

RESEARCH ARTICLE | JULY 21 2017

Preface of the “2nd Symposium on Integrated Computational Tools for Advanced Manufacturing”

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AIP Conf. Proc. 1863, 520001 (2017)

<https://doi.org/10.1063/1.4992665>



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Preface of the “2nd Symposium on Integrated Computational Tools for Advanced Manufacturing”

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The 2nd Symposium on Integrated Computational Tools for Advanced Manufacturing held within the 14th International Conference of Numerical Analysis and Applied Mathematics, in Rhodes, Greece, from September 19 to 25, 2016. This symposium is a relevant forum for the scientific exchange of multidisciplinary issues related to integrated computational tools for advanced manufacturing. It contains five reviewed papers, covering important research topics, such as numerical modelling using finite element method, computer-aided engineering, manufacturing technologies and optimization using evolutionary algorithms.

Four papers related to numerical modelling using the finite element method were presented and covered four main areas: 1) structural optimization, 2) prediction of fruit damage, 3) computational fluid dynamics applied to helmet design, and 4) mould design and injection moulding process. The obtained results suggest a significant improvement regarding the state of the art.

On the first one, an important research work was developed on numerical modelling of structural mechanical behaviour. Geometric and multimaterial parameters of wind towers were optimized. A mono and multimaterial combination using steel, concrete and polymer concreted was studied through static, modal and buckling analyses. The numerical model developed allows the optimization of wind towers design, reducing the structural mass and cost involved in the construction of this kind of structures.

In the second one a nonlinear finite element model was developed to mimic accurately apple mechanical behavior whereas its nonlinear geometrical and material properties were considered. The numerical results obtained were compared with the experimental ones allowing the validation of the proposed numerical model.

The third work used a computer fluid dynamics analysis to study drag force acting upon two helmets for wheelchair racers. Using this approach personalised 3D computer models of helmets were obtained, aiming to optimize athlete's performance through the customization of 3D computer model of helmets.

The fourth is related to mould design and injection moulding process. In this work an integrated computer tool approach was developed taking into account the design, computer simulation and manufacturing processes. Biopolymer injection process was simulated predicting biopolymer injection parameters.

In the fifth reviewed paper a novel global optimization framework using evolutionary algorithms is presented. The problematic of form follows energy was studied through this framework. Optimal 3D shape as a function of the solar energy location was calculated. This procedure adds value to the sustainable architectural building.

Nuno Alves



Nuno Alves is the Director of the Centre for Rapid and Sustainable Product Development (Evaluated with Excellent) and Adjunct Professor on Computer Modelling and Simulation at the Polytechnic Institute of Leiria (PIL). He was Course Coordinator of the Mechanical Engineering Programme at the School of Technology and Management of the Polytechnic Institute of Leiria and Coordinator of the Socrates/Erasmus Programme for Mechanical Engineering at IPL. He is/was supervisor/co-supervisor of thirty MSc/MEng Students.

Nuno Alves received a first degree, a MSc and a PhD degree in Mechanical Engineering, all from IST at Technical University of Lisbon.

He has co-edited four books, authored and co-authored more than 70 papers published in books, international journals, international conferences and 3 patents.

Nuno Alves is a reviewer of the Virtual and Physical Prototyping Journal (ISSN: 1745 2759), Bioinspiration and Biomimetics Journal (ISSN 1748-3182), International Journal of Vehicle Design (ISSN 0143-3369), Assembly Automation journal (ISSN: 0144-5154) and several International Conferences. He is also a reviewer of the South African Science Foundation.

He is involved in several research projects on the fields of the Rapid Prototyping, Bio- Manufacturing, Reverse Engineering and Plastic Injection Moulds.

Nuno Alves is Co-chair of the International Conference on Sustainable Intelligent Manufacturing (SIM) and Organizing Committee Member of the International Conference on Advanced Research in Virtual and Rapid Prototyping (VRAP).

His research interests are mainly Reverse Engineering/Design, Computer Aided Design/Engineering, Virtual and Physical Prototyping, Image-based Modelling Systems, Sensorial CAD, Multidimensional (nD) Modelling, Bio-Manufacturing.

Paula Pascoal-Faria



Paula Faria is a Lecturer of the Mathematics Department at the School for Technology and Management of the Polytechnic Institute of Leiria and a Research Member of the Centre for Rapid and Sustainable Product Development (CDRSP) of the Polytechnic Institute of Leiria. Master of Science in Pure Mathematics (Numerical Analysis and Computational Mathematics) and with a PhD in Biophysics and Biomedical Engineering by the University of Lisbon. She is the Co-Head of the R&D Computational Methods Research Group at the CDRSP. Her research activity focuses mostly on numerical modulation techniques for medical application as well as for direct digital manufacturing applied to metals, polymers and ceramics, and virtual and augmented reality. She has Co-edited 2 books, authored and co-authored more than 30 papers published international journals and international conferences. She is the Member of the Editorial Board in several international peer-review journals and was received already two science awards from the international society of biomechanics and the national society of neurology. She is the chairman and co-chairman, member of the scientific and organizing committee of different international events, workshops and congresses, such as, the International Workshop on Direct Digital Manufacturing, the Health and Social Care Information – HCIST, international conference ICBEB – The International Conference on Biomedical Engineering and Biotechnology, International Conference on Tissue Engineering (ICTE), the International Conference VRAP Conference – International Conference on advanced research in virtual and physical prototyping and the International Conference on Sustainable Intelligent Manufacturing 2016. She also coordinates granted national and international research projects and participates in the scientific committee of the CDRsp Advanced Courses on Regenerative Medicine and Workshops on Direct Digital Manufacturing. Additionally, she is the supervisor of several master thesis on Biomedical and Mechanical Engineering, as well as in the master of Healthcare Information Systems Management. She is also part of the direction board of OPEN – Business Specific Opportunities which is a non-profit private institution, created in November 2002 for the promotion of innovation and employment through several different actions held in Marinha Grande, Portugal.