EUROMECH Colloquium 603

Dynamics of micro and nano electromechanical systems:
multi-field modelling and analysis

Program

5 - 7 September 2018
Faculty of Engineering of the University of Porto, Portugal

Santander Universidades – *Reitoria da Universidade do Porto* and *Banco Santander*

SciTech

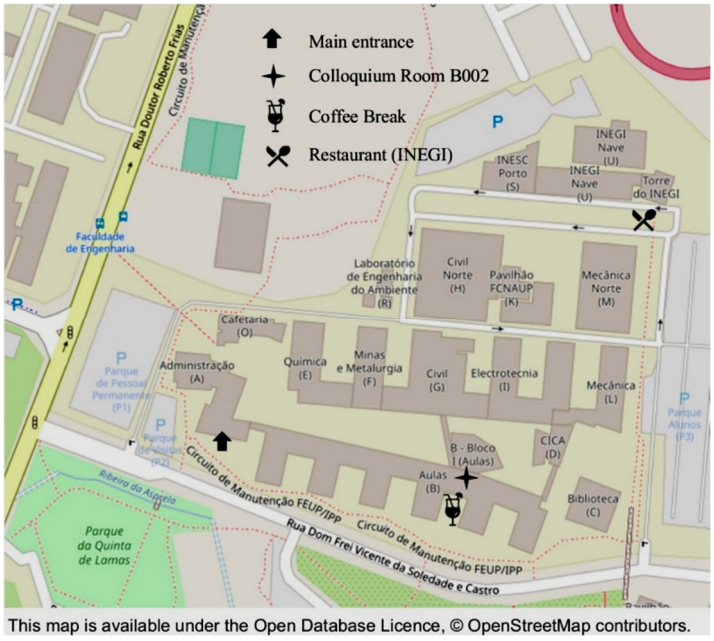
Colloquium information

Materials

Each registered person receives a badge, conference program, document case, paper, pen and USB drive with the proceedings. The organisers kindly ask you to wear your badge during the colloquium, since the badge assures entrance to premises and catering.

Venues

All lectures take place in room B002, FEUP. Coffee-breaks and the welcome reception occur in the *Coffee-Lounge* in front of room B002. Lunches occur at the restaurant on the 1st floor of INEGI, on the campus of the Faculty of Engineering.



Internet access

Please connect your mobile device to UPorto wifi network. Then, open a browser and enter the following credentials:

username - euromech

password - euromech603

Note to Speakers

Please load the presentation to the computer of room B002 at least 20 minutes before the start of the session. Please note that only file formats supported by Windows are accepted, so authors using Macs should save their presentations for projection in any of those formats (ppt, pptx or pdf).

Social activities

Three social activities will occur: a welcome reception at the end of the first day, the colloquium dinner on the second day, a tour around old Porto and the river on the last day. The three activities are included in the regular participant fee. The student fee does not include the colloquium dinner. Accompanying persons can purchase tickets to participate in any activity.

5 September, Wednesday

Time	Title	Speaker	Abst #
8:15-9:00	**Registration**		
09:00-9:20	**Colloquium Opening – P. Ribeiro, S. Lenci and S. Adhikari**		
9:20-10:10	**Invited Lecture** Nonlinear Dynamics of Thermo-visco-elastic Nano-opto-mechanical Panel Resonators: a multi-scale continuum mechanics coupled fields approach	**Chair: Stefano Lenci** **Oded Gottlieb** (Technion, Israel)	
	Session 1	**Chair: Alberto Corigliano**	
10.10-10:30	Semi-analytic modeling and experiments of a collapse-mode CMUT with fluid coupling	Rob Fey	11
10:30-10:50	Finite elements based reduced order models for nonlinear dynamics of piezoelectric and dielectric laminated micro/nanostructures	Olivier Thomas	15
10:50-11:20	***Coffee Break***		
	Session 2	**Chair: Claudia Comi**	
11:20-11:40	Analysis of isolated solutions in a symmetric MEMS array during symmetry breaking event using NNM	Clément Grenat	16
11:40-12:00	Array of nanostrings electromagnetically coupled through repelling Lorentz forces	Slava Krylov	24
12:00-12:20	Feasibility study of a resonant accelerometer with bistable electrostatically actuated cantilever as a sensing element	Omer HaLevy	26
12:20-12:40	Dynamical instability of pressurized electrically-actuated circular micro-plates	Stefano Lenci	4
12:40-13:00	Dynamic response of a piecewise linear MEMS oscillator	Andrea Guerrieri	17
13:00-14:30	***Lunch***		
	Session 3	**Chair: Olivier Thomas**	
14:30-14:50	Shock response of a ring-based Coriolis Vibrating Gyroscope under nonlinear electrostatic excitation	Stewart McWilliam	18
14:50-15:10	Frequency modulated (FM) micro-gyroscopes: recent advances	Alberto Corigliano	19
15:10-15:30	Mechanical non-linearity effects in supported MEMS ring-based resonators	Stewart McWilliam	20
15:30-15:50	Nonlinear interaction of a pair of nano/micromechanical res. with different decay rates far away from internal resonance	Oriel Shoshani	41
15:50-16:10	Observation of amplitude-dependent nonlinear damping in MEMS micro mirrors	Ulrike Nabholz	6
16:10-16:40	***Coffee Break***		
	Session 4	**Chair: Ulrich Schmid**	
16:40-17:00	Dynamic behaviour of two cantilevers partially immersed in glycerol	Stefanie Gutschmidt	30
17:00-17:20	Theoretical framework for modelling the fluid-structure interaction of complex MEMS/NEMS resonator eigenmodes	Daniel Platz	12
17:20-17:40	Dynamics of very viscous flow in deformable microchannels under impact loads	F. Galindo-Rosales	32
17:40-18:00	Gas flow in a micro-channel with an elastic obstacle	Emil Manoach	42
18:00-18:20	Pressure drop measurements in microchannels: influence of the tap design	Tomás R. Pinto	27
18:30-19:30	***Welcome Reception***		

6 September, Thursday

Time	Title	Speaker	Abst #
8:45-9:00	**Registration**		
9:00-9:50	**Invited Lecture** Dynamical Phenomena of Micro and Nano Systems for Superior Devices	**Chair: Pedro Ribeiro** **Mohammad I. Younis** (KAUST, Saudi Arabia & Binghamton University, USA)	
	Session 5	**Chair:Stefanie Gutschmidt**	
9.50-10:10	Experimental and theoretical investigation of a microbeam-based MEMS device with half electrode configuration	Stefano Lenci	13
10.10-10:30	Multiple scales analysis of MEMS resonators under the simultaneous excitation of subharmonic and primary resonances	Saad Ilyas	36
10:30-10:50	Investigating the phenomenon of mode localization in electrostatically and mechanically coupled MEMS resonators	Saad Ilyas	37
10:50-11:20	***Coffee Break***		
	Session 6	**Chair: Slava Krylov**	
11:20-11:40	Measured and simulated tri-stability in MEMS capacitive switches	Devin Kalafut	21
11:40-12:00	Electrostatic arch micro-tweezers	Ayman Alneamy	29
12:00-12:20	An overview on dynamical behaviour and control of an AFM taking into account the forces of Van Der Walls and including fractional-order derivatives in the mathematical model	José M. Balthazar	33
12:20-12:40	Toward electrostatic Atomic Force Microscopy	Ayman Alneamy	39
12:40-13:00	Molecular dynamics for characterization of probe-sample interaction in atomic force microscopy	Pierpaolo Belardinelli	49
13:00-14:30	***Lunch***		
	Session 7	**Chair: Emil Manoach**	
14:30-14:50	A note on dynamics and control of a mems oscillator with chaotic behavior	Angelo M. Tusset	34
14:50-15:10	Experiments on nonlinear characteristics of parametric resonance in microcantilever	Shouhou Tei	22
15:10-15:30	Effect of nonlinear feedback control on a coupled cantilevers	Takumi Nakamura	10
15:30-15:50	Free periodic vibrations of micro beams with piezoelectric effects	Hamed Akhavan	43
15:50-16:10	Printed circuit boards experimental and numerical characterization: mechanical, thermal and vibration analysis	Carlos Castro	7
16:10-16:40	***Coffee Break***		
	Session 8	**Chair: Farbod Alijani**	
16:40-17:00	Vibrational analysis of functionally graded nano-mass sensor based on a nonlocal continuum theory	Omid Rahmani	46
17:00-17:20	Free, geometrically non-linear, periodic vibrations of non-local plates by a mixed model	Pedro Ribeiro	35
17:20-17:40	Analysis of micro plates with a modified couple stress theory and RBF-FD meshless method	Carla Roque	5
17:40-18:00	Ballistic thermal transport in two-dimensional MoSe lattices	Slaven Tepsic	44
18:00-18:20	Application of modified LuGre friction model to the analysis of friction-induced oscillations	Andrzej Stefanski	50
18:20-18:40	Squeeze film damping control of a piezoresistive micro accelerometer for neurological disease diagnosis	Sonali Biswas	40
20:00-23:00	***Colloquium Dinner***		

7 September, Friday

Time	Title	Speaker	Abst #
8:45-9:00	**Registration**		
9:00-9:50	**Invited Lecture** Dynamics of Graphene and 2D Materials	**Chair: Sondipon Adhikari** **Peter Steeneken** (TU Delft, The Netherlands)	
	Session 9	**Chair: Rob H.B. Fey**	
9.50-10:10	On nonlinear vibrational properties of graphene-based structures	Reza Ghaffari	14
10.10-10:30	Graphene-based broadband high-frequency ultrasound detector	Gerard Verbiest	31
10:30-10:50	On the quasiperiodic motion in nonlinear graphene resonators	Farbod Alijani	48
10:50-11:20	***Coffee Break***		
	Session 10	**Chair: Hamed Akhavan**	
11:20-11:40	Atomistic modelling of hydrocarbon nanostructure failure	Mat Tolladay	9
11:40-12:00	Structure and properties of helical carbon nanotubes using MM simulations	Akshay Dahiya	38
12:00-12:20	Simulation of the electromechanical properties and strain-sensing response of CNT- polymer composites	Miguel A. S. Matos	8
12:20-13:15	**Discussion and closure – P. Ribeiro, S. Lenci and S. Adhikari**		
13:15-14:30	***Lunch***		

Friday afternoon: tour in Porto.

The tour consists of:

- a walk in the historical centre of Porto;
- Six Bridges Cruise in river Douro;
- visit to a Port wine cellar.

All colloquium delegates are welcome to the tour, but participation should be confirmed in advance.