Invited Keynote Speakers

1. Dragos AXINTE, Professor, The University of Nottingham, UK

New models for time-dependent processes enable accurate generation of freeforms

2. Shongua LI, Professor, Shenyang Jianzhu University, China

Design, Fabrication and Service of All-Ceramic Ball Bearings for Extreme Conditions Applications

3. Felician CAMPEAN, Professor, University of Bradford, UK

Reliability with Big Data: Towards Intelligent Personalised Systems Healthcare

4. Panagiotis KYRATSIS, Assoc. Prof., University of Western Macedonia, Greece

Computational design and applications

Professor Dragos AXINTE, The University of Nottingham, UK

Dragos Axinte is Professor and Chair of Manufacturing Engineering at University of Nottingham UK as well as Li Dak Sum Chair Professor at University of Nottingham Ningbo. Graduated at University of Galati, Romania, after working in industrial research for nearly eight years, he held two personal NATO Research Fellowships in Italy and Denmark and then moved to UK to carry out research with University of Birmingham and later with University of Nottingham. He was appointed Lecturer in Manufacturing Engineering (2005) and successively promoted to Associate Professor (2007), Reader (2010) and Professor (2011). Since 2009 Dragos is Director of The Rolls-Royce UTC in Manufacturing and On-Wing Technology at University of Nottingham. He is Fellow of International Academy of Production Engineering (FCIRP) and Editor-in-Chief of the International Journal of Machine Tools and Manufacture. Dragos has over 150 in top journal papers and over 20 granted international patents field with industry partners.

Dragos research interest is in the main following areas: Innovative Manufacturing Processes, Advanced Machining and Finishing Technologies, Abrasive Waterjet Machining, Monitoring and Optimisation of Manufacturing Processes, Design and Construction of Miniature Machine Tolls, Design of Innovative Robotics for Aerospace Manufacture and In-Situ Repairs in Hazardous Environments, Workpiece Surface Integrity Analysis and Applied Tribology.

New models for time-dependent processes enable accurate generation of freeforms

Abstract: We demonstrate that, despite differences in their nature, many energy beam controlled-depth machining processes (e.g. waterjet, pulsed laser, focused ion beam) can be modelled using the same mathematical framework – a partial differential evolution equation that requires only simple calibrations to capture the physics of each process. The inverse problem can be solved efficiently through numerical solution of the adjoint problem and leads to beam paths that generate prescribed three-dimensional features with minimal error. The viability of this modelling approach has been demonstrated by generating accurate freeform surfaces using three processes that operate at very different length scales and with different physical principles for material removal: waterjet, pulsed laser and focused ion beam machining. Our approach can be used to explore inverse problems for a wide range of time-dependent processes to enable a step change in generation accurate surfaces with tailored properties.

Professor Songhua Li, Shenyang Jianzhu University, China

Dr. Songhua Li is the professor in School of Mechanical Engineering, director of Engineering Training Center (ETC) and the Key Laboratory of Intelligent Engineering Equipment of Liaoning province, Shenyang Jianzhu University. Dr. Li is also the deputy director of the International Cooperation Joint Laboratory of Modern Construction Engineering Equipment and Technology and National-Local Joint Engineering Laboratory of High-Grade Stone NC Machining Equipment and Technology. He obtained Bachelor degree and Master degree from Shenyang Jianzhu University in 2000 and 2003, and Ph.D. degree from Dalian University of Technology in 2012. He has been awarded the title of "Young and Middle-Aged Experts with Outstanding Contributions" and "Experts on Special Allowances" of the Government of the State Council. Currently, he is the chairmen of Academic Committee of School of Mechanical Engineering and Academic Ethics Subcommittee of Academic Committee of Shenyang Jianzhu University, and senior member of Chinese Machinery Engineering Society (CMES). Since 2000, he has long been engaged in the research of Advanced Manufacturing Technology and Equipment. Currently, his research interests mainly focus on Ceramic Bearings and Ceramic Motorized Spindle. More than 30 state-level projects have been finished. More than 10 scientific technological achievements have been awarded by national and local governments, which include the Second Prize of National Science and Technology Progress Award "High Precision Hot Pressed Silicon Nitride Ceramic Ball Bearings" and Second Prize of National Technology Invention Award "High-Speed CNC Machine Tool Ceramic Motorized Spindle Unit", and so on. Up to now, he has obtained 30 authorized Chinese patents, published 2 books and over 100 research papers for international journals and academic conferences.

Design, Fabrication and Service of All-Ceramic Ball Bearings for Extreme Conditions Applications

Abstract: The structural ceramics such as hot isostatically pressed silicon nitride (HIPed Si_3N_4 or HIPSN) or zirconia (ZrO_2) has the properties of small specific gravity, high strength, high rigidity, good wear resistance, corrosion resistance, extreme temperature resistance, electrical insulation, non-magnetic permeability, excellent dimensional stability, self-lubricating properties which are not available in metal materials. It is one of the ideal alternative materials for the manufacturing of bearings applied to various extreme conditions. The paper reviews some of the extensive research in the field of ceramic ball bearings that has been carried out over the past decade or so. As a result of this work high precision all-ceramic ball bearings have been designed and fabricated with Si_3N_4 balls and ZrO_2 races and, also, with both races and the balls made from Si_3N_4. These bearings were used to improve the system limit speed and load capacity over an all-steel bearing design in very high-speed applications such as machine tool spindles and gas turbine engines; to eliminate corrosion and to decrease friction for extreme temperature or corrosive conditions, thus improving system performance. Investigations have shown the particular benefits of using all-ceramic bearings in severe lubrication and wear conditions such as extreme temperature, large temperature differential, high speed, ultra-high vacuum and in safety-critical applications where, for example, they can respond to the requirements of short periods of oil-off operation in an aircraft engine. Other benefits which have been demonstrated are corrosion resistance and tolerance of contaminated lubricants. As a result of the sustained development and testing it is expected that all-ceramic bearings will continue to achieve wide acceptance in all types of applications.

Professor Felician Campean, University of Bradford, UK

Felician is Professor of Automotive Reliability Engineering at the University of Bradford, UK. He holds a PhD in Reliability from Brunel University (1998) and a Manufacturing Engineering Degree from Transilvania University Brasov (1990). Has worked in the bearings industry before joining Academia as a lecturer in manufacturing automation. Joined University of Bradford in 1998 as a Research Fellow, and progressed to Senior Research Fellow (2000), Senior Lecturer in Competitive Design (2005), and Professor in 2011. He is the Associate Dean – Research and Knowledge Transfer in the Faculty of Engineering and Informatics (since 2017). As well as leading the Automotive Research Centre as Director (since 2012), Felician has led several important programmes of collaboration with industry – the Ford Engineering Quality Improvement Programme (2000-2010), the Jaguar Land Rover Engineering and Process Excellence Programme (2011-2020), and has co-founded in 2016 the Advanced Automotive Analytics laboratory in collaboration with JLR. Over the years, he has established an extensive track record of research and knowledge transfer collaboration with industry, including companies like Ford, JLR, Renault, PSA, Valeo, Honda, Tata, BAE Systems, Airbus, who have funded or co-funded much of his research.

Felician's current research interests revolve around the modelling of complex systems to improve reliability, robustness and resilience. This includes development of systems modelling methods and methodologies for risk and failure mode avoidance early in Product Development, multi-physics modelling and multi-disciplinary design optimisation for complex systems, and knowledge-enabled machine learning for systems healthcare and resilience.

Reliability with Big Data: Towards Intelligent Personalised Systems Healthcare

Abstract: We are witnessing remarkable transformations across the industries driven by digital technologies advancements and proliferation across the systems scales and boundaries. Technologies to support increased levels of autonomy as well as user centric service innovation are already commonplace in systems architectures. While technology development has been the prime focus of research and innovation effort, we have seen only limited advances on methodologies and methods to meaningfully address the reliability and resilience challenges emerging with increasingly complex systems and environments; yet the trade-off between trust and availability has become the stumbling block for the mass adoption of autonomous systems.

Underpinned by a contemporary view of automotive systems as cyber-physical systems, this talk reflects on the challenges with prognostics and health management and the opportunities afforded by the data rich systems lifecycle environment. The vision of the Automotive Healthcare Analytics Factory is discussed, in which heterogeneous data from across the product lifecycle is leveraged to deliver contextual, actionable insight for personalised healthcare of vehicle systems. The argument is made that the combination of model based engineering analysis of systems with data-driven machine learning (i.e. knowledge-enabled machine learning) set in a reliability modelling framework, provides an effective workflow for deriving smart systems healthcare solutions. Several examples developed through collaborative research with industry are used to illustrate the approach.

Dr. Panagiotis Kyratsis, University of Western Macedonia, Greece

Dr Panagiotis Kyratsis (www.kyratsis.com) is Associate Professor in the Department of Product and Systems Design Engineering, University of Western Macedonia, Greece. He is the Director of the Research Institute of Traditional Architecture and Cultural Heritage, University Research Center "TEMENUS" (urc.uowm.gr) and the Director of the Computational Design and Digital Fabrication Lab (codeplus.uowm.gr). Dr Panagiotis Kyratsis received his PhD in the area of CAD-based manufacturing process simulations from the Department of Production Engineering and Management, Technical University of Crete, Greece. He holds a diploma in Mechanical Engineering from the Aristotle's University of Thessaloniki - Greece, and he received his M.Sc. in Automotive Product Engineering and M.Sc. in CAD/CAM from Cranfield University - UK, in 1997 and 1999 respectively. He has been involved in a number of industrial projects and he has a great deal of expertise in both the design and the manufacturing aspects of product development. His main research interests include manufacturing, machining, CAD/CAM/CAE systems, product design, reverse engineering and prototyping. He has published 18 books and more than 110 papers in Scientific Journals and International Conferences. He acts as member of the editorial board and reviewer to numerous scientific journals and holds 12 industrial designs and one patent registered within the Greek Patent Office.

COMPUTATIONAL DESIGN AND APPLICATIONS

Abstract: The present keynote presentation contributes towards the use of different CAD systems based on their programming capabilities for product design. This includes programming languages based on the API of commercially available CAD systems and using graphical algorithm editors for unusual and innovative 3D geometries. The novelty of the proposed approach will be discussed using a number of case studies in a variety of research and application areas. Design engineers that decide to implement this way of work, can drastically increase their efficiency and implement their ideas in an extremely effective way.