

2nd European Future Technologies Conference and Exhibition 2011

(FET 11)

Procedia Computer Science Volume 7

**Budapest, Hungary
4-6 May 2011**

Editors:

Elisabeth Giacobino

Rolf Pfeifer

ISBN: 978-1-62748-814-3

Printed from e-media with permission by:

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



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

Copyright© by Elsevier B.V.
All rights reserved.

Printed by Curran Associates, Inc. (2014)

For permission requests, please contact Elsevier B.V.
at the address below.

Elsevier B.V.
Radarweg 29
Amsterdam 1043 NX
The Netherlands

Phone: +31 20 485 3911
Fax: +31 20 485 2457

<http://www.elsevierpublishingsolutions.com/contact.asp>

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2634
Email: curran@proceedings.com
Web: www.proceedings.com



Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Computer Science 7 (2011) iii–vii

Procedia
Computer Science

Contents

Introduction to the European Future Technologies Conference and Exhibition 2011

The European Future Technologies Conference and Exhibition 2011	1
Political Welcome Address to Conference Participants	
N. Kroes, Z. Cséfalvay, J. Pálinkás	4
Opening of the European Future Technologies Conference and Exhibition 2011	
N. Kroes, Z. Cséfalvay	6

Keynotes

How Evolution Shapes the Way Roboticists Think J.C. Bongard	8
The Age of Computation is Yet to Come A. Ekert	11
The (Hopefully Near) Future of Language Technologies G. Prószéky	14
Mathematical Models to Help Understand Developmental Biology and Cancer C. Tomlin	16
Constructive Cortical Computation R. Douglas, FET SECO IP	18
The Science of Invisibility J. Pendry	20
The Endogenous Dynamics of Markets: A Complex System Point of View J.-P. Bouchaud	22

Presentations of the 6 FET Flagship Pilots

Introducing Six FET Flagship Pilot Actions N. Kroes	24
ITFoM – The IT Future of Medicine H. Lehrach, R. Subrak, Peter Boyle, M. Pasterk, K. Zatloukal, H. Müller, T. Hubbard, A. Brand, M. Girolami, D. Jameson, F. J. Bruggeman, H.V. Westerhoff	26
Graphene-Driven Revolutions in ICT and Beyond A.C. Ferrari, V. Fal'ko, J. Kivioja	30
FuturICT: FET Flagship Pilot Project S. Bishop, D. Helbing, P. Lukowicz, R. Conte	34
Introducing the Human Brain Project H. Markram, K. Meier, T. Lippert, S. Grillner, R. Frackowiak, S. Dehaene, A. Knoll, H. Sompolinsky, K. Verstreken, J. DeFelipe, S. Grant, J.-P. Changeux, A. Saria	39
Guardian Angels for a Smarter Life: Enabling a Zero-Power Technological Platform for Autonomous Smart Systems A.M. Ionescu, C. Hierold	43
Robot Companions for Citizens P. Dario, P.F.M.J. Verschure, T. Prescott, G. Cheng, G. Sandini, R. Cingolani, R. Dillmann, D. Floreano, C. Leroux, S. MacNeil, P. Roelfsema, X. Verykios, A. Bicchi, C. Melhuish, A. Albu-Schäffer	47

Main Conference Sessions

Atoms, Photons and Entanglement for Quantum Information Technologies J.T. Barreiro, D. Meschede, E. Polzik, E. Arimondo, F. Illuminati, L. Lugiato	52
Biological and Chemical Information Technologies M. Amos, P. Dittrich, J. McCaskill, S. Rasmussen	56
Brain-Chip Interfaces: The Present and the Future S. Vassanelli	61

Complex Systems for an ICT-Enabled Energy System C.A. Pereira, D. Miorandi, N. Hatzigaryiou, P. Viejo	65
Computational Social Choice: Prospects and Challenges U. Endriss	68
Evolvability of Natural and Artificial Systems C. Fernando, G. Kampis, E. Szathmáry	73
Fundamental Frontiers of Quantum Science and Technology M. Arndt, A. Bassi, D. Giulini, A. Heidmann, J.-M. Raimond	77
Heaven and Hell: Visions for Pervasive Adaptation B. Paechter, J. Pitt, N. Serbedzija, K. Michael, J. Willies, I. Helgason	81
Innovation, Sustainability and ICT D.A. Lane, S. van der Leeuw, C. Sigaloff, F. Addarii	83
Pervasive Socio-Technical Fabric A. Ferscha, N. Davies, A. Schmidt, N. Streitz	88
Quantum Effects in Biology and their Applications to Light Harvesting and Sensing Y. Omar, M.B. Plenio, S. Huelga, M. Rasetti	92
Robots as Companions: What can we Learn from Servants and Companions in Literature, Theater, and Film? R. Trappi, M. Krajewski, Z. Ruttkay, V. Widrich	96
Soft Robotics: Challenges and Perspectives F. Iida, C. Laschi	99
Sustainable ICT: Micro and Nanoscale Energy Management L. Gammaitonni	103
Challenges of Biomimetic Infochemical Communication Z. Rácz, S.B. Olsson, J.W. Gardner, T.C. Pearce, B.S. Hansson, M. Cole	106
The City in Cinema: How Popular Culture can Influence Research Agendas M. Smyth, I. Helgason, I. Mitrovic, G. Zaffiro	110
The Future Museum E. Badalotti, L. De Biase, P. Greenaway	114
Solving Problems with Visual Analytics J. Kohlhammer, D. Keim, M. Pohl, G. Santucci, G. Andrienko	117
Vision Restoration and Vision Chip Technologies A. Kusnyerik, K. Karacs, A. Zarandy	121
Discussions and Panels	
Large Scale Funding vs. Small Scale Funding J. Stern, R. Madelin, N. Kroó, P. Verschure, J. Langer, P. Hoen	125
Perspective on Future and Emerging Technologies W. Boch, A. Fiala	126
Poster Sessions	
Medical Visual Information Retrieval based on Multi-Dimensional Texture Modeling A. Depeursinge, H. Müller	127
First Steps Toward Artificial Culture in Robot Societies A.F.T. Winfield, A.G. Sutcliffe, F.E. Griths, J.L. Bown, R. Durie, J.T. Jackson, M.D. Erbas, D. Wang, S. Bhamjee, A. Guest	130
Apparent Moving Sensation Recognition in Prosthetic Applications A.H. Arieta, M. Afthinos, K. Dermitzakis	133
Affordable Supercomputing for Data Mining Applications A.A. Benczúr	136
Information Recording in Photosensitive Photonic Cholesteric Liquid Crystal A. Chanishvili, G. Chilaya, G. Petriashvili	139
A Chemoemitter System Mimicking Chemical Communication in Insects. N. Dimov, L. Muñoz, W.P. Bula, G. Carot-Sans, J.G.E. Gardeniers, A. Guerrero	142
Modelling and Analysing Creative Communication within Groups of People: The Artistic Event at FET11 A. Camurri, C. Canepa, N. Ferrari, M. Mancini, G. Volpe	144
TERAFLUX: Exploiting Tera-Device Computing Challenges A. Portero, Z. Yu, R. Giorgi	146
TRAMS Project: Variability and Reliability of SRAM Memories in Sub-22nm Bulk-CMOS Technologies R. Canal, A. Rubio, A. Asenov, A. Brown, M. Miranda, P. Zuber, A. Gonzalez, X. Vera	148
The Scenic Project: Environment-Aware Sound Sensing and Rendering P. Annibale, F. Antonacci, P. Bestagini, A. Brutti, A. Canclini, L. Cristoforetti, E. Habets, W. Kellermann, K. Kowaleczyk, A. Lombard, E. Mabande, D. Markovic, P. Naylor, M. Omologo, R. Rabenstein, A. Sarti, P. Svaizer, M. Thomas	150

Building Simple Formations in Large Societies of Tiny Mobile Robots B. Degener, B. Kempkes, F. Meyer auf der Heide	153
THz Detection by Thermopile Antenna B. Szentpáli, P. Fürjes, I. Bársóny	156
Towards an Electric-Sense-based Bioinspired Embodied Robotic Perception System: The Modelling Aspect. B. Jawad, P.B. Gossiaux, F. Boyer	158
Unioplar Nitride Photonic Devices C. Croquet, F. H. Julien	161
eMorph: Towards Neuromorphic Robotic Vision C. Bartolozzi, C. Clercq, N. Mandloi, F. Rea, G. Indiveri, D. Fasnacht, G. Metta, M. Hofstätter, R. Benosman	163
Impact of Body Parameters on Dynamic Movement Primitives for Robot Control N. Kuppuswamy, C. Alessandro	166
Artificial Bivalves – The Biomimetics of Underwater Burrowing D.P. Germann, W. Schatz, P.E. Hotz	169
Activity Recognition in Opportunistic Sensor Environments D. Roggen, A. Calatroni, K. Förster, G. Tröster, P. Lukowicz, D. Bannach, A. Ferscha, M. Kurz, G. Hözl, H. Sagha, H. Bayati, J. del R. Millán, R. Chavarriaga	173
Certified Complexity R. Armadio, A. Aspert, N. Ayache, B. Campbell, D. Mulligan, R. Pollack, Y. R.-Gianas, C. Sacerdoti Coen, I. Stark	175
High Channel Count Electrode System to Investigate Thalamocortical Interactions D. Horváth, R. Fiáth, B.P. Kerekes, B. Dombovári, L. Acsády, K. Seidl, S. Herwik, O. Paul, P. Ruther, H.P. Neves, I. Ulbert	178
Methodological Bridges for Multi-Level Systems E. Merelli, N. Paoletti, P. Liò	180
Satellite- and Ground-based Temperature Observations used in Assessing the Urban Heat Island Phenomena E. Lelovics, R. Pongrácz, J. Bartholy	183
Automated Dialogue-based Ontology Elicitation E. Costetchi, Eric Ras, T. Latour	185
Machine Learning Optimization of Evolvable Artificial Cells F. Caschera, S. Rasmussen, M. Hanczyc	187
Nonlinear Kinetic Energy Harvesting F. Cottone, R. Mincigrucci, I. Neri, F. Orfei, F. Travasso, H. Vocca, L. Gammaitoni	190
Adhesion Mechanisms Inspired by Octopus Suckers F. Tramacere, L. Beccai, E. Sinibaldi, C. Laschi, B. Mazzolai	192
Sipping Science in a Café F. Bagnoli, G. Pacini	194
Self-Aware Pervasive Service Ecosystems F. Zambonelli, G. Castellia, L. Ferrari, M. Mamei, A. Rosi, G. Di Marzo, M. Risoldi, A.-E. Tchao, S. Dobson, G. Stevenson, J. Ye, E. Nardini, A. Omicini, S. Montagna, M. Viroli, A. Ferscha, S. Maschek, B. Wally	197
Photonic Nanoarchitectures in Butterfly Scales Allowing Species Identification G. Piszter, K. Kertész, Z. Vértesy, Z. Bílant, L.P. Biró	200
An Innovative Approach to Diffuse Optical Tomography using Code Division Multiplexing S. Iannaccone, M. Giacalone, G. Berettini, L. Potí	202
Towards a Terahertz Room-Temperature Integrated Source G. Leo, J.-M. Gérard, S. Reitzenstein, P.-U. Jepsen	205
This Pervasive Day: Creative, Interactive Methods for Encouraging Public Engagement with FET Research I. Helgason, Jay Bradley, C. Egan, B. Paechter, E. Hart	207
Influence of Slow Oscillating Transcranial Current Stimulation (so-tCS) on Electroencephalogram and Cognitive Performance I. von Mengden, C. Garcia, M. Glos, T. Penzel	209
The State Trajectory of Cell using Rényi Entropy Coefficients T. Náhlík, J. Urban, D. Štys, P. Císař, A. Pautsina, J. Vaněk	212
CEEDs: Unleashing the Power of the Subconscious J. Lessiter, A. Miotti, J. Freeman, P. Verschure, U. Bernardet	214
From Fermat's Principle to Invisibility J. Perczel, U. Leonhardt	216
CYBEREMOTIONS – Collective Emotions in Cyberspace J. Ahnf, A. Borowieci, K. Buckleye, D. Caie, A. Chmiel, A. Czaplicka, G. Dabrowski, A. Garas, D. Garciad, S. Gobron, R. Hillmann, Janusz Holyst, A. Kappas, D. Küster, M. Mitrovich, G. Paltoglou, H. Pirker, S. Rank, F. Schweitzer, J. Sienkiewicz, M. Skowron, P. Sobkowicz, D. Thalmann, M. Thelwall, M. Theunis, M. Trier, E. Tsankova, P. Weronski	221
Co-Evolution of Morphology and Control of a Wearable Robot for Human Locomotion Assistance Exploiting Variable Impedance Actuators J. van den Kieboom, F. Sergi, D. Accoto, E. Guglielmelli, R. Ronse, A.J. IJspeert	223
Biologically Inspired Computation for Chemical Sensing J. Fonollosa, A. Gutierrez-Galvez, A. Lansner, D. Martinez, JP. Rospars, R. Beccherelli, A. Perera, T. Pearce, P. Vershure, K. Persaud, S. Marco	226

Energy Efficiency of Robot Locomotion Increases Proportional to Weight J.C. Larsen, K. Stoy	228
Theoretical Study of the Emission of Light Stimulated by Phonons in Indirect Bandgap Semiconductor J.M.E. Fernández, A.M. Abietar	231
Sensitivity Analysis of Bacterial Chemotaxis Models J. Danis, T. Turányi	233
Potential of Social Modelling in Socio-Technical Systems A. Ferscha, K. Zia, A. Riener, A. Sharpanskykh	235
Weakly Electric Fish as Models for Underwater Robots: The use of Active Electrolocation for the Perception of 3-Dimensional Objects in Complex Environments K. Behr, G. von der Emde	238
From the Virtual to the Robotic: Bringing Emoting and Appraising Agents into Reality K. Kiryazov, R. Lowe, C. Beaker-Asano, A. Montebelli, T. Ziemke	241
Computational Modeling of Visual Selective Attention K.C. Neokleous, C. N. Schizas	244
How to Harness the Dynamics of Soft Body: Timing based Control of a Simulated Octopus Arm Via Recurrent Neural Networks K. Nakajima, T. Li, N. Kuppuswamy, R. Pfeifer	246
Organic Memristor based on the Composite Materials: Conducting and Ionic Polymers, Gold Nanoparticles and Graphenes K. Gorshkov, T. Berzina, V. Erokhin, M.P. Fontana	248
Scaling Laws in Robotics K. Dermitzakis, J.P. Carbajal, J.H. Marden	250
Current Trends for 4D Space-Time Topology for Semantic Flow Segmentation K. Matković, A. Lež, H. Hauser, A. Pobitzer, H. Theisel, A. Kuhn, M. Otto, R. Peikert, B. Schindler, R. Fuchs	253
Analyzing the Quantum based Satellite Communications L. Bacsardi, S. Imre	256
First Order Processing of Complex Olfactory Information in the Moth Brain L.S. Kuebler, Shannon B. Olsson, B.S. Hansson	258
Supermodeling by Combining Imperfect Models F.M. Selten, G.S. Duane, W. Wiegerinck, N. Keenlyside, J. Kurths, L. Kocarev	261
Novel Smart Concepts for Designing Swimming Soft Microrobots S. Palagi, V. Pensabene, B. Mazzolai, L. Beccai	264
Mass Production of Silicon MOS-SETs: Can we Live with Nano-Devices' Variability? X. Jehl, B. Roche, M. Sanquer, B. Voisin, R. Wacquez, V. Deshpande, B. Previtali, M. Vinet, J. Verdijin, G. C. Tettamanzi, S. Rogge, D.K.-Patil, M. Ruoff, D. Kern, D.A. Wharam, M. Belli, E. Prati, M. Fanciulli	266
From Sensorimotor Knowledge to Abstract Symbolic RepresentationsI F. Stramadinoli, M. Ruciński, Joanna Znajdek, K.J. Rohlfing, A. Cangelosi	269
Infants and iCubs: Applying Developmental Psychology to Robot Shaping J. Law, M. Lee, M. Hülse, P. Shaw	272
Models of Minimal Physical Intelligence M. M Hanczyc, F. Caschera, S. Rasmussen	275
Quantum Theory-Inspired Search D. Aerts, P. Bruza, Y. Hou, J. Jose, M. Melucci, J.-Y. Nie, D. Song	278
Expression of Insect Olfactory Receptors for Biosensing on SAW Sensors M.D. Jordan, R.A.J. Challiss	281
Electrically Controllable Magnetoresistance Switching in Multifunctional Organic based Spin-Valve Devices M. Prezioso, A. Riminiucci, I. Bergenti, P. Graziosi, D. Brunel, V.A. Dediu	283
Novel Nature Inspired Techniques in Medical Data Mining M. Bursa, L. Lhotska	286
The Shanghai Lectures: Connecting Continents in Cyberspace N. Labhart, B.S. Hasler	289
Next-Generation Multi-Mechanics Simulation Engine in a Highly Interactive Environment D. Le Touzé, J. Biddiscombe, A. Colagrossi, E. Jacquin, F. Leboeuf, J.-C. Marongiu, N. Quinlan, A. Amicarelli, M. Antuono, D. Barcarolo, M. Basa, J. Caro, M. De Leffe, N. Grenier, P.-M. Guilcher, M. Kerhuel, F. Le, L. Lobovský, S. Marrone, A. Marsh, G. Oger, E. Parkinson, J. Soumagn	292
Learning a Curvature Dynamic Model of an Octopus-Inspired Soft Robot Arm using Flexure Sensors N. Kuppuswamy, J.-P. Carbajal	294
Reflective Assistance – Pervasive Adaptation in Real Life Computing N. Serbedzija, G. Beyer	297
Quilt: Interactive Publications M. Bubak, P. Nowakowski, E. Ciepiela	301
Do-It-Yourself Environmental Sensing R. Peterová, J. Hybler	303

A Bio-Inspired Fuzzy Agent Clustering Algorithm for Search Engines R. D. Găceanu	305
CURVACE – CURVEd Artificial Compound Eyes R.P.-Camara, M. Dobrzynski, G. L'Eplattenier, J.-C. Zufferey, F. Expert, R. Juston, F. Ruffier, N. Franceschini, S. Viollet, M. Menouni, S. Godiot, A. Brückner, W. Buss, R. Leitel, F. Recktenwald, C. Yuan, H. Mallot, D. Floreano	308
A Novel Multisite Silicon Probe for Laminar Neural Recordings R. Fiáth, L. Grand, B. Kerekes, A. Pongrácz, É. Vázsonyi, G. Márton, G. Battistig, I. Ulbert	310
Adaptive Properties of Stochastic Memristor Networks: A Computational Study R. Sigala, A. Smerieri, V. Erokhin	312
Physical Measurement of Brain Perception Abilities. Foundations of a Working Methodology for the Design of “Intelligent” Beings F. Panetsos, S.L.A. Gonzalez, P.C. Marijuan, C.H.-Rincon	314
Terrestrial Locomotion Modeling Bio-Inspired by Elongated Animals S. Ali, F. Boyer, M. Porez	317
Locomotion Gait Optimization for Modular Robots; Coevolving Morphology and Control S. Pouya, E. Aydin, R. Möckel, A.J. Ijspeert	320
Flexible Assistive Robots Through AFO-based Intention Detection S.M.M. De Rossi, T. Lenzi, N. Vitiello, A. Persichetti, F. Vecchi, S. Roccella, M.C.C. Carrozza, R. Ronsse, B. Koopman, E.H.F. van Asseldonk, H. van der Kooij, J. van den Kieboom, A.J. Ijspeert	323
Ubiquitous Tracking in the Medical Environment G. Fenyvesi, T. Haidegger, L. Kovács, B. Benyó, Z. Benyó	325
Understanding Science 2.0: Crowdsourcing and Open Innovation in the Scientific Method T. Bücheler, J.H. Sieg	327
A Robotic Model of the Human Neuro-Musculo-Skeletal System T. Lenzi, S.M.M. De Rossi, N. Vitiello, S. Roccella, M.C. Carrozza	330
Impact of Real-Time Visual Attention on Computer Vision Products and Cognitive Robotics T.N. Vikram, M. Tscherpanow, B. Wrede	332
iSenseI: A Portable Ultracold-Atom-based Gravimeter M. de Angelis, M.C. Angonin, Q. Beaufils, Ch. Becker, A. Bertoldi, K. Bongs, T. Bourdel, P. Bouyer, V. Boyer, S. Dörschedt, H. Duncker, W. Ertmer, T. Fernholz, T. M. Fromhold, W. Herr, P. Krüger, Ch. Kürbis, C.J. Mellor, F.P. Dos Santos, A. Peters, N. Poli, M. Popp, M. Prevedelli, E.M. Rasel, J. Rudolph, F. Schreck, K. Sengstock, F. Sorrentino, S. Stellmer, G.M. Tino, T. Valenzuela, T.J. Wendrich, A. Wicht, P. Windpassinger, P. Wolf	334
Freestanding Functionalized Nanofilms for Biomedical Applications V. Mattoli, F. Greco, T. Fujie, S. Taccolla, A. Menciassi, P. Dario	337
BOVINOSE: Pheromone-based Sensor System for Detecting Estrus in Dairy Cows W. Wiegerinck, A. Setkus, V. Buda, A.-K. Borg-Karlson, R. Mozuraitis, A. de Gee	340
Theoretical Simulations on Electric Properties of CNT-Me and GNR-Me Interconnects using Effective Media Approach Yu.N. Shunin, Yu.F. Zhukovskii, N. Burlutskaya, S. Bellucci	343
Detection of Ligand-Elicited Cellular Responses using Surface Acoustic Wave Biosensors S. Pathak, M.D. Jordan, Z. Rácz, R.A.J. Challiss, J.W. Gardner, M. Cole	346
Micro-Electric Imaging: Inverse Solution for Localization of Single Neuron Currents based on Extracellular Potential Measurements Z. Somogyvári, D. Cserpán, I. Ulbert, P. Érdi	348
Awards Ceremony and Closing	
Awards Ceremony and Closing A. de Touzalin	353
A Role for Cortical Spiral Waves in Visual Attention? N. Wilkinson, G. Metta	s1
Actuation and Sensing Properties of Electroactive Polymer Whiskers N. Festin, C. Plesse, C. Chevrot, D. Teyssié, L. Josselin, P. Pirim, F. Vidal	s6
HOMM. ICT for Hands on Multi Media Laboratories in Museums M. Russo, R. Ghose, M. Mattioli	s: