



IPL
cdrap - centre for rapid
and sustainable
product development
polytechnic institute
of leiria

Leiria , Portugal

October 1 to 5 . 2013

VRAP

International Conference
Advanced Research in Virtual and Rapid Prototyping

Tuesday - 01 October 2013

Auditorium 1

14:30

Opening Session

14:45

14:45

Additive Manufacturing Technologies, known also as 3D Printing, represent the next major movement in Cyber Manufacturing

15:30

Gideon Levy

15:30

Virtual Prototyping Research and applications in Hong Kong Construction Industry

16:15

Heng Li

16:15

Coffee Break

16:30

16:30

**Visit to the Centre for Rapid and Sustainable
Product Development in Marinha Grande**

17:00

17:00

Welcoming Reception

18:00

Wednesday - 02 October 2013

	Auditorium 1	Auditorium 2	Auditorium 3	Auditorium 4
08:30 09:00	Conference Registration			
09:00	New Developments for Additive Manufacturing of Metals			
09:45	Ian Harris			
09:45	The design implications of additively manufactured medical products			
10:30	Richard Bibb			
10:30 10:45	Coffee Break			
10:45	Additive and Nano Manufacturing Technologies	Materials	CAD and 3D Data Acquisition Technologies	
	Chair:	Chair:	Chair:	
	Quality assurance and process monitoring of fused deposition modelling made parts A.O. Stephen, K.W. Dalgarno & J. Munguia	Qualification and modification of new polymer powders for laser beam melting using Ulbricht spheres T. Laumer, T. Stichel, M. Sachs, P. Amend & M. Schmidt	Process chain for design, optimisation and production of open-porous lightweight structures P. Sembdner, R. Weggässer, C. Schöne & R. Stelzer	
	3D printing in graphic design education: Educational experiences using Fused Deposition Modeling (FDM) in a Brazilian university C. P. de Sampaio; R. M. de O. Spinoza; J. Vicentin; D. Y. Tsukahara; J. C. da Silva; S. L. S. Borghi & F. Rostirolla	Electro-Discharge Drilling on DMLS parts in Co-Cr-Mo alloy A. Gatto, E. Bassoli, L. Denti, E. Atzeni, L. Iuliano, G. Marchiandi, P. Minetola, A. Salmi & F. Calignano	Using AM feature and Multi-attribute decision making to orientate part in Additive Manufacturing Y. Zhang & A. Bernard	
	Development of an interchangeable head based on variable section screw applied to desktop 3-D printers M. S. Freitas, Z. C. Silveira, P. I. Neto, P. Y. Noritomi & J. V. L. Silva	Influence of post-processing operations on mechanical properties of AISI10Mg Parts by DMLS M. Krishnan, E. Atzeni, R. Canali, D. Manfredi, F. Calignano, E. Ambrosio & L. Iuliano	Non-invasive image technologies and biomimetic research applied on the design of innovative projects J.R. Lopes dos Santos	
	Surface roughness investigation and prediction models for poly-jet 3D printed parts G. S. Kumar & K. Kumar	Aluminium Matrix Composites (AMCs) by DMLS D. Manfredi, R. Canali, M. Krishnan, E. P. Ambrosio, F. Calignano, M. Pavese, L. Miranti, S. Belardinelli, S. Biamino & P. Fino	Reference 3D-tumour models from CT-data for evaluation of contouring algorithm based on the PET/CT imaging I. Jonuschies & K. Broeckel, J. Kurth & B. Krause	
	Additive manufacturing as a cost-effective way to produce metal parts E. Atzeni, L. Iuliano, G. Marchiandi, P. Minetola, A. Salmi, E. Bassoli, L. Denti & A. Gatto	Custom-Built Implants Manufacture in Titanium Alloy by Direct Metal Laser Sintering (DMLS) M. A. Larosa, A. L. Jardini, L. F. Bernardes, M. R. Wolf Maciel, R. Maciel Filho, C. A. C. Zavaglia, F. Zavaglia, D. R. Calderoni & P. Kharmandayan	BioFab Toolbox – Software tools for biofabrication N. Alves, P. Bártolo, N. Ferreira, M. Gaspar & A. Mateus	
12:45	Nanocomposites and Additive Manufacturing I. Khan, A. Mateus & G. R. Mitchell			
12:45 14:00	Lunch Break			

14:00 Evolutions of additive manufacturing: from rapid prototyping to 3D printing
14:45 Alain Bernard

14:45 Realising Sustainability through Cloud Manufacturing
15:30 Lihui Wang

15:30 Coffee Break
15:45

15:45	Simulation and Virtual Environments	Biomanufacturing	Rapid Tooling and Manufacturing	Applications
Chair:	Chair:	Chair:	Chair:	Chair:
Additive Manufacturing and Topology Optimization to Support Product Family Design N. Lei, S. K. Moon & G. Bi	Rapid manufacturing of collagen scaffolds for cardiac tissue engineering K. Ragaert, S. Van de Velde, L. Cardon, F. De Somer, G. Van Nooten & P. Somers	Ressource-efficient hot sheet metal forming by innovative die cooling with laser beam melted tooling components B. Mueller, M. Gebauer, S. Polster, R. Neugebauer, R. Malek, M. Kotzian & R. Hund	A thermo-mechanical modeling reduction approach for calculating shape distortion in SLM manufacturing for aero engine components L. Papadakis & A. Loizou, J. Risse & S. Bremen	
On a Three-Dimensional Lattice Boltzmann Model of Droplet Impingement for Ink-Jet Deposition W. Zhou, D. Loney, A. G. Fedorov, F. L. Degertekin & D. W. Rosen	Ceramics-filled 3D porous biopolymer matrices for tissue-engineering on the stem cell culture: Benchmark Testing I. V. Shishkovsky & S. E. Volchkov	Digital fabrication of physical models to analyze unbuilt projects using laser cutter A. Tagliari & W. Florio	Evaluation of Shaped Metal Deposition (SMD) for applications in the energy industry U. Woy, S. Jones, R. Gault, K. Ridgway & R. McCluskey	
Heat transfer modeling in fused deposition techniques F. M. Duarte, S. F. Costa & J. A. Covas	Using biofidelic phantom organs for design stage usability testing of endovascular delivery systems K. J. O'Sullivan, L. Kiernan, L. O'Sullivan & E. Canavan	Use of external facilitator to choose optimal Rapid Tooling method – A case study A. Håkansson & J. Lundberg	Additive manufacturing of architectural models using Fused Layer Modeling and 3D-Printing S. Junk & S. Côté	
Structural and modal analysis of a desktop 3-D printer considering an interchangeable mini screw extrusion head G. dos. S. Ribeiro & Z. C. Silveira	Overview on Additive Manufacturing Techniques for Scaffold-Based Cartilage Tissue Engineering A. R. C. Santos, H. A. Almeida & P. J. Bartolo	Tool Concept for Prepreg Fabric Overmould P. Carreira, N. Alves, C. Ramos & P. Bártolo	Evaluation of FDM options for fashion shoe heels manufacturing A. Armillotta, M. Cavallaro & S. Minnella	
Danish Innovation Consortium "F-MAT" J. Byskov-Nielsen & O. Jay	Bovine collagen extraction for tissue engineering applications I. Sousa, A. Mendes, P. J. Bártolo & D.Vaz	A Review Paper on Rapid Prototyping and Rapid Tooling Techniques for Fabrication of Prosthetic Socket A. Aherwar, A. Singh & A. Patnaik	Shape analysis in the design process of products with embedded microelectronics Á. M. Sampaio, R. Simões & A. Pontes	
	A multi-physic approach to the design of 3D rapid prototyped scaffolds for tissue repair and regeneration in orthopaedic trauma U. D'Amora, A. Gloria, T. Russo, R. De Santis & L. Ambrosio		Virtual/real, rapid/slow, prototype/model in jewellery artist practice H. Dilkes	

20:00 **Welcoming Reception at Leiria's Castle**



Thursday - 03 October 2013

	Auditorium 1	Auditorium 2	Auditorium 3	Auditorium 4
08:30 09:00	Conference Registration			
09:00 09:45	3D Multi-scale Geometric Modeling and FE Analysis of porous structures for design of scaffold porous structures Anath Fisher			
09:45 10:30	Additive technologies: a roadmap towards manufacturing Tom Craeghs			
10:30 10:45	Coffee Break			
10:45	Additive and Nano Manufacturing Technologies Chair:	Materials Chair:	CAD and 3D Data Acquisition Technologies Chair:	
	Price benchmark of laser sintering service providers M. Baldinger & A. Duchi	Single track and single layer melting of silica by Selective Laser Melting C. Y. Yap, C. K. Chua, Z. Dong, Z. H. Liu & D. Q. Zhang	Rise of the machines: Has rapid prototyping evolved faster than the software used to create it? E. Curtis, K. J. O'Sullivan, E. White & A. de Eyto	
	Generic build time estimation model for parts produced by SLS Y. Zhang & A. Bernard	Preparation and Flowability Characterization of Ceramic Powders for Selective Laser Melting M. Mapar, D. Q. Zhang, Z. H. Liu, W. Y. Yeong, C. K. Chua, B. Y. Tay, O. Geramifard, S. Maleksaeedi & F. E. Wiria	Open-source STL Library and Application for Android Mobile Devices W. T. Ide, J. V. L. Silva & G. C. S. Ruppert	
	Size, Shape and Flow of powders for use in Selective Laser Sintering SLS S. Berretta, O. Ghita, K. E. Evans, A. Anderson & C. Newman	Study of the surface quality in multi track to Selective Laser Melting with CoCrMo powders Y. Pupo, L. Serenó, J. Delgado & J. Ciurana	Automatic cutting edge detection for a cylindrical mill G. Moroni & S. Petrò	
	Experimental and Numerical Modelling of Function-Graded Porous Filter Elements, Synthesized by the SLS Method I. V. Shishkovsky & I. Volyansky	Melt Characterisation of M2 High Speed Steel in Selective Laser Melting Z. H. Liu, D. Q. Zhang, K. F. Leong & C. K. Chua	A planar fractal analysis of the arterial tree of the human thyroid gland: implications for additive manufacturing of 3D ramified scaffolds E. Bassoli, L. Denti, A. Gatto, G. Spaletta, M. Sofroniou, A. Parrilli, M. Fini, R. Giardino, A. Zamparelli, N. Zini, F. Barbaro, E. Bassi, S. Mosca, D. Dallatana & R. Toni	
	Flowability of Powders for Selective Laser Sintering (SLS) investigated by Round Robin Test M. Schmid & F. Amado, G. Levy & K. Wegener	Investigation on forming process of copper alloys via Selective Laser Melting D. Q. Zhang, Z. H. Liu & C. K. Chua	Nano CAD design of scaffolds based on triple periodic surfaces H. A. Almeida & P. J. Bártolo	
12:45	Additive manufacturing in the spare parts supply chain: A case study in aerospace industry S. Khajavi, J. Holmström & J. Partanen	Thermal analysis of polystyrene coated alumina powder for indirect Laser Sintering during different process steps L. Delva, A. Verberckmoes, K. Ragaert & L. Cardon		
12:45 14:00	Lunch Break			

14:00 Combining additive and subtractive laser manufacturing: selective laser melting, ablation and remelting
Jean-Pierre Kruth

14:45 The industrialization of Additive Manufacturing
Olivier Jay

15:30 Digitizing and prototyping for Cultural Heritage
Juan Carlos Torres

16:15 Coffee Break
16:30

16:30	Simulation and Virtual Environments	Biomanufacturing	Rapid Tooling and Manufacturing	Tooling Edge - Workshop
Chair:		Chair:	Chair:	Chair:
Teaching of additive manufacturing technology – A case study in the use of multimedia learning aids C. H. Ng, C. K. Chua & K. F. Leong	Investigation of Applying Electrospinning in Fused Deposition Modeling for Scaffold Fabrication K. Auyson, P. Koomsap, A. Chanthakulchan & P. Supaphol	Rapid Prototyping and Tooling technologies to produce moulding elements of injection moulds for large parts A. Freitas, R. Soares, A. Selada, P. G. Martinho & A. S. Pouzada	Materials, Technology and Product Integration A. Pontes	
Integrating shop-floor virtual environments with real machining cell data H. M. C. Vale, C. Oliveira & A. J. V. Porto	Chitosan microlayer on the photografting modified surface of PLA, PCL and PLA/PCL bioextruder scaffolds M. Loaiza, R. A. Rezende, J. V. L. da Silva, P. J. Bártolo & M. A. Sabino	Controlling Real Time Processing Variables in a Hybrid Injection Mould D. Bjorn, L. Ferreira, C. Ribeiro & P. G. Martinho	Customized Permanent Implants J. Lino	
The Disclosure of the BIM Concept in Civil Engineering Training A. Z. Sampaio	Adhesion, proliferation and distribution of human mesenchymal stem/stromal cells (MSCs) in Poly(?-caprolactone) (PCL) scaffolds with different pore sizes C. S. Moura, S. Biscaia, T. Viana, P. J. Bártolo, C. L. da Silva, J. S. Cabral & F. C. Ferreira	Development of bioabsorbable PCL/ibuprofen mesh for maxillofacial repair using prototype injection mold G. V. Salmoria, V. G. Henschel, L. F. Vieira, C. R. M. Roesler, F. Sibilia, S. Fare & M. C. Tanzi	Comparative Study of Costs of Powder Steel Micro Manufacturing Techniques in a Life-Cycle Perspective E. Henriques	
Maintenance of Painted Interior Walls within a Virtual Environment A. Z. Sampaio & D. P. Rosário	Biofabrication of three-dimensional scaffolds of polycaprolactone with eggshell powder for bone regeneration S. Biscaia, T. Viana, H. A. Almeida & P. J. Bártolo	Design, Manufacture and Testing of Titanium EBM Insert for Injection Molding A. K. Borg & A. Rochman	CDRSP	
H.O.G.A.R. Project – a tool for efficient house design plus an immersive user experience R. Rubio, S. Martin, S. Martin-Laguna & J. C. Fernández	Effect of TCP20 Bioglass addition on the morphological and mechanical properties of 3D Bioextruded poly (ε-caprolactone) scaffolds A. C. Videira, T. Patrício, R. Pereira, J. M. F. Ferreira & P. Bártolo	Rapid tooling for individualized silicon aesthetic prosthesis manufacturing: A case study G. P. Marena, A. Fiorentino, E. Ceretti & A. Manenti		
	Mechanical requirements of biomaterials: approach to some characterization techniques applied to scaffolds, their constitutive materials, aspects of comparison or interaction with live tissues J. Laudinet			

18:30
19:00 **Musical Event**



Friday - 04 October 2013

	Auditorium 1	Auditorium 2	Auditorium 3
08:30 09:00	Conference Registration		
09:00 09:45	Materials Issues in Additive Manufacturing Dave Bourell		
09:45 10:30	Sustainable Global Manufacturing Jun Ni		
10:30 10:45	Coffee Break		
10:45	Additive and Nano Manufacturing Technologies Chair:	Materials Chair:	CAD and 3D Data Acquisition Technologies Chair:
	Production of overhanging structures by DMLS F. Callignano & D. Manfredi	Processing of nickel based superalloy MAR M-247 by means of High – Temperature Selective Laser Melting (HT – SLM) Y. C. Hagedorn, J. Risse, W. Meiners, N. Pirch, K. Wissenbach & R. Poprawe	Architecture and parametric design: a prototype for a kiosk L. Mateus, F. Roseta & F. Vaz-Monteiro
	State-of-the-Art Review on Selective Laser Melting of Ceramics W. Y. Yeong, C. Y. Yap, M. Mapar & C. K. Chua	Selective laser melting towards manufacture of three dimensional in situ Al matrix composites: a review S. Dadbakhsh, L. Hao & J. P. Kruth	A tool for computer-aided orientation selection in additive manufacturing processes A. Armillotta, M. Cavallaro & S. Minnella
	Review of Selective Laser Melting Process Parameters for Commercially Pure Titanium and Ti6Al4V K. H. Low, K. F. Leong & C. N. Sun	The effect of SLM parameters on geometrical characteristics of open porous NiTi scaffolds M. Speirs, S. Dadbakhsh, S. Buls, J. P. Kruth, J. Van Humbeeck, J. Schrooten & J. Luyten	A design methodology for parts using additive manufacturing N. Boyard, M. Rivette, O. Christmann & S. Richir
	Classical Lamination Theory applied on parts produced by Selective Laser Melting S. L. Sing, W. Y. Yeong, C. K. Chua, F. E. Wiria, Z. H. Liu, D. Q. Zhang & B. Y. Tay	Phase Change Materials as a tool for Climate Change Mitigation A. P. Vieira, H. Bartolo, G. R. Mitchell & P. Bartolo	Models for Product Design and Development in Additive Manufacturing S. Killi & A. Morrison
	Effect of laser beam profile on melt track in Selective Laser Melting L. E. Loh, Z. H. Liu, D. Q. Zhang W. Y. Yeong & C. K. Chua	Structure Development during Additive Manufacturing A. Tojeira, S. Biscaia, T. Viana, P. J. Bártolo & G. R. Mitchell	Reducing repositioning distances in fused deposition-based processes using optimization algorithms L. C. Galvão, A. O. Barboza, P. F. Benevides & L. F. Nunes, N. Volpato & R. T. Nakashima
12:45 12:45 14:00	Lunch Break		
14:00 14:45	Frontiers in Additive Manufacturing: Printing Multi-Functionality Ryan Wicker		
14:45 15:30	Building Information Modelling and collaborative working: The theory of everything in Construction Farzad Khosrowshahi		
15:30 15:45	Coffee Break		
15:45	Simulation and Virtual Environments Chair:	Biomanufacturing Chair:	Applications Chair:
	Human cranium biomechanical simulation P. Perestrelo & P. Bártolo, M. P. Torres, P. Noritomi & J. Silva	Designing apatite/wollastonite (A/W) porous scaffolds by powder-based 3D printing C. M. Gomes, A. Zocca, J. Guenster, L. Podshivalov, P. Bar-Yoseph & A. Fischer	Printing intervertebral implants with a low-cost Additive Manufacturing machine L. Serenó, L. Ramon & J. Cjurana
	Development of an Ontology-based Knowledge Methodology in Product Innovative Collaborative Conceptual Design Environment S. J. Liang	Preparation of PDLLA/Bioglass58S scaffolds by selective laser sintering G. V. Salmoria, R. V. Pereira, A. Aragones & M. C. Fredel	Challenges in design and production of customized tracheal stents A. Fiorentino, G. P. Marenda & E. Ceretti, C. Piazza & N. Hendrichs
	Micro-CT based topological optimisation scheme for the design of scaffolds H. A. Almeida & P. J. Bártolo	Determination of Resin Components for continuous Digital Light Processing (cDLP) Additive Manufacture of Resorbable Tissue Engineering Scaffolds D. Dean, E. Mott, X. Luo, M. Busso, M. Wang, C. Vorwald, A. Siblani & J. P. Fisher	Lumbar Cage Design Concepts Based on Additive Manufacturing O. Figueroa, C. A. Rodríguez, H. R. Siller, O. Martínez-Romero, E. Flores-Villaalba, J.A. Díaz-Elizondo & R. Ramirez
	Computer simulation of stereolithographic process parameters S. Campanário, P. J. Bártolo & A. C. Lemos	Vat polymerization techniques for biotechnology and medicine T. F. Patrício, R. F. Pereira, A. Cerva & P. J. Bártolo	Forensic 3D Facial Approximation From a CT Scan Video of a Mummified Egyptian-Roman Child C. A. da Costa Moraes, P. H. J. Amorim, T. F. de Moraes, G. C. S. Ruppert, J. V. L. da Silva & M. E. Santos
	Take Cover: Case study in artisan telephone covers for DDM W. Kempton & S. Killi	Levodopa controlled release from alginate membranes M. R. Franco, S. Biscaia, T. Viana & P. Bártolo	Maskless production of metallic coil structures for an application in MRI N. Wang, P. Bollgrün, K. Steffen, D. Mager & J. G. Korvink
18:00 20:00	Virtual and Physical Prototyping for Compression Sportswear P. K. Collins, M. D. Johnson & D. W. Hurst		
	Gala Dinner at Quinta do Fidalgo		



Saturday - 05 October 2013

	Auditorium 1	Auditorium 2	Auditorium 3
08:30 09:00	Conference Registration		
09:00 09:45	Enthusing students: The role of 3D Printing within a Design-Centric Programme Ian Gibson		
09:45 10:30	Prototype Casting Karuna Karunakaran		
10:30 11:15	New Frontiers in Musculoskeletal Regenerative Medicine: Biomaterials, Additive Manufacturing and Stem Cell Biology Tim Woodfield		
11:15 11:30	Coffee Break		
11:30	Additive and Nano Manufacturing Technologies Chair:	Materials Chair:	CAD and 3D Data Acquisition Technologies Chair:
	Implementing Additive Manufacturing for Medical Devices: A Quality Perspective W. Y. Yeong & C. K. Chua	Nanocomposite polycaprolactone/Carbon Nanotube processed by electrospinning applying of AC R. S. Almeida, M. A. d'Ávila, D. S. T. Martinez & O. L. Alves	Hand-held 3D scanner without sensor pose tracking or surface markers J. Kofman & K. Borribanbunpotkat
	Direct Writing of Conductive Polymer tracks as part of an additive manufacturing process G. R. Mitchell & F. J. Davis	Oxidative Treatment of Carbon Nanotubes by Hydrogen Peroxide and O2 Plasma for Rapid Manufacturing Applications G. V. Salmoria, I. Michelena, G. M. O. Barra, L. F. Vieira & R. A. Paggi	Calibration of a hand-held multi-line laser-camera 3D scanner K. Borribanbunpotkat & J. Kofman
	Fundamental Issues for Additive Manufacturing of Lithophanes M. Yuan & D. L. Bourell	Influence of the Monomers Feed Ratio on the Polyurethane Reaction in RIM N. Gomes, J. Salmazo, P. Bártolo, A. Gouveia, R. J. Santos, M. M. Dias & J. C. B. Lopes	Error compensated camera-projector calibration in shape measurement D. Li & J. Kofman
	Investigation of process condition for constructing plaster of paris part with selective vacuum manufacturing P. Senanan, N. Chansri & P. Koomsap	Photopolymerization kinetics of 2-Hydroxyethyl Methacrylate (pHEMA) hydrogels, effect of different crosslinked agent. L. L. Lima, C. A. C. Zavaglia, V. P. Bavaresco, E. Pinto, P. J. S. Bártolo & J. M. R. Gomes	Interaction in an immersive multi-projection system based on light wand like devices C. Oliveira, H. M. C. Vale & A. J. V. Porto
	Materials characterization for stereolithography P. Camaño & P. J. Bártolo	Synthesis of New Biobased Unsaturated Polyesters for Advanced Processing F.A.M.M. Gonçalves, C.S.M.F. Costa, I.G.P. Fabela, P.N. Simões, D. Farinha, H. Faneca, A.C. Serra, P.J. Bártolo & J.F.J. Coelho	Innovative developments on Agile-CAD system M. Gaspar, N. Alves, N. Martins-Ferreira & P. Bártolo
13:30			
13:30 14:00	Closing Ceremony		