Preface

It is a great pleasure to welcome you to the 27th International Conference on CADCAM, Robotics and Factories of the Future, sponsored by the International Society for Productivity Enhancement, Middlesex University, Festo Limited GB, National Instruments UK & Ireland, the Sector Skills Council for Science, Engineering and Manufacturing Technologies and our proceedings publisher Institute of Physics Publications.

This is the second time Middlesex University has played host to this longstanding international conference, last time being the 12th edition in 1996. The subject content of the conference remains current, focusing on cutting edge developments in research. The conference themes this year are divided into seven themes, Product Development and Sustainability, Modelling and Simulation, Automation, Robotics and Handling Systems, Advanced Quality Systems Tools and Quality Management, Human Aspects in Engineering Activities, Emerging Scenarios in Engineering Education and Training, and Emerging Technologies in Factories of the Future. The conference is organised into seven sessions running in parallel over three days, providing a platform to speakers from 16 different countries. The programme also features four eminent keynote speakers and a hands-on workshop organised by National Instruments.

Organising an event such as this would not be possible without the help of many colleagues. I am grateful to the members of the Organising Committee, the International Scientific Committee, our sponsors and all those colleagues who helped in the review of many abstracts and consequently full papers. This required meticulous attention to detail and strict adherence to very tight deadlines. However large or small a conference is, the effort required to make the local arrangements work for all is not insignificant. The conference organisers acknowledge the particular efforts of Miss Mita Vaghi in providing her expertise in event management and her diligent support and Anete Ashton of IoP Publications for her guidance and help in producing the conference proceedings and online listing. The organisers also recognise the support provided by our sponsors and in particular to Richard Roberts and David Baker from National Instruments, Babak Jahanbani and Phil Holmes from Festo Ltd. Their continued support over the course of the planning period and also during the event itself is very much appreciated.

We are also indebted to all the contributors to the conference, particularly the researchers, and practitioners.

Professor Mehmet Karamanoglu
Conference Chair
Our sponsors

We are grateful for the generosity of our sponsors:

Middlesex University, London

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On Knowledge-based Enterprising Strategy for Lean Product Development

Keynote Summary:
Today, more advanced and rich PLM technologies exist to capture valuable product development processes, gather the right knowledge required for the process, sort through all those processes to determine the right process/knowledge to employ, make the right decisions for engineering the product, lay the right product design details, perform a right set of (appropriate) analyses, develop right sizing algorithms, and perform right checks to validate results, etc. If all of these ‘right’ process knowledge be embedded into a framework of dynamic and reconfigurable Product models (called SMART PRODUCT CONFIGURATOR), supported by a set of reconfigurable dynamic SmartPart templates (in each categories say Specs, Sizing and Geometry), one could achieve remarkable results. Companies could be able to engineer-to-order most products in half the time or in one third of the time, what it takes today. The group of experts in each domain could become the knowledge-keeper for those domain templates. Today, indeed, several leading edge aerospace and automotive companies are moving toward supporting this vision. Today, reusable (and plug and play) knowledge templates are being defined upfront, based either on standardized rules and constraints, or on a standardized components library that adapts to the particulars of a product family, or project, with minimum efforts. This talk will discuss the process used for building those Product Configurators. You will also hear how engineers could use them for ‘engineering-to-order’ new ‘production-ready’ products – never done before.

About Keynote Speaker:
Brian Prasad is an award-winning, internationally recognized thought leader in the area of knowledge capture & reuse, knowledge management (KM), knowledge-based engineering (KBE) and KM architecture. As a practicing KBE manager, consultant, author and researcher, he has been actively performing and studying these areas for more than twenty-five years. His latest book is titled Concurrent Engineering Fundamentals – 2 volume set. He has held leadership positions with the NASA Langley, UCI, Caltech, Unigraphics Solutions, Ford Motor, EDS, General Motors. He has consulted with more than 50 organizations in US and abroad.

Dr Prasad’s achievements have resulted in recognition as a Fellow of ASME and bibliographic entries in Who’s Who of Aerospace, Who’s Who in Science and Engineering, and other COE recognitions and OCEC distinguished engineering Merit Award. His entertaining but clear and concise insights make him a sought after speaker, lecturer and consultant. He is the founding Editor-in-Chief of Concurrent Engineering – An International Journal (published by SAGE publishing since 1991: http://cer.sagepub.com/ ).
What is Visual Analytics and how different disciplines make use of it?

About Keynote Speaker:
Dr B L William Wong is Professor of Human-Computer Interaction and Head, Interaction Design Centre, at Middlesex University’s School of Science and Technology, London, UK. Prior to academia, Professor Wong worked in the Republic of Singapore Air Force. In his last appointment he was Head, Systems and Communications Operations Branch, HQ RSAF.

His research interest is in the representation design of information to support decision making in naturalistic environments, from a Cognitive Work Analysis perspective. His research includes air traffic control, hydro-electricity dispatch control, emergency ambulance command and control, intelligence analysis, and visual analytics, emphasising information uptake, decision making and situation awareness in real-time dynamic environments.

He is a recipient of over US$25.3 million in grants, and project coordinator for several US-UK and European Union multi-institution R&D project consortiums. Together with his students and colleagues, he has published over 100 scientific peer reviewed articles. He currently leads an 18-organisation UK–Europe–US R&D consortium funded by the European Commission FP7 Project VALCRI, Visual Analytics for Sense-making in Criminal Intelligence Analysis.
**Dr Nina Gaissert**  
Corporate Bionic Research  
Festo AG & Co. KG  
Germany  
www.festo.com/bionics

The Bionic Learning Network of Festo – Production of the future inspired by nature

**Keynote summary:**
Whether it’s energy efficiency or light-weight construction, function integration or the ability to learn and to communicate, throughout evolution, nature has developed a wealth of optimisation strategies for adapting to its environment, and these strategies can be applied to the world of engineering. That is why Festo set up the Bionic Learning Network in 2006, a research network linking Festo to well-known universities, institutes, development companies and private inventors. Within this network the engineers, designers and researchers are aiming to learn from nature’s vast resources of intelligent solutions to provide fresh impulses for technology and industrial applications. Since then more than 40 projects have been perfected. Here we present the most stunning like the AquaJellies, the Bionic Kangaroo or the Bionic Handling Assistant. We will explain what we learned from swarms of jellyfish, kangaroos or elephants about human-machine-interaction and machine-machine-communication and how this knowledge will shape the production of the future.

**About Keynote Speaker:**
Nina Gaissert is responsible for corporate bionic research at Festo. The Bionic Learning Network of Festo is a cooperation between renowned universities, research institutes, technology companies and Festo itself, a leading world-wide supplier of automation technology and the performance leader in industrial training and education programs.

Within the Bionic Learning Network the engineers, designers and researchers are aiming to get inspired by nature and to learn from nature’s vast resources of intelligent solutions to provide fresh impulses for technology and industrial applications. Within this network Nina Gaissert is responsible for corporate bionic research, i.e. providing the biological background for ongoing and future projects and accompanying the projects scientifically.

Prior to joining Festo in 2011 Nina Gaissert studied technical Biology at the University of Stuttgart and the MIT, MA, USA. In 2011 she obtained a PhD of Natural Sciences from the Max Planck Institute for Biological Cybernetics, studying the neural integration of the visual and the haptic senses.
From Industrialization to Re-industrialization and Factory of the Future

Keynote Summary:
Characteristics of the transformation process from traditional societies into industrial, results of urbanization. The impact of industrialization on the environment. Industrialization, its causes and effects: reallocations, outside-resource-using, service society. Information based society. Neo–industrialization based on intelligent networking, circular economy, shared value and promoting competitiveness and sustainable development. Factory of the future: today dream and future new visions. New manufacturing concepts, advanced materials, communication system, human aspects in engineering activities. Whether the industry is needed?

About Keynote Speaker:
Professor dr hab. inz. Janusz Szpytko, AGH University of Science and Technology, Poland. Professor, educator, researcher, manager in education and research. Type of sector: university, R&D and education, mechanical engineering, automation and metrology, transportation and logistics, automation and robotics, manufacturing, quality and control, sensing and diagnostics/decision making, mechatronics. Specialty in Science and Technology: transport systems and devices, safety and reliability, automation and robotics, engineering logistics. Industrial replacements and training in: Poland, Sweden, Germany; professional training and visiting professor: UK, Italy, France, Greece, Germany, Norway, Laos, and others.

Author or co-author of app. 500 publications in science and education, promoter more than 140 students on B.Sc., M.Sc., Ph.D. levels. Member of STSTKT PAN, IFAC, PTD, ISPE, PTB, PSRA, ISA, SITPH, SEFI and others. Co-coordinator and member of several R&D projects both on national and internationals level. President of the SITPH, and member of management boards of various organizations national and international. Organiser and member of several professional scientific and programme committees of international and national conferences and symposiums, member of editorial boards projects and both more than few hundred scientific papers and project reviewer, editor of scientific journals; biographical are published also in: Who is who in America, Who is Who in in Science and Engineering and others.

Professor Szpytko was the organiser of the 21st International Conference on CAD/CAM, Robotics and Factories of the Future, 17–20 July, 2005, Krakow, Poland.
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