



Report on:

**IEEE CASS Outreach Initiative 2014,
IEEE International Meeting on
Analysis and Applications of
Nonsmooth Systems**

10 – 12 September 2014





Organizer:

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Conference Website

<http://aans2014.deib.polimi.it/>

Objective:

The main objective of this meeting was to bring together researchers in applied and theoretical nonsmooth systems to share the latest theoretical results, to discuss novel and promising applications, to identify the challenges that lie at the frontier of mathematics and engineering and plan the most promising routes to a solution.

Program:

10 September

- 08.30 AM Registration opens
- 09.15 AM Welcome message
- 09.30 AM Invited talk: "Nonlinear, Non-smooth Dynamics of Hysteresis-Based Load Controls" Ian Hiskens
- 10.00 AM "Laplacian dynamics on temporally switching networks" Naoki Masuda and Konstantin Klemm and Victor M. Eguiluz
- 10.30 AM "Interactions of noise and discontinuities: sensitive and qualitative changes" Rachel Kuske and David Simpson and Yue Xian Li
- 11.00 AM Coffee break
- 11.30 AM "Onset of chaos via irregular sequences of border collision bifurcations in a single-phase power electronic inverter" Viktor Avrutin and Zhanybai T. Zhusubaliyev and Erik Mosekilde and Laura Gardini
- 12.00 PM "Non-smooth simulations of aero-elastic phenomena" Ugo Galvanetto and Marco Coccon and Luca Magri
- 12.30 PM "A common analytic proof of the existence of a homoclinic and T-point in reversible piecewise linear system" Victoriano Carmona and Fernando Fernández-Sánchez and Elisabeth García-Medina
- 01.00 PM Lunch break

03.00 PM Invited talk: "Some ecological applications of differential equations with discontinuous righthand sides" Vlastimil Krivan
 03.30 PM "Bifurcation analysis of the Wilson Cowan equations with a nonsmooth firing rate" Jeremy Harris and Bard Ermentrout
 04.00 PM "Time-switching models in population ecology" John G. Donohue and Petri T. Piiroinen
 04.30 PM Coffee break
 05.00 PM "Filippov unplugged" John Hogan and Martin Homer and Mike Jeffrey and Robert Szalai
 05.30 PM "Relaxing Filippov's assumptions: why you'd want to, and what happens when you do" Mike R. Jeffrey

11 September

09.30 AM Invited talk: "Convergence and Synchronization in Piecewise Smooth Networks" Mario Di Bernardo
 10.00 AM "Quantized consensus: discontinuous equations in continuous time" Francesca Ceragioli and Paolo Frasca
 10.30 AM "A general framework for analyzing synchronization dynamics of weakly perturbed oscillators in hybrid dynamical systems" Sho Shirasaka and Wataru Kurebayashi and Hiroya Nakao
 11.00 AM Coffee break
 11.30 AM "Estimating basin of attraction in piecewise-linear systems by nonsmooth Lyapunov functions" Max Demenkov
 12.00 PM "The period adding bifurcation: a rigorous proof and applications to hybrid systems in neuroscience" Lluís Alsedà and Albert Granados and Maciej Krupa
 12.30 PM "More limit cycles from a piecewise linear Hopf-pitchfork bifurcation" Emilio Freire, Manuel Ordóñez and Enrique Ponce
 01.00 PM Lunch break
 03.00 PM Invited talk: "A Hybrid System Perspective on Networked and Event-Triggered Control" Maurice Heemels
 03.30 PM "Incremental stability of bimodal Filippov systems in \mathbb{R}^n " Davide Fiore and Mario Di Bernardo
 04.00 PM "On the controllability of discrete-time conewise linear systems" Devrim Kaba and Kanat Camlibel
 04.30 PM Coffee break
 05.00 PM "Nonsmooth Systems and numerical methods" Petri T. Piiroinen
 05.30 PM "A new software for dynamical analysis of nonsmooth systems" Kuntal Mandal and Soumitro Banerjee
 08.00 PM Social dinner

12 September

09.30 AM Invited talk: "Engineering extreme materials with defects and nonlinearity" Chiara Daraio
 10.00 AM "Hamiltonian and forced/damped discrete breathers in vibro-impact chain" Oleg Gendelman and Itay Grinberg
 10.30 AM "Piecewise linear maps in refraction and reflection through complex optical media" Paul Glendinning and Jean-Marc Gambaudo
 11.00 AM Coffee break
 11.30 AM "Nonlinear Dynamic Structures with Developing Discontinuity" Vladimir Babitsky and Vikrant Hiwarkar
 12.00 PM "Dynamics of elastic structures with non-smooth forces" Robert Szalai
 12.30 PM "Dynamics of yoke-bell-clapper impacting system" Piotr Brzeski and Tomasz Kapitaniak and Przemysław Perlikowski
 01.00 PM Lunch break

03.00 PM Invited talk: “Hybrid mathematical formalism for analysis of biological regulatory networks” Madalena Chaves
03.30 PM “Two-step Regulation in Gene Network Models” Geoffrey McGregor and Roderick Edwards and Anna Machina and Pauline Van Den Driessche
04.00 PM “Non-smooth dynamics in spiking neuron models” Kyle Wedgwood and Stephen Coombes and Ruediger Thul
04.30 PM “Poincaré half-maps for piecewise linear systems via inverse integrating factors” Victoriano Carmona and Fernando Fernández-Sánchez and Elisabeth García-Medina

Metrics of success

We had 32 speakers, and 40 participants from Europe, North America, India, Japan, and Russia, thus meeting our target in size and variety of represented nations and institutions. Participants expressed great satisfaction in the outcome of the event, and interest for repeating the format in the future.

Budget

The budget (\$18000 = €12449,95) was mainly used to cover invited speakers and student travel expenses, and conference meals, as follows:

Expenses:

Printed material	€572,58
Invited speakers	€3436,19
Student travel grants	€2160,77
Refreshments and banquet	€5149,4
Support personnel from Politecnico	€758,58
total:	€12077,52