



Second IFAC Workshop on Fractional Differentiation and its Applications

19 - 21 July, 2006, Porto, Portugal

FINAL PROGRAM





Wednesday, July 19, 2006

8:30-9:30	Registration
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9:30-10:00	Opening Ceremony
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10:00-10:30	Coffee-Break
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10:30-11:30	Plenary Lecture 1
	Fractional Relaxation and Time-Fractional Diffusion of Distributed Order
	Francesco Mainardi University of Bologna, Italy
	Auditório E Chair: Stefan Samko

11:30-13:00	Auditório E	Sala de Actos	Sala de Reuniões
	Session We-AE/1	Session We-SA/1	Session We-SR/1
	Fractional-Order Control 1 <i>Session proposed by Duarte Valério and J. Sá da Costa</i>	Mathematical Tools 1	Fractional Variational Principles 1
	Chair: Duarte Valério Co-Chair: Piotr Ostalczyk	Chair: Virginia Kiryakova Co-Chair: Katica Hedrih	Chair: Malgorzata Klimek Co-Chair: Om Agrawal

13:00-14:30	Lunch
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14:30-16:00	Auditório E	Sala de Actos	Sala de Reuniões
	Session We-AE/2	Session We-SA/2	Session We-SR/2
	Fractional-Order Control 2 <i>Session proposed by Duarte Valério and J. Sá da Costa</i>	Mathematical Tools 2	Fractional Variational Principles 2
	Chair: Duarte Valério Co-Chair: Vicent Feliu	Chair: J. A. Tenreiro Machado Co-Chair: Wolfgang Halang	Chair: Dumitru Baleanu Co-Chair: Delfim Torres

16:00-16:30	Coffee-Break
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16:30-18:00	Auditório E	Sala de Actos	Sala de Reuniões
	Session We-AE/3	Session We-SA/3	Session We-SR/3
	Fractional-Order Control 3 <i>Session proposed by Duarte Valério and J. Sá da Costa</i>	Mathematical Tools 3	Modeling and Identification 1
	Chair: Duarte Valério Co-Chair: Gary Bohannon	Chair: Peter Krempf Co-Chair: Tsuyako Miyakoda	Chair: Pierre Melchior Co-Chair: Wajdi Ahmad

18:30-20:00	Welcome Reception
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8:30-9:00	Registration
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9:00-10:00	<p style="text-align: center;">Plenary Lecture 2</p> <p style="text-align: center;">Periodization of Fractional Integrals</p> <p style="text-align: center;">Stefan G. Samko</p> <p style="text-align: center;">Universidade do Algarve, Portugal</p> <p style="text-align: center;">Auditório E</p> <p>Chair: Virginia Kiryakova</p>
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	Auditório E	Sala de Actos	Sala de Reuniões
10:00-11:30	<p>Session Th-AE/1</p> <p>Control Techniques</p> <p>Chair: Jocelyn Sabatier Co-Chair: Jose Quintana</p>	<p>Session Th-SA/1</p> <p>Physics</p> <p>Chair: Nobuyuki Shimizu Co-Chair: Silvio Sorrentino</p>	<p>Session Th-SR/1</p> <p>Modeling and Identification 2</p> <p>Chair: Richard Magin Co-Chair: Jay Adams</p>

11:30-12:00	Coffee-Break
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	Auditório E	Sala de Actos	Sala de Reuniões
12:00-13:00	<p>Session Th-AE/2</p> <p>Discretization of Fractional-Order Operators</p> <p>Chair: Blas Vinagre Co-Chair: Joaquín Cervera</p>	<p>Session Th-SA/2</p> <p>Viscoelasticity 1</p> <p>Chair: Mikael Enelund Co-Chair: Markus Haschka</p>	<p>Session Th-SR/2</p> <p>Modeling and Identification 3</p> <p>Chair: Jean-Claude Trigeassou Co-Chair: Lino Figueiredo</p>

13:00-14:30	Lunch
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14:30-15:30	<p style="text-align: center;">Plenary Lecture 3</p> <p style="text-align: center;">N-Fractional Calculus and Its Applications</p> <p style="text-align: center;">Katsuyuki Nishimoto</p> <p style="text-align: center;">Institute for Applied Mathematics, Japan</p> <p style="text-align: center;">Auditório E</p> <p>Chair: Francesco Mainardi</p>
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15:30-19:30	Tour
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20:00-22:30	Conference Banquet
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Friday, July 21, 2006

8:30-9:00	Registration
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9:00-10:00	Plenary Lecture 4 The CRONE Approach : Theoretical Developments and Major Applications Alain A. Oustaloup LAPS - Université Bordeaux I, France Auditório E Chair: Alain Le Méhauté
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	Auditório E	Sala de Actos	Sala de Reuniões
10:00-11:30	Session Fr-AE/1 Robotics Chair: Maamar Bettayeb Co-Chair: Manuel Silva	Session Fr-SA/1 Viscoelasticity 2 Chair: Nicole Heymans Co-Chair: Jose Espíndola	Session Fr-SR/1 Analysis and Implementation Techniques Chair: Manuel Ortigueira Co-Chair: Alexandra Galhano

11:30-12:00	Coffee-Break
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	Auditório E	Sala de Actos	Sala de Reuniões
12:00-13:00	Session Fr-AE/2 Electrical Systems Chair: Patrick Lanusse Co-Chair: J. M. Rosario	Session Fr-SA/2 Diffusion 1 Chair: Alain Le Méhauté Co-Chair: Eduardo Cuesta	Session Fr-SR/2 CRONE Applications Chair: Om Agrawal Co-Chair: Ramiro Barbosa

13:00-14:30	Lunch
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14:30-15:30	Plenary Lecture 5 Ubiquitous Fractional Order Controls? YangQuan Chen Utah State University, USA Auditório E Chair: Blas Vinagre
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15:30-16:00	Coffee-Break
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	Auditório E	Sala de Actos	Sala de Reuniões
16:00-17:30	Session Fr-AE/3 State-Space Systems Chair: Igor Podlubny Co-Chair: Reyad EL-Khazali	Session Fr-SA/3 Diffusion 2 Chair: Wen Chen Co-Chair: Eqab Rabei	

18:00-20:00	Closing Ceremony/Farewell Buffet
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Parallel Sessions

Wednesday, July 19, 2006

	Auditório E	Sala de Actos	Sala de Reuniões
	Session We-AE/1 Fractional-Order Control 1 Chair: Duarte Valério Co-Chair: Piotr Ostalczyk	Session We-SA/1 Mathematical Tools 1 Chair: Virginia Kiryakova Co-Chair: Katica Hedrih	Session We-SR/1 Fractional Variational Principles 1 Chair: Malgorzata Klimek Co-Chair: Om Agrawal
11:30	A Robust Tuning Method for Fractional Order PI Controllers <i>YangQuan Chen, Huifang Dou, Blas M. Vinagre, Concha A. Monje</i>	On the Forms of Source Terms in Fractional Differential Equations Masataka Fukunaga	A Formulation and a Numerical Scheme for Fractional Optimal Control Problems Om P. Agrawal
11:50	Tuning-Rules for Fractional PID Controllers Duarte Valério, José Sá da Costa	Caputo Linear Fractional Differential Equations <i>A. A. Kilbas, M. Rivero, L. Rodríguez-Germá, J. J. Trujillo</i>	Nonconservative Systems within Fractional Generalized Derivatives Dumitri Baleanu, Sami I. Muslih
12:10	On Auto-Tuning of Fractional Order $PI^{\lambda}D^{\mu}$ Controllers Concepción A. Monje, Blas M. Vinagre, Vicente Feliu, YangQuan Chen	Fractional Central Differences and Derivatives Manuel D. Ortigueira	Noether's Theorem for Fractional Optimal Control Problems <i>Gastão F. Frederico, Delfim M. Torres</i>
12:30	Analog Fractional Order Controller in a Temperature Control Application Gary W. Bohannon	Fractional Derivative of $(1+X)^{\alpha}$ <i>Zivorad Tomovski, Kostadin Trencevski</i>	Path Integral Quantization of Brownian Motion as Mechanical Systems with Fractional Derivatives <i>Sami I. Muslih, Eqab M. Rabei, Dumitru Baleanu</i>

	Auditório E	Sala de Actos	Sala de Reuniões
	Session We-AE/2 Fractional-Order Control 2 Chair: Duarte Valério Co-Chair: Vicent Feliu	Session We-SA/2 Mathematical Tools 2 Chair: J. A. Tenreiro Machado Co-Chair: Wolfgang Halang	Session We-SR/2 Fractional Variational Principles 2 Chair: Dumitru Baleanu Co-Chair: Delfim Torres
14:30	Robust Stability Checking of a Class of Linear Interval Fractional Order System using Lyapunov Inequality <i>Hyosung Ahn, YangQuan Chen, Igor Podlubny</i>	Minimum Norm Properties of Even Degree Polynomial Splines with Respect to Fractional Differentiation Operators Wolfgang A. Halang	Fractional Mechanics - a Noncommutative Approach Malgorzata Klimek
14:50	Variable-Fractional Order Dead-Beat Control of an Electromagnetic Servo-Part I <i>Tomasz Rybicki, Piotr Ostalczyk</i>	Multi-Index Mittag-Leffler Functions, Generalized Fractional Calculus and Laplace Type Transform Virginia Kiryakova	A General Fractional Finite Element Formulation Om P. Agrawal
15:10	Variable-Fractional Order Dead-Beat Control of an Electromagnetic-Part II Piotr Ostalczyk, Tomasz Rybicki	On the 'Proper' Primitives in Fractional Calculus Peter W. Krempf	Deterministic and Stochastic Analysis of Fractionally Damped Strings Om P. Agrawal
15:30	Analog Implementation of Non Integer Order Integrator Via Field Programmable Analog Array <i>Ricardo Caponnetto, Domenico Porto</i>	Some Applications of the Multiply Elements Beta Functions to Some Functions Obtained from the N-Fractional Calculus of a Power Function Tsuyako Miyakoda, Katsuyuki Nishimoto	

	Auditório E	Sala de Actos	Sala de Reuniões
	Session We-AE/3 Fractional-Order Control 3 Chair: Duarte Valério Co-Chair: Gary Bohannan	Session We-SA/3 Mathematical Tools 3 Chair: Peter Krempf Co-Chair: Tsuyako Miyakoda	Session We-SR/3 Modeling and Identification 1 Chair: Pierre Melchior Co-Chair: Wajdi Ahmad
16:30	Study of Fractional Wiener/Hammerstein Systems in Closed-Loop <i>Patrick Lanusse, Alain Oustaloup</i>	Transversal Vibrations of the Axially Moving Sandwich Double Belt System with Creep Layer Katica Hedrih	Electrochemical Noise Signal Processing using R/S Analysis and Fractional Fourier Transform <i>Rongtao Sun, Nikita Zaveri, YangQuan Chen, Anhong Zhou, Nephi Zufelt</i>
16:50	A Fractional Adaptation Scheme for Lateral Control of an AGV <i>José Ignacio Suárez, Blas M. Vinagre, YangQuan Chen</i>	Solutions to Some Fractional Differential Equations of Viscoelastic Vibration by Means of N-Fractional Calculus <i>Katsuyuki Nishimoto, Tsuyako Miyakoda</i>	Fractional Order Processing of Quartz Crystal Microbalance Based DNA Biosensor Signals <i>Anhong Zhou, YangQuan Chen</i>
17:10	Fractional-Order Harmonics in the Trajectory Control of Redundant Manipulators <i>Fernando M. Duarte, Maria da Graça Marcos, J. A. Tenreiro Machado</i>	N-Fractional Calculus of Some Products of Some Function Katsuyuki Nishimoto	Application of a Sigma-Point Kalman-Filter for the Online Estimation of Fractional Order Impedance Models for Solid Oxide Fuel Cells Markus Haschka, Thomas Weickert, Volker Krebs
17:30	On the GPI-PWM Control of a Class of Switched Fractional Order Systems <i>Hebertt Sira-Ramírez, Vicente Feliu</i>		Fractional-Order System Identification Using Complex Order-Distributions Jay L. Adams, Tom T. Hartley, Carl F. Lorenzo

Thursday, July 20, 2006

	Auditório E	Sala de Actos	Sala de Reuniões
	Session Th-AE/1 Control Techniques Chair: Jocelyn Sabatier Co-Chair: Jose Quintana	Session Th-SA/1 Physics Chair: Nobuyuki Shimizu Co-Chair: Silvio Sorrentino	Session Th-SR/1 Modeling and Identification 2 Chair: Richard Magin Co-Chair: Jay Adams
10:00	Automatic Loop Shaping in QFT by Using CRONE Structures <i>Joaquín Cervera, Alfonso Baños</i>	Contribution of Non Integer Integro-Differential Operators (NIDO) to the Geometrical Understanding of Riemann's Conjecture – (I) Alain Le Méhauté	Fractional Modelling and Identification of a Thermal Process <i>A. Benchellal, T. Poinot, J.-C. Trigeassou</i>
10:20	Variable Structure Control of Fractional Time-Delay Systems <i>Reyad EL-Khazali, Wajdi H. Ahmad</i>	<i>Fractional Calculus and the Schrödinger Equation</i> <i>Enrico Scalas, Dumitru Baleanu, Francesco Mainardi, Antonio Mura</i>	Fractional Multi-Models of the Gastrocnemius Frog Muscle <i>Laurent Sommacal, Pierre Melchior, Jean-Marie Cabelguen, Alain Oustaloup, Auke Jan Ijspeert</i>
10:50	Fractional Dynamics in the Describing Function Analysis of Nonlinear Friction Fernando M. Duarte, J. A. Tenreiro Machado	Random Walks on Curved Spacetime Surface and Fractional Derivatives H. Hara, N. Ikeda, M. Furukawa	Modeling and Simulation of a Fractional Order Bioreactor System <i>Wajdi Ahmad, Nabil Abdel-Jabbar</i>
11:10	QFT Loop Shaping Using a Fractional Integrator-Real-Time Application to a Coupled-Tank System <i>Nataraj V. Paluri, Rambabu K., Nandkishor Kubal, Vishwesh Vyawahare</i>	Quasi-Fractals: New Method of Description of a Structure of Disordered Media <i>R. R. Nigmatullin., A. P. Alekhin</i>	

	Auditório E	Sala de Actos	Sala de Reuniões
	Session Th-AE/2 Discretization of Fractional-Order Operators Chair: Blas Vinagre Co-Chair: Joaquín Cervera	Session Th-SA/2 Viscoelasticity 1 Chair: Mikael Enelund Co-Chair: Markus Haschka	Session Th-SR/2 Modeling and Identification 3 Chair: Jean-Claude Trigeassou Co-Chair: Lino Figueiredo
12:00	Approximation and Synthesis of Non Integer Order Systems Abdelbaki Djouambi, Abdelfatah Charef, Alina Voda Besançon	Finite Element Analysis of Vibrating Non-Homogeneous Beams with Fractional Derivative Viscoelastic Models <i>Giuseppe Catania, Alessandro Fasana, Silvio Sorrentino</i>	Estimation of Lead Acid Battery State of Charge with a Novel Fractional Model Jocelyn Sabatier, Mohamed Aoun, Alain Oustaloup, Gilles Grégoire, Franck Ragot, Patrick Roy
12:20	New Direct Discretization of the Fractional-Order Differentiator/Integrator by the Chebyshev-Padé Approximation A. P. de Madrid, C. Mañoso, R. Hernández	A Numerical Algorithm for Differential Equations with Nonlinear Fractional Derivatives Hiroshi Nasuno, Nobuyuki Shimizu	Modeling the Cardiac Tissue Electrode Interface Using Fractional Calculus R. L. Magin, M. Oviaia
12:40	Discretization of Complex-Order Differintegrals Ramiro S. Barbosa, J. A. Tenreiro Machado, Manuel F. Silva	Fractional Calculus Description of DMTA Transient in Long-Memory Materials Nicole Heymans	Electrical Fractional Dynamics in Fruits and Vegetables Isabel S. Jesus, J. A. Tenreiro Machado, J. Boaventura Cunha

Friday, July 21, 2006

	Auditório E	Sala de Actos	Sala de Reuniões
	Session Fr-AE/1 Robotics Chair: Maamar Bettayeb Co-Chair: Manuel Silva	Session Fr-SA/1 Viscoelasticity 2 Chair: Nicole Heymans Co-Chair: Jose Espíndola	Session Fr-SR/1 Analysis and Implementation Techniques Chair: Manuel Ortigueira Co-Chair: Alexandra Galhano
10:00	Fractional Control of Two Arms Working in Cooperation <i>Nuno F. Ferreira, J. A. Tenreiro Machado, Alexandra F. Galhano, J. Boaventura Cunha</i>	The G^α -Scheme to Approximate Fractional Derivatives – Application to Dynamics of Dissipative Systems <i>Ana Cristina Galucio, Jean-François Deü, François Dubois</i>	Identification of Non Linear Fractional Systems Using Continuous Time Neural Networks <i>François Benoît-Marand, Laurent Signac, Thierry Poinot, Jean-Claude Trigeassou</i>
10:20	Fractional Order Fourier Spectra in Robotic Manipulators with Vibrations <i>Miguel M. Lima, J. A. Tenreiro Machado, Manuel Crisóstomo</i>	Optimum System of Viscoelastic Vibration Absorbers by Fractional Calculus <i>J. J. de Espíndola, E. M. Lopes, C.A. Bavastrí</i>	Hardware Implementation of Fractional-Order Systems as Infinite Impulse Response Filters <i>C. X. Jiang, J. L. Adams, J. E. Carletta, T. T. Hartley</i>
10:50	Analysis of Fractional-Order Robot Axis Dynamics <i>J. M. Rosario, D. Dumur, J.A. Tenreiro Machado</i>	Time Domain Formulation of the Biot Poroelastic Theory Using Fractional Calculus <i>Mikael Enelund, Peter Olsson</i>	Fractional Dynamics in Genetic Algorithms <i>Eduardo S. Pires, J. A. Tenreiro Machado, P. Moura Oliveira</i>
11:10	Comparison of Different Orders Padé Fractional Order $PD^{0.5}$ Control Algorithm Implementations <i>Manuel F. Silva, J. A. Tenreiro Machado, Ramiro S. Barbosa</i>	Adaptative Discretization of an Integro-Differential Equation Modeling Quasi-Static Fractional Order Viscoelasticity <i>Klas Adolffsson, Mikael Enelund, Stig Larsson</i>	Fractional-Order Evolutionary Design of Digital Circuits <i>Cecília Reis, J. A. Tenreiro Machado, J. Boaventura Cunha, Lino Figueiredo</i>

	Auditório E	Sala de Actos	Sala de Reuniões
	Session Fr-AE/2 Electrical Systems Chair: Patrick Lanusse Co-Chair: J. M. Rosario	Session Fr-SA/2 Diffusion 1 Chair: Alain Le Méhauté Co-Chair: Eduardo Cuesta	Session Fr-SR/2 CRONE Applications Chair: Om Agrawal Co-Chair: Ramiro Barbosa
12:00	Fractional Order and Fractal Modelling of Electrical Networks <i>O. Enacheanu, D. Riu, N. Retière</i>	A Speculative Study of Fractional Laplacian Modeling of Turbulence <i>Wen Chen</i>	Recursive Distributions of Poles and Zeros for Linear Phase Variations <i>Jocelyn Sabatier, Mathieu Moze, Patrick Lanusse, Alain Oustaloup</i>
12:20	Identification of the Fractional Impedance of Ultracapacitors <i>J. J. Quintana, A. Ramos, I. Nuez</i>	Enhanced Diffusion in a Bounded Domain <i>Marie Christine Néel, Liliana Di Pietro, Natalia Krepsheva</i>	Frequency Band-Limited Fractional Differentiator in Path Tracking Design <i>Alexandre Poty, Pierre Melchior, Alain Oustaloup</i>
12:40	Fractional Models of Loudspeaker Coils <i>Siegmar Kempfle, Ingo Schaefer</i>	Variable Order Modeling of Diffusive-Convective Effects in the Oscillatory Flow Past a Sphere <i>H. C. Pedro, M. H. Kobayashi, J. C. Pereira, C. M. Coimbra</i>	Volterra Series Based Analysis of Components Nonlinearities in a Limited Bandwidth Fractional Differentiator Achieved in Hydropneumatic Technology <i>Pascal Serrier, Xavier Moreau, Alain Oustaloup</i>

	Auditório E	Sala de Actos	Sala de Reuniões
	Session Fr-AE/3 State-Space Systems Chair: Igor Podlubny Co-Chair: Reyad EL-Khazali	Session Fr-SA/3 Diffusion 2 Chair: Wen Chen Co-Chair: Eqab Rabei	
16:00	A Note on the Controllability and the Observability of Fractional Dynamical Systems <i>Maamar Bettayeb, Said Djennoune</i>	Backward Euler Method as a Positivity Preserving Method for Abstract Integral Equations of Convolution Type <i>E. Cuesta, M. P. Calvo, C. Palencia</i>	
16:20	On the State-Space Modeling of Fractional Systems <i>Reyad EL-Khazali</i>	Numerical Study of Fractional Evolution-Diffusion Equations Dirac Like <i>T. Pierantozzi, L. Vázquez</i>	
16:40	Stability of Discrete Fractional Order State-Space Systems <i>Andrzej Dzieliński, Dominik Sierociuk</i>	Fractional Nonlinear Diffusion Equation: Exact Solutions <i>M. K. Lenzi, E. K. Lenzi, M. F. de Andrade, L. R. Evangelista, L. R. da Silva</i>	
17:00	Observer for Discrete Fractional Order State-Space Systems <i>Andrzej Dzieliński, Dominik Sierociuk</i>		

Instructions for presentations

Each individual paper presenter will be allotted 15 minutes for his/her presentation, plus another 5 minutes for questions (20 minutes total). Please prepare your presentation with these time limits in mind. Also, please note that the following audiovisual equipment will be available in each meeting room at the conference:

- Laptop (with CD drive, USB port, Adobe Acrobat Reader and Microsoft Office 2003)
- LCD Projector
- Screen
- Overhead projector

If you require any additional AV equipment please email FDA'06 Secretariat (fda06@dee.isep.ipp.pt) as soon as possible in order to try and accommodate your needs. [^](#)