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International Federation of Automatic Control

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Fractional Differentiation and its Applications

FDA 2004

IFAC Workshop

Bordeaux, France, July 19 – 21, 2004

The first IFAC Workshop on Fractional Differentiation was held in Bordeaux, France, July 19–21, 2004. This Workshop was sponsored by the IFAC Technical Committee on Linear Systems and co-sponsored by the IFAC Technical Committee on Modeling, Identification and Signal Processing. The workshop was organized by the “Société de l'Electricité, de l'Electronique, et des Technologies de l'Information et de la Communication”, the “Laboratoire d'Automatique, Productique et Signal, UMR 5131 CNRS, Université Bordeaux 1 – ENSEIRB, and the Institut Supérieur des Matériaux du Mans, ISMANS. The workshop was supported by the PSA Peugeot Citroen, AREVA and Coverplant Engineering Societies.

The International Program Committee of the workshop received 136 paper contributions. 105 selected papers and 4 invited plenary papers constitute the preprints. In the preprints, 32 countries are represented, 28 papers are from France, and the other main contributors are the USA (17 papers), Japan (11 papers), Germany (9 papers), Spain (9 papers), Italy (7 papers), Portugal (7 papers), Poland (6 papers) and Russia (6 papers).

This workshop aimed at gathering the experts of the field and all interested researchers, coming from universities and industries, in order to make the point on progresses and on current research lines. It is in the line of some other conferences and symposia recently organized in this area and demonstrates the growing interest of researchers in fractional systems in the course of the last two decades. In this context the workshop put emphasis on representation, analysis tools and software for fractional systems; synthesis, implementation and discretisation techniques for fractional operator, fractional systems and fractional regulators; simulation methods for fractional systems; modeling of mechanical, physical, chemical, biological, economical systems and materials; system identification of fractional systems and applications; control by fractional PID, CRONE control, robust control and their applications; robotics and mechatronics thought modeling, control and path planning; image and signal processing; industrial applications. The following fields were mainly concerned: Electrical Engineering, Electronics, Electromagnetism, Electrochemistry, Thermal Engineering, Mechanics, Rheology, Automatic Control, Robotics, Mechatronics, Signal Processing, Biology, Physics, Econophysics.

All those attending the IFAC FDA'04 Workshop had the opportunity to participate in a high-level scientific and technical workshop and to share some days with outstanding specialists in Fractional Differentiation and its Applications from all over

the world. The workshop indeed brought together 110 experts from 26 countries to share the state-of-art in fractional systems studies.

The four plenary papers were given by leading experts in the field:

New Engineering and design tools based on fractional differentiation, by Prof. Alain Le Mehauté (Institut Supérieur des Matériaux du Mans, France) and Prof. Raoul R. Nigmatulin (Department of Theoretical Physics, Kazan State University, Russia)

Fractional splines and wavelet bases with applications in signal and image processing, by Prof. Michael Unser (Biomedical Imaging Group, Swiss Federal Institute of Technology Lausanne, Switzerland)

Power laws, random walks, and fractional diffusion processes as well-scaled refinement limits, by Prof. Rudolf Gorenflo (Free University of Berlin, Germany) and Prof. Francesco Mainardi (Department of Physics, University of Bologna, Italia)

New trends on differential equations, by Prof. Anatoly A. Kilbas (Department of Mathematics and Mechanics, Belarusian State University, Minsk, Belarus).

The 22 technical sessions of the workshop are given below:

- 3 Control
- 3 Fractional Differentiation in Materials Modeling I
- 2 System Identification
- 2 Implementation/Discretisation of Fractional Operators
 - 1 Physical and Biological Systems Modeling
 - 1 Mathematical Tools
 - 1 Software for Fractional Systems
 - 1 Applications in Econophysics
 - 1 Technological Transfers
 - 1 Thermal and Fluid Systems Modeling
 - 1 Applications in Electrical Engineering
 - 1 Anomalous Transport / Random Walks
 - 1 Applications in Control, Robotics and Mechatronics
 - 1 Fractional Diffusion Equations and their Applications
 - 1 Fractional Systems Analysis
 - 1 Numerical Methods for Fractional Systems

In general, the organization work of this workshop was excellent. Comments we received from participants were all positive. The workshop was a success.

J. Sabatier

IFAC Fellows

As foreshadowed in the 4th Issue of the IFAC Newsletter, the Nomination Procedure to select distinguished persons to become IFAC Fellows is now underway. If you want to nominate a person to be made an IFAC Fellow, please download the relevant information from the IFAC Website at www.ifac-control.org/fellows/

Discrete Event Systems (WODES04)

IFAC Workshop

Reims, France, 22–24 September, 2004

The Workshop on Discrete Event Systems, WODES, is one of the most distinguished international events entirely devoted to discrete event systems. This 7th edition of the WODES was organised as an IFAC Workshop for the 1st time. It followed earlier successful meetings in Prague (1992), Antibes (1994), Edinburgh (1996), Cagliari (1998), Ghent (2000) and Zaragoza (2002). The aim of the Workshop was to provide researchers from different fields (control theoreticians and control engineers, software engineers and computer scientists, operations research specialists) with an opportunity to exchange information and new ideas, and to discuss new developments in the field of Discrete Event Systems.

In addition to the three Plenary Addresses, the Workshop comprised 76 papers (from 23 countries) that were selected by the International Program Committee from 130 submitted papers. The organisation of the sessions was as follows:

- 3 invited lectures given by distinguished speakers:
Oded Maler: “On optimal and sub-optimal control in the presence of adversaries”; Stefan Kowalewski: “Discrete control systems for cars – quality is more than correct function”; and Alessandro Giua, with Carla Seatzu as co-author: “A systems theory view of Petri nets”.
- 2 invited sessions on theory & application of supervisory control (organised by T. Ushio and N. Rakoto) and another invited session on theory & applications of colored Petri nets (organised by C. Seatzu and M.-P. Fantì).
- 9 contributed sessions covering the following topics related to Discrete Event Systems: modelling formalisms, verification, control synthesis, diagnosis, scheduling, performance evaluation and optimisation. 2 other sessions were related to the verification, analysis and control of hybrid systems.
- 1 poster session including 21 papers.

In the light of the reviews of IPC members and the recommendation of session chairs, 13 application-oriented papers were selected and their extended versions will be reviewed for possible inclusion in a special issue of Control Engineering Practice.

The Workshop was sponsored by the TC on Discrete Event Dynamic Systems, and co-sponsored by the TC on Control Design and the TC on Manufacturing Plant Control. Local sponsorship came from the French Ministry of Research, GDR MACS of CNRS, Regional Council of Champagne Ardenne, and General Council of Marne, City of Reims, and the University of Reims Champagne Ardenne.

129 participants from 22 countries attended the Workshop. Sessions were well attended, and there was 1 no show. The Workshop venue was a very pleasant place and stimulating for the participants; the Banquet took place in the prestigious Champagne House. The Workshop provided the opportunity for the juniors and seniors of the Discrete Event Systems community to meet and exchange ideas and new results, and the comments received from participants were all positive, indicating that the Workshop was a success.

Janan Zaytoon, IPC Chair and NOC Co-Chair

Control Applications in Marine Systems – CAMS 2004

IFAC Conference

Ancona, Italy, 7 – 9 July, 2004



IFAC events inspire art students

New technologies and methodologies for control systems play a significant role in the development of surface vessels, floating structures, sub-sea vehicles, and other devices within the marine environment.

Modelling, simulation, advanced control and artificial intelligence techniques can improve performance, reliability, security, economy and ecology of marine systems.

The aim of the IFAC Conference on Control Applications in Marine Systems, held in Ancona, Italy, on July 7–9, 2004, was to highlight all these topics, present the state of the art and the current research activities and advances in this field, establish the lines of innovative activities and analyse the transfers of innovative solutions to the industrial production marine systems. This Conference was sponsored by the IFAC Technical Committee on Marine Systems. Local sponsorships came from the Università Politecnica delle Marche, Ancona, the Calzoni S.r.l, Milan, the Fincantieri – Cantieri Navali Italiani S.p.A., Trieste, Italy, the International Shipyards Ancona, Ancona, Italy, the National Instruments, Milan, Italy and the Rockwell Automation, Milan, Italy.

The Conference attracted 120 participants from 20 different countries with senior and junior researchers in the area of theory and applications of automatic control for maritime systems, coming from Universities and Industries; about 20 participants were technicians coming from industries and more than 20 participants were PhD students. From 92 papers received, 75 were accepted for oral presentation of which 72 were presented at the Conference. An electronic copy in a CD-ROM and a hard copy in a book of the conference preprints were provided to each participant. The Conference Proceedings will be published by the IFAC Publisher Elsevier Science Ltd.

The papers ranged from total control and modelling of vessels, underwater vehicles, off-shore structures to detailed control and modelling of ancillary and auxiliary subsystems. The conference was organised in 20 technical sessions, of which 8 sessions focused on surface vessels, 6 sessions on underwater vehicles, 3 sessions on control and modelling of ancillary and auxiliary subsystems, 2 sessions on off-shore structure and 1 session on cooperative marine systems. The following six distinguished speakers were invited to present

plenary papers: “Autonomous Underwater Vehicles for Scientific and Naval Operations” by Professor Edoardo Bovio, NATO Undersea Research Centre, Italy; “Some Recent Development of Next Generation’s Marine Traffic Systems” by Professor Kazuhiko Hasegawa, Osaka University, Japan; “Italian Navy Trends in Automation of Ship Controls” by Rear-Admiral Dino Nascetti, Italian Navy, Italy; “Structural Issues in the Design of Marine Control Systems” by Professor Asgeir Johan Sørensen, Norwegian University of Science and Technology, Norway; “Aspects of Industrial Dynamic Positioning: Reality-tolerant Control” by Dr Richard Stephens, ALSTOM Power Conversion, UK; “Design of Robust Shipboard Power Automation Systems” by Professor Edwin Zivi, U. S. Naval Academy, Annapolis, USA. The technical programme was completed with a one-day tutorial (July 6): “Diagnosis and Fault Tolerant Control for Marine Systems” by Professor Mogens Blanke, Technical University of Denmark, Denmark.

The presented regular papers and the plenary lectures fitted very well into the scope of the Conference, interesting results were discussed on the system model and identification of surface vessels and underwater vehicles, and on the hybrid and non linear control of marine systems. Innovative implementations of advanced control schemes were also presented for the industrial production marine systems. The Conference provided an excellent opportunity to meet and exchange ideas on the innovative topics of Control Applications in Marine Systems.

Technical visits to local shipyards and social events were organised. The social dinner was held in the fabulous setting of the Mount Conero, in the South of Ancona, where the flat and levelled seashore is abruptly interrupted by its green vegetation merging within the deep blue of the Adriatic Sea. The Conference was also a great opportunity to visit the Marche region to discover its historical parts and its beautiful colours: the transparency of the sea, the green of the hills and the blue of the mountains. The conference chairs would like to thank the international program committee, all authors and plenary speakers for a very interesting technical and scientific program. We are looking forward to the next CAMS conference planned for 2007 in Croatia.

Mike Grimble, IPC Chair
Reza Katebi, Editor
Sauro Longhi, NOC Chair

Advanced Fuzzy/Neural Control – AFNC'04

IFAC Workshop

September 16–17, 2004

Oulu, Finland

The 2nd IFAC Workshop on Advanced Fuzzy/Neural Control (AFNC'04) was held at the University of Oulu, 16–17 September 2004, Oulu, Finland. The first workshop in the series took place in Valencia in 2001. The event was sponsored by the IFAC TC on Cognition and Control.

Fuzzy logic and neural networks have been topics of intensive research and application, and have also given rise to a lively discussion, for several decades. Both have been seen as members in the bigger family of methods inside computational intelligence. Theoretical development has been immense, and what is also very important for the control community, applications have been growing both in numbers and in importance. Both approaches are widely used both in industry and in other sectors of the economy. The applications, of course, stimulate new research and development. The workshop series was created to boost activities in the area of computational intelligence.

AFNC'04 acted as an international forum for scientists and practitioners involved in the field of control to present their latest research, results and ideas. The workshop also aimed at disseminating knowledge and experience in alternative methods and approaches in using fuzzy logic and neural networks in control. According to the usual practice, the program included plenary lectures and technical sessions covering the latest theoretical developments, methods for controller design as well as adaptation and optimisation. A lot of scope was given to applications that ranged from robotics to industrial control. Several industrial sectors were represented, namely metallurgical industry, paper industry, chemical industry, energy sector, and pharmaceuticals. The problem setting in these applications was from modelling and simulation to actual control, optimisation and fault diagnosis.

In addition to two plenary lectures, the Workshop included nine regular sessions. Topics of the plenary lectures were *Fuzzy Systems in Modeling and Nonlinear Identification* presented by Professor Robert Babuska (Delft University of Technology) and *Soft Computing in Ambient Intelligence* presented by Professor Heikki Koivo (Helsinki University of Technology). Regular sessions comprised 32 papers and covered the topics of *fuzzy modelling, neural networks, Takagi-Sugeno models, neural network applications, robotic and manipulators, industrial applications, controller design, adaptive and optimal control and fault diagnosis*.

The altogether 50 participants represented 15 different countries. The excellent quality of presentations and interesting discussions among the participants compensated the high number of presentations.

Leena Yliniemi
NOC Chair

Kauko Leiviskä
IPC Chair

Advanced Control Strategies for Social and Economic Systems

Multitrack Conference

Vienna, Austria, Sept. 2 – 4, 2004

The main idea behind this Multitrack Conference was to merge the triennial events of 5 IFAC technical committees namely “Supplemental Ways of Improving International Stability”, “Cost Oriented Automation”, “Economic and Business Systems”, “Social Impact of Automation” and “Developing Countries”. Therefore this conference covered a very broad spectrum of subjects dedicated to these committees. In addition, 6 other IFAC TCs co-sponsored this event.

The 5 Survey papers were mainly assigned to the subjects of these 5 main sponsoring technical committees. They dealt with adaptation of a post structuring analysis of the technological and ethical issues in engineering and technology research focusing also on environmental and social impacts in terms of labor (Stapleton, Kile, Supplemental Ways of Improving International Stability); ethics is becoming more and more significant in engineering issues (Brandt, Rose – Social Effects), human cooperation in networked and extended enterprises (Erbe – Cost Oriented Automation), management of a multi-agent demand and supply network (Villa – Economics and Business) and scientific progress and its technological applications: dealing concretely with some social and ethical issues (Richardson, Developing Countries/Supplemental Ways of Improving International Stability). In addition, 32 technical papers were presented and arranged in 10 sessions. The titles of the sessions are in line with the broad subject of this conference and range from social aspects to economic aspects, robotics and automation control and ethics. Ethics was a very hot topic at this conference and was discussed from different viewpoints in many papers.

The program was completed by a very interesting panel discussion organized by Jacques Richardson.

According to the IFAC decision to involve more and more young people in IFAC – it was a very young panel (average age 28 years).

Summarizing the scientific technical output of this conference: Ethics is becoming of ever greater interest in control engineering, the classical IFAC topic on social effects is moving more and more into the direction of human machine cooperation, new automation technologies require more people with interdisciplinary education and developing countries need the newest technology for an efficient improvement of their industry.

M.W. Han, NOC Chair

*To all our readers a
Happy and Peaceful
Festive Season*

Informatics in Control, Automation and Robotics – ICINCO 2004

INSTICC/IFAC Conference

Setubal Portugal, August 24 – 28, 2004

The 1st International Conference on Informatics in Control, Automation and Robotics (ICINCO 2004) aimed at representing a major forum to debate technical advances presented by researchers and developers from academia and from industry, working in areas related to Control, Automation and Robotics. The program of this conference included oral presentations and posters organized in three simultaneous tracks: “Intelligent Control Systems and Optimization”, “Robotics and Automation” and “Systems Modeling, Signal Processing and Control”. Furthermore, ICINCO 2004 included 6 plenary keynote lectures, 2 satellite workshops and 2 tutorials, given by internationally recognized researchers.

The conference received 310 paper submissions, not including workshops, from 51 different countries, in all continents. To evaluate each submission, a double blind paper evaluation method was used, with the help of prestigious experts, each of them holding a Ph.D. in at least one of ICINCO topic areas. Finally, only 184 papers were accepted for publication in the proceedings, and presentation at the conference; of these, 113 papers were selected for oral presentation and 71 papers were accepted for poster presentation. The global acceptance ratio was less than 60% and the full paper acceptance ratio was 36%. These are high quality standards, which will be reinforced next year, at ICINCO 2005, to be held in Barcelona, Spain. Furthermore, a short list of about thirty papers will be selected to be included in a book that will be published by Kluwer Academic Publishers with the best papers of ICINCO 2004. Two satellite workshops, related to the field of the conference were held in conjunction with ICINCO 2004: “The 1st International Workshop on Artificial Neural Networks: data preparation techniques and application development” (ANNs 2004) and the “1st International Workshop on e-learning and Virtual and Remote Laboratories” (VIRTUAL-LAB 2004).

Information about ICINCO 2005 is already available on the web at <http://www.icinco.org>

Joaquim Belo Lopes Filipe, IPC

IFAC Journals

The Tables of Contents of the IFAC Journals can be found respectively at

Automatica

<http://www.elsevier.com/wps/find/journaldescription.librarians/270/description>

Control Engineering Practice

<http://www.elsevier.com/wps/find/journaldescription.librarians/123/description>

Engineering Applications of Artificial Intelligence

<http://www.elsevier.com/wps/find/journaldescription.librarians/975/description>

Journal of Process Control

<http://www.elsevier.com/wps/find/journaldescription.librarians/30445/description>

Annual Reviews in Control

<http://www.elsevier.com/wps/find/journaldescription.librarians/429/description>



FORTHCOMING EVENTS

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| Title | 2005 | Place | Further Information |
|--|----------------------------|-------------------------------|---|
| IFAC Workshop Advanced Control Circuits and Systems | March 6 – 10 | Cairo Egypt | http://www.eri.sci.eg/accs05 e-mail: accs05@eri.sci.eg |
| EDS/IEEE/IFAC Conference 13th on Solid-State Sensor and Actuators – Transducers05 | June 5 – 9 | Seoul Korea | http://www.transducers05.org e-mail: info@transducers05.org |
| American Control Conference – in co-operation with IFAC – | June 8 – 10 | Portland OR, USA | http://www.ee.washington.edu/conf/acc2005/ e-mail: SJayasuriya@mengr.tamu.edu |
| 16TH IFAC WORLD CONGRESS | JULY 4 – 8 | PRAGUE CZ | http://www.ifac.cz |
| EWICS Intl. Conference 24 th Computer Safety, Reliability and Security – SAFECOMP2005 | Sept. 28 – 30 | Fredrikstad Norway | http://www.safecomp.org e-mail: safecomp2005@hrp.no |
| Title | 2006 | Place | Further Information |
| IFAC Symposium Mathematical Modelling – 5 th MATHMOD | February 08 – 10 | Vienna Austria | http://simtech.tuwien.ac.at/MATHMOD/ email: inge.troch@tuwien.ac.at |
| IFAC Symposium Advanced Control of Chemical Processes ADCHEM'06 | April 02 – 05 | Gramado Brazil | http://not yet available e-mail: not yet available |
| IFAC Symposium System Identification – SYSID 2006 | April 05 – 07 | Newcastle Australia | http://not yet available e-mail: not yet available |
| IFAC Symposium (12th) Information Control Problems in Manufacturing – INCOM'06 | May 17 – 19 | St. Etienne France | http://www.emse.fr/incom06 e-mail: incom06@emse.fr |
| IFAC Conference 6th Analysis and Design of Hybrid Systems – ADHS'06 | June 07 – 09 | Alghero Italy | http://www.diee.unica.it/adhs06/ e-mail: adhs06@diee.unica.it |
| IFAC Symposium 7th Advances in Control Education – ACE 06 | June 21 – 23 | Madrid Spain | http://www.dia.uned.es/ace2006/index.html e-mail: not yet available |
| IFAC Conferences Analysis and Control of Chaotic Systems | June 28 – 30 | Reims France | http://www.univ-reims.fr/chaos06 e-mail: not yet available |
| IFAC Symposium 5 th Robust Control – ROCOND | July 05 – 07 | Toulouse France | http://not yet available e-mail: arzelier@laas.fr |
| IFAC Symposium Fault Detection, Supervision and Safety of Technical Processes – SAFEPROCESS | August 30 – September 1 | Beijing China | http://www.au.tsinghua.edu.cn/safe/safeprocess2006/ e-mail: safeprocess2006@mail.tsinghua.edu.cn |
| IFAC Symposium 8 th Robot Control – SYROCO | September 6 – 8 | Bologna Italy | http://www-lar.deis.unibo.it/syroco2006/ e-mail not yet available |
| IFAC Symposium Mechatronics Systems | September 12 – 14 | Wiesloch Germany | http://www.mechatronics06.com e-mail: ringelmann@vdi.de |
| IFAC 50th Anniversary Celebration Present and Future of Automatic Control | September 15 | Heidelberg Germany | |
| IFAC Symposium 6th Modelling and Control of Biomedical Systems | September 20 – 22 | Reims France | http://not yet available e-mail not yet available |
| Title | 2007 | Place | Further Information |
| IFAC Symposium Nonlinear Control Systems | August 22 – 24 | Pretoria South Africa | http://www.nolcos2007.org.za e-mail: noc@nolcos2007.org.za |
| Title | 2008 | Place | Further Information |
| 17 TH IFAC WORLD CONGRESS | July 6 – 11 | Seoul Korea | http://www.ifac2008.org e-mail: secretariat@ifac2008.org |