
HAM EPSRC
UK Postgraduate Workshop
on Human Adaptive Mechatronics
STAFFORDSHIRE
UNIVERSITY

UK Postgraduate Workshop on Human Adaptive Mechatronics (HAM)

15-16 January 2009, Staffordshire University,

Octagon Building, Beaconside, Stafford, ST18 0AD, UK

Conference Programme

15th January 2009

10:30 – 11:00	Registration + Coffee	Boardroom (3rd floor), Octagon Building
11:00 – 12:00	Welcome and Keynote Speech	RED Lecture Theatre (3rd floor), Octagon Building
12:00 – 13:30	Lunch	Gallery (2nd floor), Beaconside Building
13:30 – 15:00	Keynote Speech	RED Lecture Theatre, Octagon Building
15:00 - 15:05	Picture taken	Outside Octagon Building
15:05 - 16:30	Interactive Sessions + Coffee	Boardroom, Octagon Building
16:30 - 18:00	Keynote Speech	RED Lecture Theatre, Octagon Building

16th January 2009

08:30 - 09:00	Coffee	Boardroom, Octagon Building
09:00 - 10:30	Keynote Speech	BLUE Lecture Theatre (3rd floor), Octagon Building
10:30 - 12:00	Interactive Sessions + Coffee	Boardroom, Octagon Building
12:00 - 13:30	Lunch	Gallery, Beaconside Building
13:30 - 15:00	Keynote Speech	BLUE Lecture Theatre, Octagon Building
15:00 - 15:30	Conclusion	BLUE Lecture Theatre, Octagon Building

Plenary Lectures

Plenary Lecture 1: Development of Scrub Nurse Robot System with Respect to How to Adapt to Individual Surgeons

Professor Fujio Miyawaki, Advanced Multidisciplinary Engineering, Graduate School of Advanced Science and Technology,
Tokyo Denki University, Ishizaka, Hatoyama-machi, Hiki-gun, Saitama 350-0394, JAPAN,
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Abstract: We have been developing the Scrub Nurse Robot (SNR) System for endoscopic and laparoscopic surgery to compensate for severe shortage of human scrub nurses. They help surgeons exchange surgical instruments since a surgeon conducts a surgical operation by selecting instruments best suitable for situations. This exchange of instruments is the only collaborative action between surgeons and scrub nurses.

The goal of the SNR project is to develop an SNR functioning like an 'ideal' scrub nurse who is able to predict accurately which one out of a dozen surgical instruments a surgeon will request next and to provide it timely without any surgeon's verbal order. We think that the way of realizing HAM in the SNR project is to achieve these two factors.

Firstly, I will explain briefly what the laparoscopic surgery is like and what in laparoscopic surgery brought us an idea of the latest (3rd) version of SNR. In this type of surgery, a surgeon conducts surgical procedures while watching a monitor which displays the operative field obtained from an endoscope (termed 'laparoscope' in the case of abdominal surgery). The surgical procedures are carried out with long surgical instruments inserted into the operative field through small-caliber cylindrical tubes (each termed 'trocar cannula') which penetrate the abdominal wall of a patient. When a surgeon exchanges instruments, it usually takes about 5 seconds. This exchange of instruments is repeated about 60 – 150 times in laparoscopic cholecystectomy (surgical removal of the gallbladder). During each exchange of instruments, a surgeon has to wait for about 2 seconds in average until he receives the requested instrument from a scrub nurse. Surgeons feel as if the exchanging and waiting time were many times longer than the actual periods of time since these times are just waste of time for them. Therefore, they want to make the times as short as possible. Concerning another problem during exchange of instruments, it is not so easy for elder surgeons to insert a long instrument into the small-caliber trocar cannula after receiving it from a scrub nurse.

Therefore, the latest version of SNR was designed to release surgeons from such a burden. In other words, the SNR automatically inserts an instrument into the trocar cannula in stead of surgeons, thereby also contributing to shortening of exchanging time, especially, for elder surgeons. The latest version of SNR will be reported more specifically.

Secondly, we have been collecting information on sequence and frequency of surgical instruments used in laparoscopic cholecystectomy in

order for SNR to achieve the above-mentioned accurate prediction of surgical instruments. We have just developed an automatic acquisition system of such information using the technique of radio frequency identification (RFID). This system chiefly consists of several RFID antennas each connected to a trocar cannula, a dozen RFID tags each attached to a surgical instrument, and an application program to acquire start and ending times of communication between tags and antennas as well as the ID signals from the tags. This system makes a big progress in databasing that sort of surgical information. We will report this system more precisely and the contents of surgical information, too, because we found that the contents varied from surgeon to surgeon and reflected their skills and experiences.

Finally, how to determine human skills properly has been a big issue in HAM. We paid an attention to human skills from a viewpoint such that mental pressure impedes full exertion of their skills. Because it is extremely difficult to measure the mental pressure accurately, first of all, we mainly focused on muscular activities of the upper extremities during fine handiwork. More specifically, we examined how many pushpins 9 examinees were able to transfer from one cup to another within 10 seconds using a pair of chopsticks. At the same time, we measured electromyograms in their shoulder muscles and two muscles in the forearm, and their electrocardiograms. Multiple regression analysis reveals that increase in muscular activities of shoulder muscle impedes the given task and that use of the muscle on the little finger side rather than that on the thumb side brings better results. This approach to investigation of human skills will be reported more specifically.

Biography: Professor Fujio Miyawaki gained his Doctor of Medical Science (MD, PhD) with a thesis entitled ‘‘Development of a new elastic suture – evaluation for suture material of small calibre arteries’’ from University of Tokyo in 1979. He has been a British council fellow at the Institute of Medical & Dental Bioengineering in University of Liverpool, UK from 1986 to 1988. During 1979 to 1990, he held several academic positions in University of Tokyo, Tokyo Koseinenkin Hospital, and Tokyo Women’s Medical College. In 1990, he was promoted as assistant professor at the Department of Cardiovascular Surgery in Tokyo Women’s Medical College. From 1993 to 1999, he was a division head at the Department of Surgical Research in National Cardiovascular Center Research Institute. From 1999 until now, he is a professor at the Department of Life Sciences and Engineering, School of Science and Engineering in Tokyo Denki University. Currently, He is also in charges of Master’s program at the Graduate School of Science and Engineering, and Doctoral program at the Graduate School of Advanced Science and Technology in Tokyo Denki University in Japan. He is the fellow of American Heart Association, board of Japanese Society for Artificial Organs, board of the Society of Life Support Technology, etc. His research interests range from ‘cells’ to ‘robots’. The current main projects are as follows: 1) development of Scrub Nurse Robot System; 2) development of Vibratory Microinjection System; 3) development of Recovery-Directed Left Ventricular Assist Device; 4) research on antithrombogenicity of magnetite.

Plenary Lecture 2: iCub – A Humanoid Robot inspired by Children

Professor D G Caldwell

Director, Italian Institute of Technology, Genoa, 16163, Italy, Email: Darwin.Caldwell@iit.it

Abstract: Advancing the understanding of human cognition is currently an active area of research within the neuroscience field. At the same time the robotics community is looking towards the use of artificial cognition for robot systems. The iCub developed under the EU funded RobotCub project is a collaborative project between roboticists, pschologists, and neuroscientists with the aim of further developing and understanding cognitive processes.

The project and the underlying principles of the iCub are based on the belief that manipulation of objects and interaction with the world around us plays a fundamental role in the development of human cognitive capabilities. Many of the basic skills used by humans, such as locomotion and object manipulation, are learnt very early on in their development. For this reason the iCub seeks to explore the development of cognition through the creation of a child like humanoid robot.

The iCub, aims to replicate both the physical and cognitive abilities of an 18 month to 2.5 year old child. To ensure that this interaction is as true as possible the robot must be a highly accurate representation of the infant inspiration. As a result the ‘baby’ robot, stands 100cm tall, fits within the general size and shape of a child, weighs less than 23 kg and has 69 DOF. The presentation will explore the development and application of the iCub Humanoid.

Biography: Darwin G Caldwell is a Director at the Italian Institute of Technology in Genoa, Italy, and a Visiting/Honorary Professor at the Universities of Sheffield, Manchester and Wales, Bangor. Prior to his appointment at IIT he was at the University of Salford from 1989 to 2007 as a Lecturer, S. Lecturer, Reader and finally Professor of Advanced Robotics in the Centre for Robotics and Automation (1999-2007). His research interests include innovative actuators and sensors, haptic feedback, force augmentation exoskeletons, dexterous manipulators, humanoid robotics, bipedal and quadrapedal robots (iCub), biomimetic systems, rehabilitation robotics, telepresence and teleoperation procedures, and robotics and automation systems for the food industry. He is the author or co-author of over 190 academic papers, 8 patents and has received awards at several international conference and events including, ICRA, IROS, ICAR, IAV and Virtual Concepts. He is a past chair of the UKRI region of the IEEE (Robotics and Automation Society) and the IEE Robotic and Intelligent Systems PN. He is on the editorial board of Journal for Robots, International Journal of Social Robotics and Industrial Robot.

Plenary Lecture 3: Intelligent Mechatronic Systems for Environmental Interactions

Professor Lakmal Seneviratne
Division of Engineering
King's College London, Strand, London, WC2R 2LS
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Abstract: Many applications require mechatronic systems to actively interact with the environment. These tasks include unmanned ground vehicles (UGV) in outdoor terrain, medical robotic systems and humanoid hands. Increasing the autonomy of such systems poses multi-disciplinary research challenges. A fundamental understanding of the interaction dynamics between the system and the environment is an essential element in controlling such systems with increased autonomy. The presentation will focus on the modelling and estimation of vehicle-terrain and tool-soft tissue interactions. Simple sensor feedback from the system is used with system models to identify unknown environment properties and hence increase system autonomy.

Biography: Lakmal Seneviratne is Professor of Mechatronics at King's College London (2001-), Director of the Centre for Mechatronics at KCL (1994-), and Head of the Division of Engineering at KCL (2004-). His main research interests are centred on robotics and automation, with special emphasis on the modelling and control of mechatronic systems interacting with complex dynamic environments. Professor Lakmal Seneviratne graduated with a BSc and PhD in Mechanical Engineering from King's College London. He then worked as a RA at University College London, and after two years at GEC Energy Systems Ltd he returned to King's as a lecturer in Mechanical Engineering, being promoted to the Chair of Mechatronics in 2001. His main research interests include robotics and automation, with special emphasis on the use of engineering mechanics based algorithms to create intelligent behaviour in a variety of applications. He has published over 130 refereed papers related to mechatronics. He has held several grants from national and European sources, as well as industry. Currently he is involved in several mechatronics projects including unmanned ground vehicles in outdoor environments (EPSRC, QinetiQ), robotic excavators (EPSRC, QinetiQ), autonomous mine detection systems (QinetiQ), autonomous pipe inspection systems (TCS, System Technologies Ltd) and auotomated assembly systems (Desoutter Ltd). He has secured over £1.7M worth of research funding. He has been closely involved in setting up and delivering new degree courses in Mechatronics.

Plenary Lecture 4: Are you ready for robot invasion?

Professor Huosheng Hu
School of Computer Science and Electronic Engineering
University of Essex, Wivenhoe Park, Colchester CO3 4SQ
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Abstract: After recent advancement of computing and robotics technologies, intelligent robots are soon ready to serve us in our homes, hospitals, offices and everywhere. They can speak, recognise facial expression, understand spoken and gesture instructions, navigate autonomously in human-centred environments, and therefore will play an important role in our daily life. This talk briefly overviews the key challenges in advanced robotics technologies, in particular focused on the recent development of human-centred robotics that concerns with the development of various kinds of robots for coexisting with humans. Three case studies, bio-mimetic system modelling, human motion tracking, head gesture/brain signal based control of a wheelchair, are discussed respectively, and some preliminary results are demonstrated via video.

Biography: Huosheng Hu is a Professor in Computing & Electronic Systems Department at the University of Essex, leading the Human-Centred Robotics Group. His research interests include behaviour-based robotics, human-robot interaction, embedded systems, learning algorithms, pervasive computing, and service robots. He has published over 250 papers in journals, books and conferences in these areas, and received a number of best paper awards. He is one of founding members of IEEE Robotics & Automation Society Technical committee on Networked Robots, a senior member of IEEE and ACM, and a member of IET and IAS. He has been a chair or committee member for many international conferences such as IEEE ICMA, IEEE ROBIO, IEEE IROS, RoboCup Symposiums, and IASTED RA, CA, and CI conferences. He currently serves as one of Editors-in-Chief for International Journal of Automation and Computing.

Plenary Lecture 5: Operator Based Nonlinear Control and Fault Detection – New Challenge of System Control Engineering

Professor Mingcong Deng, Department of Systems Engineering, Faculty of Engineering
Okayama University, 3-1-1, Tsushima-Naka, Okayama, Japan
Email:deng@suri.sys.okayama-u.ac.jp

This talk will cover the following points:

- Robust stabilization and tracking performance for the nonlinear feedback control system with the uncertainties need to be extended.
- Reliable detection of faults issues for the above control design scheme with the uncertainties are not considered.
- Robust tracking control system design problem for nonlinear plants under bounded uncertainties and input constraints
- Fault detection problem of the output tracking filter and robust controller for nonlinear plants under unknown but bounded uncertainties

Biography: Professor Mingcong Deng is Associate Professor in modeling and control at Okayama University. He received his B. S. and M. S. degrees in Control Engineering from Northeastern University, China, in 1986 and 1991, and his Ph.D. in Systems Science from Kumamoto University, Japan, in 1997. From 1997 to 2000 he was with Kumamoto University as assistant professor, from 2000 to 2001 he was with University of Exeter (UK) as research fellow, and then he spent one year in NTT Communication Science Laboratories for human arm dynamics research as research associate. From the end of 2002, he works at Okayama University, where he is an associate professor now. In 2005, he visited Concordia University, Canada, as a visiting scientist for two months. Prof. Deng is a member of SICE, IEICE, JSME, ICROS and IEEE senior member. He has extensive research experience in nonlinear system modeling and control including operator-based control, strong stability-based control and robust parallel compensation. He is co-investigator of Grants-in-Aid for Scientific Research (**S**) supported by JSPS (Grant No. 16101005). He has published over 100 research papers which focus on: adaptive and robust control of processes, analysis and control of hybrid machines, control of time delay systems, predictive control, nonlinear system modeling. He was awarded Japanese Government (MONBUSHO) Scholarship(1993.01); IFAC Japan Foundation Scholarship by IFAC (1999.07); EPSRC Scholarship (UK, 2000.04); Googol Application Research Award (Aug., 2004); Interviewed by American Embassy Tokyo as a premier academic (April, 2006). Best paper Award of SICE-ICASE International Joint Conference (Oct., 2006). He served as the editor of International Journal of Advanced Mechatronic Systems and associate editors for an international journal and program committee members of many IEEE international conferences.

Plenary Lecture 6: Measurement of Electromagnetic Signals Generating from the Human Brain and its Application to HAM

Yoshinori Uchikawa
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Tokyo Denki University, Ishizaka, Hatoyama, Saitama 350-0394 Japan
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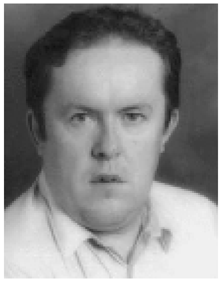
Abstract: Bio-signals generated from the human body must be useful information on developing the interface device of the human machine system. Recently, the signals of the human brain measured by functional magnetic resonance imaging (fMRI), electroencephalogram (EEG), and near-infrared spectroscopy (NIRS) are often used for development of brain machine interface (BMI) technology. Especially, to achieve the human adaptive mechatronics (HAM) system, including assistance of human operation and enhancement of an operator's skill, more understanding of brain function is needed. Nowdays, magnetoencephalogram (MEG), namely, the extremely weak magnetic field generated by electrical activities of neuron in the brain, is also widely used for research on high-order brain function. However, there are problems of separating multiple sources, which are closely located and overlapped in time, when many distinct areas of cortex are active. In these cases, the magnetic field distribution of normal component is not helpful for estimating the location and number of sources, owing to the lack of a dipole pattern. In addtion, a certain method to detect the transient weak signals hid by the intense signals such as second somatosensory (SII) activity in primary somatosensory (SI) activity overlapping in time is still remained. In order to overcome these problems, new method is required to develop in both of signal processing and SQUID instrument. We have developed 3-D second-order gradiometer units connected to 39-channel SQUIDs for vector measurement of the MEG, which can simultaneously detect magnetic field components perpendicular and tangential to the surface of the body. We have carried out the 3-D vector measurement of the SEF(somatosensory evoked field) and we have examined the usefulness. So, firstly, in this presentation, we show the usefulness of 3-D vector measurement for discriminating multiple sources overlapping in time. Secondly, new method of signal processing using singular value decomposition (SVD) and time-frequency analysis of SEF waveforms to different finger stimulation (thumb, fourth and little finger) is shown. Thirdly, we show a prototype system for assessing vigilance levels and for alerting the subject with sound, using EEG and EOG (electroocculogram) signals, which is an example of application to HAM. And the recent work of MEG study is also introduced.

Biography: Yoshinori Uchikawa received the B.S. degree in electronic engineering in 1973, and the M.S. and Ph.D. (Dr. Eng.) degrees both in electrical engineering from Tokyo Denki University, Tokyo, Japan, in 1976 and in 1985, respectively. He was Associate Professor of the Department of Applied Electronic Engineering at Tokyo Denki University from 1988 to 1993. He was Professor of the Department of Applied Electronic Engineering at Tokyo Denki University from 1993 to1999 and served as Chairman of the Department from 1995 to 1999. He has been Professor of the Department of Electronic and Computer Engineering at Tokyo Denki University since 1999. From 2001 to 2004, he was Head of System and Biological Engineering Division of the Research Institute for Science and Technology at Tokyo Denki University. He was Director of the Frontier Research and Development Center at Tokyo Denki University from 2003 to 2006. He was one of the members of the COE Project of Tokyo Denki University, which was awarded by the 21st COE Research/Education Program by Ministry of Education, Culture, Sports, Science Technology in 2003, and he was a leader of Human Group of this project from 2003 to 2007. He was a Guest Scientist of the Institute of Physikalisch-Technische Bundesanstalt (PTB), Berlin, West Germany, from 1983 to 1985. He has been administrative member of Japan Bioelectromagnetics Society since 1997. He received IEEJ Academic Promotion Award and IEEJ Distinguished Paper Award from the Institute of Electrical Engineers of Japan (IEEJ) in 2001. He is a member of IEEE etc. His research interests are in bio-signal processing, the inverse problem of MEG and MCG, and design of SQUID system for biomagnetic measurement, etc.

Plenary Lecture 7: Improving Arm Function Post Stroke through Application of Iterative Learning Control and Arm Modelling

Professor Eric Rogers, School of Electronics and Computer Science,
University of Southampton, Southampton SO 17 1BJ, UK, Email: etar@ecs.soton.ac.uk

Abstract: following a stroke many people have a complex and varied pattern of motor and functional impairment in the hemiplegic upper extremity. Weakness of the anterior deltoid or triceps brachii often impairs ability to reach away from the body in order to position the hand to grasp and manipulate objects. The aim of rehabilitation is to promote functional recovery through the facilitation of motor control and skill acquisition. The importance of upper limb function to independence is reflected in measures such as the Barthel ADL Index where the ability to reach is required for over 50% of the activity of daily living tasks. Despite this recognised importance, the current prognosis for upper limb recovery following stroke remains poor.Roughly half of all acute stroke participants starting rehabilitation will have a marked impairment of function of one arm, of whom only about 14 percent will regain useful upper limb function. Consequently there is a clear need to improve the effectiveness of treatments. Research into conventional therapy and motor learning theory provides evidence that intensity of practice of a task, variety and feedback are important. This knowledge is being applied in novel treatments such as robotic therapy which provide the opportunity for repetitive movement practice. This lecture will describe recent research at Southampton that has shown how iterative learning control can be used in this area. This will include the design of the robotic system, the modelling of the human arm required for control law design together with some conclusions from trials with stroke patients. Finally, some areas for future research will be briefly discussed.

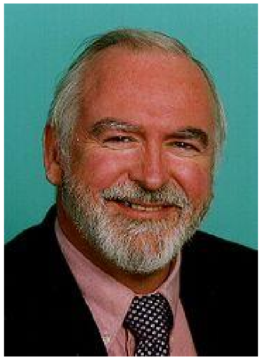


Biography: Eric Rogers was born into a farming family based outside Newmills, a small village in County Tyrone, Northern Ireland. After a first degree in Mechanical Engineering from Queen's University Belfast, he undertook masters and PhD studies in The University of Sheffield and was awarded the DSc degree by Queen's University Belfast in 2004 for research in control systems. He has been a member of the academic staff of the University of Southampton since 1990 and is currently Professor of Control Systems Theory and Design in The School of Electronics and Computer Science. His major research interests include multidimensional (nD) systems theory and its applications, systems with repetitive dynamics, iterative learning control theory and applications in engineering and rehabilitation, and flow control. He is the editor-in-chief of the International Journal of Control.

Plenary Lecture 8: Problem Based Learning for Mechatronics

Professor Robert M Parkin, Loughborough University, UK
http://www.lboro.ac.uk/departments/mm/staff/parkin.html

Abstract: Many University Departments find it problematical to teach integrated disciplines like Mechatronics. It can be difficult to design a suitable group project with balance in the constituent parts and an appropriate level of challenge. The presentation concerns such a project centred on a mobile line following robot utilising three embedded microcontrollers. The robots are now in their 18^{th} generation. 6^{th} generation devices were taken on and sold worldwide by a leading educational equipment company. The project has been taken up by Industry and is used to train 60 Graduate Engineers per year (after two years of industrial experience). The teaching module earned the Responsible Examiner "runner up" status in a National Teaching Award launched by the Engineering Subject Centre. The presentation is augmented by experiences over 12 years of teaching the module and video clips of performance.



Biography: Professor Rob Parkin was born on 22nd April 1953. He gained a BSc in Engineering Science from Leicester University. Work on advanced instrumentation and algorithmic control for complex mechanical systems, in the form of a Diesel Gas Turbine, provided the material for his Doctoral Thesis at Leicester Polytechnic. He has had industrial experience with Fredk Pollard & Co Ltd (machine tools), Rank Taylor Hobson Ltd (surface finish and roundness instrumentation) and Tamarix Design Associates (computerised instrumentation & control). He was a founder member of the UK Mechatronics Forum, serving on the steering committee with periods as Vice Chair and Chair from 1990-99.

Prof. Parkin founded the Mechatronics Research Group at De Montfort University where his research activities were recognised by a personal chair in Mechatronics. He was leader of the Mechatronics Research Group and Professor of Mechatronics at Loughborough University for over 12 years before becoming Head of the Wolfson School of Mechanical & Manufacturing Engineering. Rob is a member of the Saxonian Academy of Sciences and the IEEE and a Fellow of the IMechE, IET and RSA

Plenary Lecture 9: Robot brains to design the future?

Abstract: Intelligent robots must analyse their worlds at many levels of abstraction. Human beings *create* new ways of looking at problems, and often their 'solutions' relate to different problems to those first formulated. Planning involves identifying future possible states, selecting one or more as goals, devising trajectories to reach the goals, and devising control strategies to keep the system on trajectory. The 'future' can be considered to be a huge space of possible worlds, and planning can be considered to be a search problem with the objective of finding relatively good future states. This idea of *finding* the future is passive and contrasts radically with the reality that human beings actively *construct* the future – we build the future as it *ought* to be and according to how we can make it come into being. Human beings create artificial systems, and the process of doing this is *design*. Designers do not solve problems using algorithms. They engage in a computationally irreducible generate-test process that accumulates information and understanding as it progresses. It is widely accepted in the design research community that there is a 'designerly' way of solving problems, and that the process of doing design results in new ways of looking at problems, reframing them and producing emergent solutions that 'satisfice' the many competing constraints. In human systems the future is what we make it and a defining feature of human intelligence is that we *design the future*. This presentation is based on recent experimental work indicating that solving open-ended design problems involves different ways of using of the human brain compared to solving logical or mathematical problems. This suggests that the architecture of robot brains can be fundamentally rethought from the perspective of design with planning and execution as the process of designing the future.

Biography: Professor Jeffrey Johnson is Professor of Complexity Science and Design at the Open University in the UK where he is Head of the Department of Design, Development, Environment and Materials in the Faculty of Mathematics, Computing and Technology. He is Rector of the Paris-based Open University for Complex Systems and visiting researcher at Ecole Polytechnique. His research in complex systems is founded on new mathematical methods of representing very large multilevel systems and their dynamics. He believes that the *in-vivo* experimental method for the science of complex artificial systems involves building and interacting with them. This research has been developed through many areas of application including robotics, machine vision, neural systems, cognition, design, organisational management, urban planning and large road traffic systems. He has directed many research projects and is currently leader of the European *ASSYST* project (Action for the Science of Complex SYstems for Socially intelligent icT) coordinating complex systems science in Europe and around the world. He is President of the international Complex Systems Society, a chartered engineer and a chartered mathematician. He has published widely and his latest book, *Hypernetworks in the science of complex systems* will be published by Imperial College Press in 2009.

Recommended Hotels

If you need to stay at Stafford, the following hotels, which are in the town centre and about 20 minutes by walk from the university, are recommended.

The Swan From £50 per night, 46-46a Greengate Street, Stafford, ST16 2JA http://www.theswanstafford.co.uk 01785 258 142	The Vine Hotel From £49.95 per night, Salter Street, Stafford, ST16 2JU 01785 244 112	Wyndale guest house £20 per night, 199 Corporation Street, Stafford, ST16 3LQ 01785 223 069	The Moat house £70 per night, four stars. Lower Penkridge Road, Acton Trussell, Stafford, http://www.moathouse.co.uk 01785 712217

Travel Directions to the Staffordshire University

By Train

Stafford railway station is in the town centre, about a mile and a half from the campus. Taxis stop outside the station for the short ride to the University. There is also a frequent bus service from outside the station which goes directly to the Stafford Campus. The number 9 Arriva bus runs approximately every 15 minutes.

By Car

From M6

1. Leave the M6 motorway at Junction 14 (Stafford North).
2. Follow signs for Staffordshire University / RAF Stafford.
3. Carry straight on through the first roundabout onto the A513 Beaconside and pass the main entrance to RAF Stafford on your left.
4. At the next roundabout, take the A518 turning and the entrance to Staffordshire University is immediately on your left.

5. Follow the access road through the campus. Visitor parking is available in either of the large car parks. The main reception is opposite the Octagon building.

From the East

1. As an alternative to using the motorway, take the A518 to Stafford.
2. Pass the County Showground on your left and carry on until you see the large, yellow Octagon Building on your right (NB no right turn).
3. Carry on to the roundabout and turn back on yourself. The entrance to Staffordshire University is immediately on your left.
4. Follow the access road through the campus. Visitor parking is available in either of the large car parks. The main reception is opposite the Octagon building.

By Air

Manchester, Birmingham airports are all about an hour's travel time from Sheffield. Birmingham Airport is served by many domestic and international carriers and has a direct rail link to Stafford both day and night. Both London airports (Heathrow and Gatwick) are reasonably accessible by rail with just one change of train. We recommend you to allow at least two hours travel time between either of these airports and Sheffield.

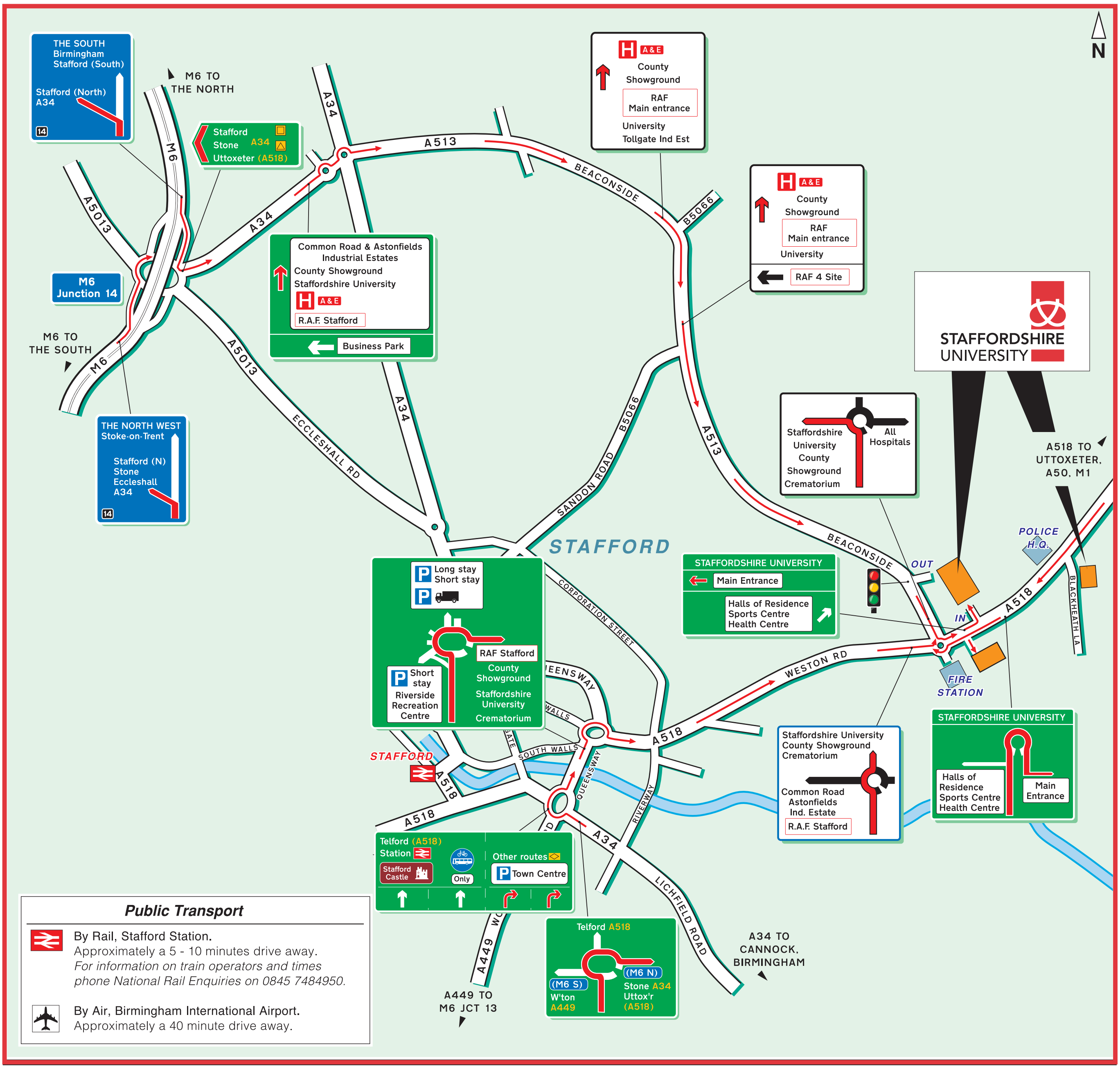
Car Parking

The workshop site, the Faculty of Computing, Engineering, and Technology, is located at **Octagon Building.**
Please use the map below if you are coming by car. For direction help: http://www.staffs.ac.uk/maps/

Helpline:

Mr Yang Liu
(+44) 01785 353255 (daytime)
(+44) 07525741047 (mobile)

Stafford approach



Public Transport

By Rail, Stafford Station.
Approximately a 5 - 10 minutes drive away.
For information on train operators and times phone National Rail Enquiries on 0845 7484950.

By Air, Birmingham International Airport.
Approximately a 40 minute drive away.