interaction During General Anesthesia: The Choice of Pharmacokinetic Model 441
Catarina S. Nunes, Teresa F. Mendonca, Luis Antunes, David A. Ferreira, Francisco Lobo, Pedro Amorim

Cardiovascular System Modeling of Heart-Lung Interaction During Mechanical Ventilation 447
Bram W. Smith, Steen Andreassen, Geoffrey M. Shaw, Stephen E. Rees, J. Geoffrey Chase

A Differential Model of Controlled Cardia Pacemaker Cell 453
Karima Djabella, Michel Sorine

Modeling Light and Moderate Exercise in Type 1 Diabetic Patients with Glycogen Depletion and Replenishment 459
M. Hernandez-Ordonez, D. U. Campos-Delgado

A Nonlinear Mathematical Model of an Immunotherapy Treatment of Parathyroid Carcinoma 465
J. Hattersley, M. J. Chappell, N. D. Evans, G. P. Mead, A. R. Bradwell

A PK-PD Model of Cell Cycle Response to Topotecan 471
R. Ali, L. Campbell, N. D. Evans, R. J. Errington, K. R. Godfrey, P. J. Smith, M. J. Chappell

Interpolated Maps of Biomechanical Characteristics of Human Skull 477
F. Rambaud, A. Pinti, P. Drazetic, R. Delille, L. Soufflet

A Continuously Updated Hybrid Blood Gas Model for Ventilated Patients 482
A. Wang, M. Mahfouf, G. H. Mills

Analysis of Rupture of Intracranial Saccular Aneurysms 488
Krzysztof Szafranski

Modeling and Control of HIV Dynamics 494
Alberto Landi, Alberto Mazzoldi, Chiara Andreoni, Matteo Bianchi, Andrea Cavallini, Leonardo Ricotti, Luca Ceccherini Nelli, Riccardo Iapoce

In Silico Analysis of P53 Response to DNA Damage 501
Gabriele Lillacci, Mauro Boccadoro, Paolo Valigi

Model Analysis of the Choke Points Arrangement During Forced Expiration 507
Adam G. Polak, Janusz Mroczka

A Fuzzy Classifier for Drug Sensitivity in Septic Patients During Cardiopulmonary Bypass 513
O. K. King, M. Mahfouf, J. J. Ross, M. Denai

A Model of the Ventricular Activity Using Bond Graphs 519
V. Le Rolle, A. Hernandez, P. Y. Richard, J. Buisson, G. Carrault

Model of the Knee for Understanding the Squat Movement Biomechanics 525
Guillaume Agnesina, Redha Taiar, William Bertucci, Alain Lodini

Generic Probabilistic Networks in Medical Decision Support 530
K. Jensen, S. Andreassen

Generalized Cellular Automata for Studying the Behavior of Cell Populations 536
Noel Bonnet, Jean Marie Zham

Patient Variability and Uncertainty Quantification in Anesthesia: Part I - PKPD Modeling and Identification 542
Stephane Bibian, Guy A. Dumont, Mihai Huzmezan, Craig R. Ries

Patient Variability and Uncertainty Quantification in Anesthesia: Part II - PKPD Uncertainty 548
Stephane Bibian, Guy A. Dumont, Mihai Huzmezan, Craig R. Ries

Author Index