



UNIVERSIDAD
POLITECNICA
DE VALENCIA



MATHEMATICAL MODELS OF ADDICTIVE BEHAVIOUR, MEDICINE & ENGINEERING 2010

September 8th-10th, 2010

Instituto de Matemática Multidisciplinar, Universidad Politécnica de Valencia, 46022
Valencia, Spain

Edificio 8G, piso 2, acceso A y C

Webpage: <http://jornadas.imm.upv.es>

Invited Speakers:

- 1.) **Biobarrier formation in porous media with randomness**, Dan Stanescu and *Benito Chen-Charpentier* (University of Texas at Arlington, Texas, U.S.A.)
- 2.) **Huge progeny production during the transient of a quasispecies model of viral infection, reproduction and mutation**, *José A. Cuesta* (Universidad Carlos III de Madrid, Leganés, Madrid, Spain)
- 3.) **Numerical simulation of periodic structure problems**, *Matthias Ehrhardt* (Lehrstuhl für Angewandte Mathematik und Numerische Analysis Fachbereich C-Mathematik und Naturwissenschaften, Bergische Universität Wuppertal, Germany) and Chunxiong Zheng.
- 4.) **Homotopy WHEP as an efficient algorithm for solving stochastic differential equations**, *Magdy El-Tawil* (Cairo University, Faculty of Engineering Mathematics Dept., Giza, Egypt)
- 5.) **Approaches to model dynamics of H1N1 influenza virus in selected regions**, *Gilberto González-Parra* (Departamento de Cálculo, Universidad de los Andes, Mérida, Venezuela)
- 6.) **A WNS-FDTD method to simulate light scattering in flow cytometry**, *Silvia Jerez* and Andrés Lara (Centro de Investigación en Matemática, Guanajuato, Mexico)

- 7.) **Nonlinear juvenile predation population dynamics**, *Francisco Solis* (Centro de Investigación en Matemática, Guanajuato, Mexico)
- 8.) **Growth impact of hydrodynamic dispersion in Couette-Taylor bioreactor**, *Stepán Papáček* (Institute of Physical Biology, University of South Bohemia, Czech Republic), Václav Stumbauer, Dalibor Stys, Karel Petera, and Ctirad Matonoha
- 9.) **An accurate closed-form solution by modal series for Lotka-Volterra models that preserve periodic solutions**, *Abraham José Arenas Tawil* (Universidad de Córdoba, Montería, Colombia)

List of Accepted Communications (Organized by sessions):

Mathematical Models of Addictive Behaviour (September 9th, morning session)

- 1) I. García, L. Jódar, **P. Merello**, and F. J. Santonja, *A discrete mathematical model for shopping addiction: causes, risks and addicted population evolution.*
- 2) N. Guadalajara, I. Barrachina, **E. de la Poza**, and D. Vivas, *Modeling the behavior of potential addictive pharmaceutical products.*
- 3) **M. del Líbano**, S. Llorens, M. Salanova, and W. B. Schaufeli, *Towards a development of a workaholism mathematical model.*
- 4) **F. Guerrero**, F. J. Santonja, and R. J. Villanueva, *Analysing the effect of Spanish smoke-free legislation in the next few years: a mathematical modeling approach.*
- 5) **M. Rubio** and E. Sánchez, *Predicting cocaine relapse in cocaine dependent patients under treatment.*

Mathematical Models in Medicine (September 8th, 9th and 10th, three morning sessions)

- 6) F. J. de Cos Juez, M. A. Suárez, **F. Sánchez-Lasheras**, and A. Murcia, *Application of neural networks to the study of the influence of diet and lifestyle on the value of bone mineral density in post-menopausal women.*
- 7) R. Shoucri, *Optimal control theory and cardiac contraction.*
- 8) F. J. de Cos Juez, P. J. García, **F. Sánchez-Lasheras**, and F. J. Moreno, *A data driven ensemble classifier for breast cancer detection in a screening program. A case study.*
- 9) L. Acedo, **J. A. Moraño**, R. J. Villanueva, and J. Villanueva-Oller, *Random networks to study the dynamics of respiratory syncytial virus (RSV) in the Spanish region of Valencia.*
- 10) **C. Santamaría**, B. García-Mora, G. Rubio, and S. Lujan, *An analysis of the recurrence progression process in bladder carcinoma by means of joint frailty models.*

- 11) **M. T. Signes**, H. Mora, and J. M. García, *Computational framework based on Behavioural modeling: Application to the matching of ECG recordings.*
- 12) M. J. Rodríguez-Álvarez, F. Sánchez, A. Soriano, **A. Iborra** and C. Mora, *Exploiting symmetries for weight matrix design in CT imaging.*
- 13) **L. Acedo** and D. F. Aranda, *Analysis of the electroencephalogram as a random walk*

Mathematical Models for Internal Combustion Engines (September 9th, afternoon session)

- 14) R. Payri, B. Tormos, J. Gimeno, and **G. Bracho**, *Improvement of a LES solver for calculation of compressible liquid flows in high pressure conditions.*
- 15) F. J. Salvador, J. Martínez, **J.-V. Romero**, and M.-D. Roselló, *Influence of biofuels on the internal flow in diesel injector nozzles.*
- 16) J. M. García, X. Margot, **M. Chávez**, and A. Karlsson, *Coupling methodology of one-dimensional and multi-dimensional computational fluid dynamics (CFD) models for the simulation of diesel sprays.*
- 17) J. Galindo, A. Tiseira, **P. Fajardo** and R. Navarro, *Coupling methodology of a 1D finite elements and a 3D finite volumes CFD code based on the method of characteristics.*
- 18) **F. Piscaglia**, A. Montorfano, A. Onorati, and G. Ferrari, *High Resolution Central Schemes for multi-dimensional non-linear acoustic simulation of silencers in internal combustion engines.*
- 19) S. Hoyas, A. Gil, **J. M. Mompó-Laborda**, and D. Khuong-Anh, *Large eddy simulation of diesel sprays.*
- 20) **R. Novella**, A. García, J. M. Pastor, and P. González, *Evaluation of integrating detailed chemical kinetics into CFD for diesel spray ignition and combustion analysis.*
- 21) J. R. Serrano, F. J. Arnau, P. Piqueras, and **M. A. Reyes-Belmonte**, *Effects of the computational grid on the solution of boundary conditions in one-dimensional flow modelling.*

Mathematical Models in Engineering (September 8th and 9th, afternoon sessions and September 10th, morning session)

- 22) **S. Carlos**, A. Sánchez, and S. Martorell, *Model to study the effect of workforce in a safety equipment maintenance plan and its optimization.*
- 23) **M. Araújo**, T. Rivas, E. Giráldez, and J. Taboada, *Use of machine learning techniques to analyse the risk associated with mine lode deposits.*
- 24) A. Jimeno, R. Molina, and **J. L. Sánchez**, *Mathematical morphology for design and manufacturing.*
- 25) **C. Ordoñez**, J. R. Rodríguez, A. N. Reyes, and P. J. García, *Analysis of the influence of forest environments on the accuracy of GPS measurements by using genetic algorithms.*
- 26) **V. Arroyo**, A. Cordero, and J. R. Torregrosa, *Improvement of artificial satellites orbit determination.*

- 27) **E. Parrilla**, J. R. Torregrosa, J. Riera, and J. L. Hueso, *Fuzzy control for obstacle detection in stereo video sequences.*
- 28) S. González-Pintor, **D. Ginestar**, and G. Verdú, *Updating the lambda modes of a nuclear power reactor.*
- 29) **D. Ayala-Cabrera**, M. Herrera, J. Izquierdo, R. Pérez-García, *Towards the visualization of water supply system components with GPR images.*
- 30) **J. Martínez**, M. López, J. M. Matías, and J. A. Vilán, *Classifying slate tile quality using automated learning techniques.*
- 31) **F. Pedroche**, *Tips for a mathematical model of Facebook.*
- 32) J. A. Hernández, J. D. Ospina, and D. Villada, *A simulation-based performance study of the Multidynamics Optimization Algorithm.*
- 33) **F. Moreno**, F. Arango, and J. Echeverri, *Spatial Season Queries in a Multidimensional Model.*
- 34) J. Benítez, **X. Delgado-Galván**, J. Izquierdo, and R. Pérez-García, *Balancing consistency and expert judgment in AHP.*
- 35) M. Rebollo, **A. Palomares**, and C. Carrascosa, *Consensus networks as agreement mechanism for autonomous agents in water markets.*
- 36) **F. J. Camacho**, A. N. Pérez, and A. García, *Mathematical model to determine geometric consistency in order to evaluate road safety*
- 37) **E. Camacho**, M. L. Pérez, and J. Camacho, *Mathematical model for shape voids optimization in precast breakwater structures*
- 38) **M. Ali Baradaran Ghahfarokhi**, *Modeling human behavior and activities in cyberspace using heavy tailed distributions*
- 39) **C. Jordán**, S. Morillas, and E. Sanabria, *Image smoothing through switching filtering and graph-based modeling*

Mathematical Models in Business (September 8th, morning session)

- 40) **F. Reyes**, C. M. Cadarso, M. J. Rodríguez, *Estimating hospital production functions through flexible regression models.*
- 41) **F. García**, F. Guijarro, and I. Moya, *A mathematical model of perfect competition: An application to the European car industry.*
- 42) J. C. R. Alcantud, D. L. Matos, and **C. R. Palmero**, *Algorithmic construction of a new efficiency index for revealed preference.*
- 43) L. Gómez-Valle and **J. Martínez-Rodríguez**, *Numerical approximation of the term structure models with different risk-neutral drifts.*
- 44) **J. David Cabedo** and J. M. Tirado, *Sector concentration risk: a model for estimating capital requirements*

Numerical Methods (September 8th, afternoon session)

- 45) J. C. Cortés, L. Jódar, and **L. Villafuerte**, *Numerical solution of random differential models.*
- 46) **O. Angulo**, J. C. López-Marcos, and M. A. López-Marcos, *Numerical approximation of asymptotic states for a size-structured population model with a dynamical resource.*
- 47) **E. Ponsoda** and S. Blanes, *New efficient numerical methods to describe the heat transfer in a solid medium.*
- 48) L. Bergamaschi, **R. Bru**, and A. Martínez, *Low-rank update of preconditioners for the inexact Newton method with SPD Jacobian.*

- 49) J. Escolano, F. Rodríguez, **M. A. Castro**, F. Vives, and J. A. Martín, *Exact and analytic-numerical solutions of bidimensional lagging models of heat conduction.*
- 50) **J. Sastre**, J. Ibáñez, E. Defez and P. Ruiz, *Computing matrix exponential to solve coupled differential models in Engineering.*

Schedule

- Communications: 15 min + 5 min.
- Plenary sessions: 20 min + 5 min.

Wednesday 8th

	<p align="center">Plenary Session (Venue: RED CUBE)</p> <p align="center"><i>Chairman: L. Jódar</i></p>
9:00-9:25	J. A. Cuesta (Univ. Carlos III de Madrid) , <i>Huge progeny production during the transient of a quasispecies model of viral infection, reproduction and mutation</i>
9:25-9:50	M. Ehrhardt (Bergische Universität Wuppertal, Germany) , <i>Numerical simulation of periodic structure problems</i>
	<p align="center">Session: Mathematical Models in Medicine I (Venue: RED CUBE)</p> <p align="center"><i>Chairman: J. A. Cuesta</i></p>
9:50 - 10:10	F. Sánchez-Lasheras (Tecniproject SL, Spain) , <i>Application of neural networks to the study of the influence of diet and lifestyle on the value of bone mineral density in post-menopausal women.</i>
10:10 - 10:30	R. Shoucri (Royal Military College of Canada) , <i>Optimal control theory and cardiac contraction.</i>
10:30-10:50	F. Sánchez Lasheras (Tecniproject SL, Spain) , <i>A data driven ensemble classifier for breast cancer detection in a screening program. A case study.</i>
11:00-11:30	<p align="center">COFFEE BREAK</p>
	<p align="center">Session: Mathematical Models in Business (Venue: RED CUBE)</p> <p align="center"><i>Chairman: M. Ehrhardt</i></p>
11:30-11:50	F. Reyes (Univ. de Santiago, Spain) , <i>Estimating hospital production functions through flexible regression models.</i>
11:50-	F. García (Facultad de ADE, UPV) , <i>A mathematical model of</i>

12:10	<i>perfect competition: An application to the European car industry.</i>	
12:10-12:30	C. R. Palmero (Univ. de Salamanca, Spain) , <i>Algorithmic construction of a new efficiency index for revealed preference.</i>	
12:30-12:50	J. Martínez-Rodríguez (Univ. de Valladolid, Spain) , <i>Numerical approximation of the term structure models with different risk-neutral drifts.</i>	
12:50-13:10	J. David Cabedo (Univ. Jaume I) , <i>Sector concentration risk: a model for estimating capital requirements.</i>	
	Parallel session: Mathematical Models in Engineering I (Venue: RED CUBE) <i>Chairman: J. R. Torregrosa</i>	Parallel session: Numerical Methods (VENUE: YELLOW CUBE) <i>Chairman: B. M. Chen-Charpentier</i>
16:00-16:20	V. Arroyo (IMM, UPV) , <i>Improvement of artificial satellites orbit determination.</i>	L. Villafuerte (Univ. Autónoma de Chiapas, Mexico) , <i>Numerical solution of random differential models.</i>
16:20 - 16:40	E. Parrilla (IMM, UPV) , <i>Fuzzy control for obstacle detection in stereo video sequences.</i>	A. J. Arenas (Univ. de Córdoba, Montería, Colombia) , <i>An accurate closed-form solution by modal series for Lotka-Volterra models that preserve periodic solutions.</i>
16:40 - 17:00	D. Ginestar (IMM, UPV) , <i>Updating the lambda modes of a nuclear power reactor.</i>	O. Angulo (Univ. de Valladolid) , <i>Numerical approximation of asymptotic states for a size-structured population model with a dynamical resource.</i>
17:00 - 17:20	D. Ayala-Cabrera (IMM, UPV) , <i>Towards the visualization of water supply system components with GPR images.</i>	J. Sastre (IMM,UPV) , <i>Computing matrix exponential to solve coupled differential models in Engineering.</i>
17:30 - 18:00	COFFEE BREAK	
	Parallel session: Mathematical Models in Engineering I (Venue: RED CUBE) <i>Chairman: J. R. Torregrosa</i>	Parallel session: Numerical Methods (Venue: YELLOW CUBE)

		<i>Chairman: O. Angulo</i>
18:00 - 18:20	F. J. Camacho (UPV, Spain), <i>Mathematical model to determine geometric consistency in order to evaluate road safety.</i>	R. Bru (IMM,UPV), <i>Low-rank update of preconditioners for the inexact Newton method with SPD Jacobian.</i>
18:20-18:40	E. Camacho (UPV, Spain), <i>Mathematical Model for shape voids optimization in precast breakwater structures</i>	M. A. Castro (Univ. de Alicante, Spain), <i>Exact and analytic-numerical solutions of bidimensional lagging models of heat conduction.</i>
18:40-19:00	M. Ali Baradaran (International Labor Organization, Iran), <i>Modeling human behavior and activities in cyberspace using heavy tailed distributions.</i>	S. Blanes or P. Bauer (IMM, UPV), <i>New efficient numerical methods to describe the heat transfer in a solid medium.</i>

Thursday 9th

	Plenary Session (Venue: RED CUBE)	
	<i>Chairman: J. R.Torregrosa</i>	
9:30-9:55	B. M. Chen-Charpentier (Univ. of Texas at Arlington, U.S.A.), <i>Biobarrier formation in porous media with randomness</i>	
9:55-10:20	S. Papáček (Univ. of South Bohemia, Czech Republic), <i>Growth impact of hydrodynamic dispersion in Couette-Taylor bioreactor</i>	
	Session: Mathematical Models in Medicine II (Venue: RED CUBE)	
	<i>Chairman: B. M. Charpentier</i>	
10:20 - 10:40	J. A. Moráño (IMM, UPV), <i>Random networks to study the dynamics of respiratory syncytial virus (RSV) in the Spanish region of Valencia.</i>	
10:40-11:00	C. Santamaría (IMM, UPV), <i>An analysis of the recurrence progression process in bladder carcinoma by means of joint frailty models.</i>	
11:00-11:30	COFFEE BREAK	

	Session: Mathematical Models of Addictive Behaviour (Venue: RED CUBE) <i>Chairman: G. González-Parra</i>	
11:30-11:50	P. Merello (IMM, UPV) , <i>A discrete mathematical model for shopping addiction: causes, risks and addicted population evolution.</i>	
11:50-12:10	E. de la Poza (Facultad de ADE, UPV, Spain) , <i>Modeling the behavior of potential addictive pharmaceutical products.</i>	
12:10-12:30	M. del Líbano (Univ. Jaume I de Castellón, Spain) , <i>Towards a development of a workaholism mathematical model.</i>	
12:30-12:50	F. Guerrero (Univ. de Valencia, Spain) , <i>Analysing the effect of Spanish smoke-free legislation in the next few years: a mathematical modeling approach.</i>	
12:50-13:10	M. Rubio (IMM, UPV) , <i>Predicting cocaine relapse in cocaine dependent patients under treatment.</i>	
	Plenary Session (Venue: RED CUBE) <i>Chairman: R. J. Villanueva</i>	
15:30-15:55	G. González-Parra (Univ. de los Andes, Mérida, Venezuela) , <i>Approaches to model dynamics of H1N1 influenza virus in selected regions</i>	
	Session: Mathematical Models in Engineering II (Venue: RED CUBE) <i>Chairman: F. Solis</i>	Session: Mathematical Models for Internal Combustion Engines (Venue: YELLOW CUBE) <i>Chairman: F. Piscaglia</i>
16:00 - 16:20	S. Carlos (UPV, Spain) , <i>Model to study the effect of workforce in a safety equipment maintenance plan and its optimization.</i>	G. Bracho (CMT, UPV) , <i>Improvement of a LES solver for calculation of compressible liquid flows in high pressure conditions.</i>
16:20 - 16:40	M. Araújo (Univ. de Vigo, Spain) , <i>Use of machine learning techniques to analyse the risk associated with mine lode deposits.</i>	M. A. Reyes-Belmonte (CMT,UPV) , <i>Effects of the computational grid on the solution of boundary conditions in one-dimensional flow modeling.</i>
16:40-17:00	J. L. Sánchez (Univ. de Alicante, Spain) , <i>Mathematical morphology for design and manufacturing.</i>	M. Chávez (CMT, UPV) , <i>Coupling methodology of one-dimensional and multi-dimensional computational fluid dynamics (CFD) models for the simulation of diesel sprays.</i>

17:00-17:20	C. Ordoñez (Univ. de Vigo, Spain) , <i>Analysis of the influence of forest environments on the accuracy of GPS measurements by using genetic algorithms.</i>	P. Fajardo (CMT,UPV) , <i>Coupling methodology of a 1D finite elements and a 3D finite volumes CFD code based on the method of characteristics.</i>
17:30 - 18:00	COFFEE BREAK	
	Session: Mathematical Models in Engineering II (Venue: RED CUBE) <i>Chairman: M. Ehrhardt</i>	Session: Mathematical Models for Internal Combustion Engines (Venue: YELLOW CUBE) <i>Chairman: R. Payri</i>
18:00 - 18:20	X. Delgado-Galván (IMM, UPV) , <i>Balancing consistency and expert judgment in AHP.</i>	F. Piscaglia (Politecnico di Milano, Italy) , <i>High Resolution Central Schemes for multi-dimensional non-linear acoustic simulation of silencers in internal combustion engines.</i>
18:20-18:40	J. Martínez (Univ. de Vigo, Spain) , <i>Classifying slate tile quality using automated learning techniques.</i>	J. M. Mompó-Laborda (CMT,UPV) , <i>Large eddy simulation of diesel sprays.</i>
18:40-19:00	A. Palomares (DSIC, UPV, Spain) , <i>Consensus networks as agreement mechanism for autonomous agents in water markets.</i>	R. Novella (CMT,UPV) , <i>Evaluation of integrating detailed chemical kinetics into CFD for diesel spray ignition and combustion analysis.</i>
19:00-19:20	C. Jordán (IMM, UPV) , <i>Image smoothing through switching filtering and graph-based modeling.</i>	J. V. Romero (IMM, UPV) , <i>Influence of biofuels on the internal flow in diesel injector nozzles.</i>

Friday 10th

	Plenary Session (Venue: RED CUBE) <i>Chairman: D. Ginestar</i>	
9:00-9:25	S. Jerez (CIMAT, Guanajuato, Mexico) , <i>A WNS-FDTD method to simulate light scattering in flow cytometry.</i>	
9:25-	M. El-Tawil (Cairo University, Giza, Egypt) , <i>Homotopy WHEP as</i>	

9:50	<i>an efficient algorithm for solving stochastic differential equations.</i>
	Session: Mathematical Models in Medicine III (Venue: RED CUBE) <i>Chairman: B. M. Charpentier</i>
9:50 - 10:10	M. T. Signes (Univ. de Alicante) , <i>Computational framework based on Behavioural modeling: Application to the matching of ECG recordings.</i>
10:10 - 10:30	A. Iborra (IMM, UPV) , <i>Exploiting symmetries for weight matrix design in CT imaging.</i>
10:30- 10:50	L. Acedo (IMM, UPV) , <i>Analysis of the electroencephalogram as a random walk.</i>
11:00- 11:30	COFFEE BREAK
	Plenary Session (Venue: RED CUBE) <i>Chairman: D. Ginestar</i>
11:30- 11:55	F. Solis (CIMAT, Guanajuato, Mexico) , <i>Nonlinear juvenile predation population dynamics</i>
	Session: Mathematical Models in Engineering III (Venue: RED CUBE) <i>Chairman: F. Solis</i>
12:00- 12:20	F. Pedroche (IMM, UPV) , <i>Tips for a mathematical model of Facebook.</i>
12:20- 12:40	J. A. Hernández (Univ. Nacional de Colombia, Sede Medellín) , <i>A simulation-based performance study of the Multidynamics Optimization Algorithm.</i>
12:40- 13:00	F. Moreno (Universidad Nacional de Colombia, Sede Medellín) , <i>Spatial Season Queries in a Multidimensional Model.</i>
LUNCH OF THE CONFERENCE	