

ROBOTS IN SOCIETY: CURRENT ROBOTICS Welcome! Today's event will explore the growing role of robotics in different services and sectors, and everyday life.

## **REGISTRATION AND COFFEE**



### **10:00 - WELCOME AND OVERVIEW**

#### **PROF BRYAN BRIDGE, TWI & CLAWAR**

Professor Bryan Bridge BSc DSc FInstNDT CEng FIET CPhys FInstNDT FRSA is a Physics and Engineering Research Consultant with his own name company. Bryan has been involved in 35 collaborative research projects in materials processing and engineering, in the renewables, offshore, nuclear, aerospace, transport and manufacturing sectors; with a strong focus on automated and robotic deployment of NDE and Continuous On Line Structural Health Monitoring.

Prof Bryan Bridge has an extensive academic background and in 1989 Bryan came to London South Bank University as Professor and Head of the Electrical and Electronic department. In 1992 He founded the Research Centre of Automated and Robotic NDT with a Centre of Excellence Award from the then PCFCE and was Co-Director until 2008. He has been Principal Investigator of more than 70 externally funded research projects since 1974 and published over 320 research papers. He is a Trustee and Director of the CLAWAR Association Ltd and a permanent Honorary Member of The Physical Society Club whose elected members are limited to 31 and celebrates its 100th Anniversary in 2019.



# **10:10 - ROBOTS FOR MANUFACTURING**

#### JEREMY HADALL, MTC COVENTRY

This talk will to look at how intelligent and adaptable automation systems can be developed for advanced manufacturing processes requiring human robot interaction within a safe dynamic environment and how they can be integrated and run alongside existing work practices. We will look at current and coming technologies on human robot interaction, existing safety standards and where we need to be in order to have a safe and practical human robot collaboration.

Jeremy Hadall has been developing automation systems for industry since leaving the University of Hertfordshire with a Masters in Engineering. Since 2010, he has led the development of advanced automation systems for the Manufacturing Technology Centre where he is Chief Technologist for Robotics and Automation. The MTC has spearheaded the wider uptake and the development of new automation concepts within UK manufacturing.

Jeremy Hadall is also a Chartered Engineer with the Institution of Engineering Technology and chairs its Design & Production Executive Committee. He also chairs the Automation Forum of the UK's High Value Manufacturing Catapult and is a member of the British Automation and Robotics Association's council."



# **10:30 - COLLABORATIVE INDUSTRIAL ROBOTS**

### SATWIK MEHTA, HSSMI, UK

Details of ISO TS15066 for Industrial Collaborative Robots and the opportunities and challenges for manufacturing.

Satwik Mehta manages the Virtual Engineering Team at HSSMI. He has extensive experience in manufacturing predominantly in the automotive sector. After graduating from the University of Pune in Mechanical Engineering, he worked for the Volkswagen Group on multidimensional facets of planning new products and processes. Satwik has also acquired an MSc in Manufacturing Engineering from the University of Warwick where he developed a framework for operations sustainability. Satwik oversees delivery of research and commercial programs for the Virtual engineering team at HSSMI. He is also leading an Industrial working group for developing design and installation guidelines for collaborative robots.



# **11:20 - NDT ROBOT APPLICATIONS IN HAZARDOUS ENVIRONMENTS**

### PROF TARIQ SATTAR, LONDON SOUTH BANK

Reliable Non Destructive Testing (NDT) is vital to the integrity, performance management and sustainability of capital assets in safety critical industries such as oil and gas, aerospace, transportation, power generation and off-shore and subsea operations. The presentation will show climbing and swimming robots developed to detect weld and corrosion defects.

Professor Tariq Sattar is a pioneer in the development of robotic Non-Destructive Testing. He leads the research in this area in his role as the TWI chair and Director of the London South Bank Innovation Centre (LSBIC) based in Cambridge which collaborates with TWI Ltd, the National Structural Integrity research Centre and London South Bank University to research and develop automation and robotics for non-destructive testing. His research has won eleven awards for best papers and industrial innovation in the field of robotics. It was selected by the Royal Society for its 350th anniversary summer science exhibition and again by the Royal Academy of Engineering as an interactive display in its zone at the Big Bang event, ICC ExCel Centre.

# **TEA BREAK**



# **11:40 - ROBOTS FOR NUCLEAR APPLICATIONS**

#### DR SIMON WATSON, MANCHESTER UNIVERSITY

This presentation gives an overview of the types of mobile robots which are being developed to support the decommissioning of nuclear sites like Sellafield and Fukushima.

Dr Simon Watson is a Lecturer in Robotic Systems at the School of Electrical and Electronic Engineering at the University of Manchester. He obtained his MEng in Mechatronic Engineering in 2008 and his PhD in 2012, both from the University of Manchester. His research focus is on mobile robots for the exploration and characterisation of hazardous and extreme environments, and active areas of research include novel platform design, communications and localisation, sensing and navigation and multi-level control. Simon works closely with industry to take robotic platforms from University prototypes through to commercially viable systems, such as the AVEXIS underwater vehicle, which was recently deployed on the Sellafield site.



# 12:00 - ROBOT ETHICS

### DR SARAH FLETCHER, CRANFIELD UNIVERSITY

As we face significant growth in human-robot interaction across all walks of life there is a common drive to develop, manufacture and implement robotics without fully exploring and understanding the wider human and societal impacts. Although human factors are known to be instrumental to the success of advanced technologies, particularly in industrial work settings, there is a prevailing focus on physical integration and safety. People are required to work with robots with some safety and performance training but there is little formal guidance for designers and integrators to ensure ethical and psychological safety. The UK has begun to address the growing need for guidance with the development of BS 8611:2016 Guide to the ethical design and application of robots and robotic systems but there is still a need for application- and context-specific requirements.

Dr Sarah Fletcher leads the Industrial Psychology and Human Factors (IPHF) group in the Centre for Structures, Assembly and Intelligent Automation at Cranfield University. She has been conducting social science research in manufacturing / automated systems for over 17 years. Her funded research specialises in understanding human requirements for the design and implementation of safe and efficient industrial work systems, particularly focusing on factors that impact on users' trust and acceptance of industrial human-robot collaboration, and on applying novel and traditional methods to capture and analyse cognitive processes and tacit knowledge in human behaviour and performance. Sarah is an active member of national and international standards development as part of the BSI AMT/10 Robotics committee and the ISO Robotics Technical Committee 299, Working Group 3: Industrial Safety.



# 12:20 - SERVICE ROBOTS

### **PROF GS VIRK, CLAWAR & INNOTECUK**

The presentation gives an overview of robotics from its early roots in traditional industrial manufacturing applications through the growing need for mobile robots to the current growing interest in service robots for both medical and non-medical scenarios. Throughout these developments, the technical and non-technical challenges have grown and how these are being addressed will be described. In the main, the design basis for the traditional applications has been to keep robots and humans apart due to safety concerns. More recently, the trend is towards involving close human-robot interactions to realise service robots for assistive applications especially to address the global ageing society problems. These have led to new ISO robot standardization projects and activities to address growing ethical concerns.

Professor Gurvinder S. Virk. is Technical Director at InnotecUK Limited in with responsibility to lead R&D projects and technical innovations for realising intelligent inspection robot systems for hazardous applications; in addition he is Adjunct Professor at IIT Ropar, India. He holds a PhD in Control theory from Imperial College, University of London, UK and his current interests are in commercialisation of NDT inspection robots, wearable exoskeleton robots for health and wellbeing, medical robots for rehabilitation, active and assistive living applications, robot safety standardisation, robot modularity and inter-operability, social robotics and robot ethics. He is also Trustee and Treasurer of the UK registered charity CLAWAR.

# LUNCH AND ROBOT EXHIBITION



# 14:00 MEDICAL ROBOTS

### LUKE HARES, CAMBRIDGE MEDICAL ROBOTICS

Robotics and minimal access surgery have a history together going back forty years. This development has been driven by desire to combining the precision and reach of robotics with the skill and knowledge of human surgeon. The talk will offer a short trip through this history and some thoughts on future developments in this area.

Luke Hares is Technical Director at Cambridge Medical Robotics (CMR). He a physicist with practical multidisciplinary engineering skills and, for the past 20 years, has been involved in the conception and development of many products and medical devices. Luke was responsible for the Versius concept, created in response to the need for a better way to perform laparoscopic surgery. Before co-founding CMR he worked for Cambridge Consultants and Sagentia in the UK and the US, where he worked on medical devices, robotics, ASIC developments and consumer products.

Luke is leading the CMR technology team and has overall responsibility for the technology strategy of the company. He is accustomed to championing ideas, communicating technically complex ideas and designing and managing the development of complex systems. He regards his particular areas of expertise as imagination, a focus on the user and the application, and multi-disciplinary system design.



# 14:20 - USES WITH DISABILITIES INTERACTING/CONTROLLING ROBOTS

### DR PETER O'NEILL, SHEFFIELD HALLAM UNIVERSITY

The presentation gives a personal overview to the present day, then moves into the modules and research projects being carried out at Sheffield Hallam to introduce the idea of inclusion within their applications. Conventional access methods of those with motor, sensory and cognitive impairments and possible areas were robots could become an invaluable assistive technology. The challenges of using these conventional interactive methods to control robots will be described and how alternatives could be realised for persons with disabilities.

Dr Peter O'Neill is Senior Lecturer at Sheffield Hallam University since 2009 and has research interests in assistive technology and how this can be realised via robotics. He holds a BSc (Hon) in Software Engineering and PhD focussed on human-computer interaction, both from Sheffield Hallam University. He has worked the Department of Medical Physics and Clinical Engineering at Barnsley Hospital where his duties included developing software assistive technology applications, one of which would drive an electric wheelchair. He was also involved in a start up on software development. In addition, he was required to use his own personal knowledge of disability (he was born disabled) to enhance the quality of service and understanding of service staff providing for the residents of those living within the Barnsley hospital catchment area.



# 14:40 - THE CYBORG EXPERIMENT

### PROF. KEVIN WARWICK, COVENTRY UNIVERSITY

In this presentation a practical look is taken at how the use of implant and electrode technology can be employed to create biological brains for robots, to enable human enhancement and to diminish the effects of certain neural illnesses. In all cases the end result is to increase the range of abilities of the recipients. An indication is given of a number of areas in which such technology has already had a profound effect, a key element being the need for a clear interface linking a biological brain directly with computer technology.

Kevin Warwick is Emeritus Professor at Reading and Coventry Universities. His research areas are artificial intelligence, biomedical systems, robotics and cyborgs. Kevin is a Chartered Engineer and a Fellow of the IET who has published over 600 research papers. His experiments into implant technology led to him being the cover story on the US magazine, 'Wired'. He achieved the world's first direct electronic communication between two human nervous systems, the basis for thought communication. He has been awarded higher doctorates (DSc) by Imperial College and the Czech Academy of Sciences. He received the IET Mountbatten Medal, the Ellison-Cliffe Medal from the Royal Society of Medicine and presented the Royal Institution Christmas Lectures.

TEA BREAK & ROBOT DEMONSTRATIONS OF RESEARCH PROTOTYPES AND COMPANY PRODUCTS

# **ROBOT VIDEOS**



# 15:45 - ROBOTS IN ARCHITECTURE AND DESIGN

#### FEDRICO ROSSI, SENIOR LECTURER IN ARCHITECTURE LSBU

This presentation will give an overview of various robot machining applications used in the field of design, art and architecture.

A comprehensive presentation to cover the processes behind the digital design, large data handling, the kinematic simulation and manufacturing of large complex geometries and assembled objects as results of various collaborations in academia, digital artists and design practices.

As well there will be a tour at the Digital Architecture and Robotic Lab showing projects results and live robotic demonstrations.

Federico Rossi studied architecture in Florence before to complete his studies at the Architectural Association in London. Federico founded the design practice frform.com to continue his research between design and digital manufacturing. In 2010 joined the London South Bank University as senior lecturer, where consequently he founded the DARLAB - Digital Architecture & Robotic Lab - an experimental lab on robotics applied to design and architecture. He is member of Intelligent Factory an Italian industry research cluster and member of robots in architecture for robotic application for the built environment.



### 16:00 - PANEL DISCUSSION ON KEY ISSUES OF CONCERNS

Panel Moderator: Osman Tokhi, LSBU & Bryan Bridge, Trustee, CLAWAR Presenters: JH, SM, TS, SW, SF, GSV, LH, PO, KW, FR

#### Issues:

- Are current robots important for society in UK? If so, why?
- Identify key areas for new robot applications
- What are main barriers to widespread adoption of robots?
- Which areas are most important globally and for UK?
- Conclusions

Close: Gurvinder S Virk, CLAWAR

**NETWORKING & REFRESHMENTS** 

### PARTNERS



London South Bank University has over one hundred years of experience of providing high quality education for all types of student. Founded in 1892 celebrating its 125th birth year in 2017. LSBU is world leaders in the use of robotics in non-destructive testing and developing intelligent robotic systems. Our School of arts and creative industries has experts in Theatre and Performance to Film Making, Photography, Visual effects, Sound Technologies and Games. The Big Data & Informatics group drawing on the best scientific traditions in computer science, engineering and business.

#### CLAWAR ASSOCIATION LIMITED - WWW.CLAWAR.ORG

LONDON SOUTH BANK UNIVERSITY - WWW.LSBU.AC.UK



CLAWAR Association Ltd was set up in March 2006 as a non-profit making membership based organisation registered in the UK at Companies House. The aim was to focus on activities to encourage the widening of the robot market sector by supporting international ISO/IEC robot standardisation activities in the emerging areas of service robots (personal and medical robots). In promotion of its mission; "robotics for the benefit of the public", the Association organises conferences, symposia and workshops. Among these are the annual International CLAWAR conference series and the International Robot Ethics conference series.

#### MANUFACTURING TECHNOLOGY CENTRE - WWW.THE-MTC.ORG



MTC develops and proves innovative manufacturing processes and technologies in an agile, low risk environment, in partnership with industry, academia and other institutions. We focus on delivering bespoke manufacturing system solutions for our customers. We operate some of the most advanced manufacturing equipment in the world, and employ a team of highly skilled engineers, many of whom are leading experts in their field. This creates a high quality environment for the development and demonstration of new processes and technologies on an industrial scale.

#### **INNOTEC UK - WWW.INNOTECUK.COM**



InnoTecUK is an experienced, dynamic and progressive robotics and automation solution provider. We specialise in Development and Commercialisation of innovative and effective Industrial robotic systems to overcome complex challenges across many industries including but not limited to; Offshore, Nuclear, Renewable energy and Oil & Gas. Our Robotic and Automation solutions have evolved through years of in-depth research and development by our team of in house engineers specialising in the following disciplines; Electrical and Electronic, Aeronautical, Mechanical, Telecommunications and Software engineering.



#### THE WELDING INSTITUTE, TWI - WWW.TWI-GLOBAL.COM

TWI, formed in 1946, is a world-leading not-for-profit research and technology organisation with a turnover in 2016 of £73m. TWI is internationally renowned for its ability to employ multidisciplinary, impartial teams to implement both established and advanced joining technologies, or to solve problems arising at any stage of the product life cycle – from initial design, materials selection, production and quality assurance, through to in-service performance, repair and life extension.

#### UK ASIAN BUSINESS COUNCIL - WWW.UKABC.CO.UK



The UK Asian Business Council (UKABC) is the leading UK-based organisation promoting bi-lateral trade and investment between the UK, Asian and African markets. The UKABC is passionate about helping UK companies of all sizes export/import and invest in one of the most exciting, vibrant and fastest growing regions in the world.

Working closely with the UK and Asia/African, key partner organisations we have created an extensive UK-Asian/African business network that allows us to provide unique market insights, and links UK innovation and expertise with Asia's and Africa's vast commercial developments.