

UKSim2019

**UKSim-AMSS 21st International Conference on
Modelling and Simulation**

**27 – 29 March 2019, Cambridge
United Kingdom**

Conference Program

and Abstracts of Papers

Conference Program at a Glance Pages 3 - 4

Conference Program in Full Pages 5 – 21

UKSim2019

**UKSim-AMSS 21st International Conference on Modelling and Simulation
27 – 29 March 2019, Cambridge, United Kingdom**

Conference Chair

Taha Osman, Nottingham Trent University, UK

Program Chair

Glenn Jenkins, University of Wales Trinity Saint David, United Kingdom

Venue/Local Arrangements/Registration

Glenn Jenkins, University of Wales Trinity Saint David, United Kingdom

Simen Moene, Kingston University, UK

EUROSIM Liaison Chair

Taha Osman, Nottingham Trent University, UK

General Chair

David Al-Dabass, Nottingham Trent University, UK

IJSSST Special Issues Editor: Europe

Maurizio Naldi, University of Rome "Tor Vergata", Italy

Published as Special Issue in:

International Journal of Simulation: Systems, Science and Technology

IJSSST V20, N2S,

ISSN 1473-804x Online, ISSN 1473-8031 Print

*** * * ***

List of Published Papers

| Seq | # | Title | First author | Presenter |
|-----|----------------------------|---|---------------------------------------|---------------|
| 1 | 1570522547 | <i>Developing a Toolbox for Modeling and Simulation of Elevators</i> | Reggie Davidrajuh | Davidrajuh |
| 2 | 1570524176 | <i>The Optimum Location for Access Point Deployment Based on RSS for Indoor Communication</i> | Oras Al-ani | Al-ani |
| 3 | 1570524179 | <i>Outdoor Transmitter Localization Using Multiscale Algorithm</i> | Oras Al-ani | Al-ani |
| 4 | 1570526850 | <i>An Orchestration Framework for IoT Devices Based on Public Key Infrastructure (PKI)</i> | Justice Agyemang | Agyemang |
| 5 | 1570527724 | <i>Development of High Accuracy BiCMOS Current-Sensor and Error-Amplifier in Current-Mode DC-DC Boost Converter</i> | Chan-Soo Lee | Lee |
| 6 | 1570528023 | <i>Customized Mixed Model Stochastic Assembly Line Modelling Using Simulink Day-1</i> | Rangith Kuriakose | Kuriakose |
| 7 | 1570529394 | <i>Functional Encryption Technique in UAV Integrated HetNet: A Proposed Model Day-3</i> | Diwankshi Sharma | Gupta |
| 8 | 1570533832 | <i>Notes Recommendation e-Book System</i> | Mohammed Abdel Razek | Abdel Razek |
| 9 | 1570534187 | <i>Bluetooth and ZigBee: A Network Layer Architecture Gateway Day-3</i> | Amina Khan | Gupta |
| 10 | 1570534521 | <i>Green Supply Chain Management Practices in Developing Countries - Case Study from Jordan</i> | Hadeel Abdellatif | Abdellatif |
| 11 | 1570534657 | <i>A Conceptual Framework for Assessing Anonymization-Utility Trade-Offs Based on Principal Component Analysis</i> | Maurizio Naldi | Naldi |
| 12 | 1570534771 | <i>IR Sensors Array for Robots Localization Using K Means Clustering Algorithm</i> | Israa AL-Forati | AL-Ibadi |
| 13 | 1570534938 | <i>Interpolated Rigid Map Neural Networks for Anatomical Joint Constraint Modelling</i> | Glenn Jenkins | Jenkins |
| 14 | 1570534985 | <i>Pre-Processing for Neural Model Design in A Real Industrial Problem</i> | Valentina Colla | Maddaloni |
| 15 | 1570535122 | <i>Performance of Static Slicing Algorithms for Petri Nets</i> | Reggie Davidrajuh | Davidrajuh |
| 16 | 1570535186 | <i>Optimization Heuristic for Dynamic Vehicle Routing Problem</i> | Ludovica Adacher | Adacher |
| 17 | 1570535312 | <i>A Comparison of Exact and Heuristic Methods for a Facility Location Problem</i> | Maurizio Naldi | Naldi |
| 18 | 1570535318 | <i>Octree-based Implementation of the Monte Carlo Algorithm for Solving Three Dimensional Radiative Transport Problems on an Unstructured</i> | Kelvin Donne | Bashford |
| 19 | 1570535013 | <i>Medical-Laboratory Algorithm WTH-MO for Segmentation of Digital Images of Blood Cells: A New Methodology for Making Hemograms</i> | Ana Carolina Monteiro | Sub |
| 20 | 1570535018 | <i>Proposal of Improvement for Channels with Rician Fading Through the Methodology CBEDE</i> | Reinaldo Padilha | Sub |
| 21 | 1570534623 | <i>Challenges of the Promise of Internet of Things (IoT) in Multi-hop Communications System</i> | Chowdhury SajadulIslam | Sajadul Islam |

UKSim2018, Program at a Glance

UKSim2019 Conference Program at a Glance

Presentation Guidance

1. Presenter must demonstrate deep and detailed knowledge of the paper content by utilizing the full 20 minutes presentation time.
2. The session chair must be satisfied the presenter has answered at least one question in full to the approval of both the session chair and the participants.
3. The value of conference attendance is to get maximum feedback from participants on the significance of the research being presented.
4. Speak clearly and slowly, do not Mumble or race through the sentences, moderate your voice to make sure attendees hear every word you say without shouting.

| | |
|--|--|
| Session Code: Wed.am2.A means Wednesday morning after tea break in room A. Other Time periods: am1, am2, pm1, pm2 | Paper No: from the above table: 1, 2, 3, . 20 |
| Day-0: Tuesday 26 March 2019: 5 to 6pm, Early registration desk opens for one hour, meet at the Eagle after. | |
| Time | Day-1: Wednesday 27 March 2019 (Keynote Speaker-1 + 10 papers) |
| 9.15 - 10.45 | Wed.am1.A: (Chair: David Al-Dabass/Taha Osman): Opening session and Keynote Speakers-1 : Prof Frank Wang |
| 10.45 - 11.05 | Refreshments |
| | Room |
| 11.05 - 12.25, 4 | Wed.am2.A (Chair: Glenn Jenkins): 2, 3, 4, 18 |
| 12.30 - 1.40 | Lunch |
| 1.45 - 3, 3 | Wed.pm1.A (Chair: Taha Osman): 5, 6, 8 |
| 3 - 3.20 | Refreshments |
| 3.20 - 4.30, 3 | Wed.pm2.A (Chair: Glenn Jenkins): 10, 11, 12 |
| 4.30 | Close of day-1 & photo opportunity |
| 6 - 8.30 | Dinner at own expense, meet at the Eagle after. |
| Day-2: Thursday 28 March 2018 (8 papers) | |
| 9.10 - 10.25 | Thu.am1.A: (Chair: David Al-Dabass/Taha Osman): day-2 opening session + 19, 20, 21 |
| 10.25 - 10.45 | Refreshments |
| 10.45 - 12.25, 5 | Thu.am2.A (Chair: Taha Osman): 13, 14, 15, 16, 17 |
| 12.25 | Close of day-2 & photo opportunity |
| 12.40 | Lunch |
| 2.30pm -> | Cambridge Tour/Glenn Jenkins. Conference Dinner in College 7pm, meet at the Eagle after. |
| Day-3: Friday 29 March 2018 (Keynote-2 & 3+ 3 papers) | |
| 9.10 - 10.20 | Fri.am1.A: (Chair: David Al-Dabass/Glenn Jenkins): day-3 opening session + Keynote Speaker-3: Prof Gareth Loudon |
| 10.20 - 10.35 | Refreshments |
| 10.35 - 11.35, 3 | Fri.am2.A (Chair: Glenn Jenkins): 1, 7, 9 |
| 11.35 - 12.35, KN3 | Fri.am3.A (Chair David Al-Dabass/ Glenn Jenkins): Keynote Speaker-3: Prof Qiang Shen |
| 12.35 | Close of conference & photo opportunity |
| 12.45 | Lunch and depart |

UKSim2019, 27 to 29 March 2019, Program

| Time | Session |
|----------------------------|---|
| Wednesday, March 27 | |
| 09:15 am-10:45 am | Wed.am1.A: Opening Session and Keynote Speaker-1: Prof Frank Wang |
| 11:05 am-12:25 pm | Wed.am2.A: Papers 2, 3, 4, 18 |
| 01:45 pm-03:00 pm | Wed.pm1.A: Papers 5, 6, 8 |
| 03:20 pm-04:30 pm | Wed.pm2.A: Papers 10, 11, 12 |
| Thursday, March 28 | |
| 09:10 am-10:25 am | Thur.am1.A: Papers 19, 20, 21 |
| 10:45 am-12:25 pm | Thur.am2.A: Papers 13, 14, 15, 16, 17 |
| Friday, March 29 | |
| 09:10 am-10:20 am | Fri.am1.A: Keynote Speaker-2: Prof Gareth Loudon |
| 10:35 am-11:35 am | Fri.am2.A: Papers 1, 7, 9 |
| 11:35 am-12:35 pm | Fri.am3.A: Keynote Speaker-3: Prof Qiang Shen |

Wed.am1.A: Keynote Speaker-1: Prof Frank Wang

Chairs: David Al-Dabass (Nottingham Trent University, UK)
Taha Osman (Nottingham Trent University & School of Science and Technology, UK).

Brain-like Computer Powered by Memristors

Frank Wang ¹, Na Helian ²

¹ School of Computing, University of Kent, United Kingdom.

² School of Computer Science, University of Hertfordshire, United Kingdom.

Our memristor-based neuromorphic computation is technically positioned between the brain and the traditional computer, as shown in Fig.1. We are pushing it towards the brain direction (Brains are thought to be made of memristors [1-4]). In Fig.1, the traditional Turing machine is represented as two boxes: CPU and memory. Historically such a separation of computation and memory simplifies the machine design and exceeds the natural human brain in terms of computational performance. However, there are two sides to everything. There are two negative side-effects: the communication overhead between the two boxes (CPU and memory) and the energy consumption that may be several orders of magnitudes larger. By nature, memristor (as well as its variants) is a 2-in-1 element combining both memory and computation functions. The Adaptive Neuromorphic Architecture (ANA) is a remarkable example, in which a mem-inductor can not only memorize the past history of the stimuli but also compute the time constant (\sqrt{LC}) [5]. That is why we see a small energy consumption in the brain (it consumes only about the same amount of electric power as a night light) in contrast to that of the traditional architecture.

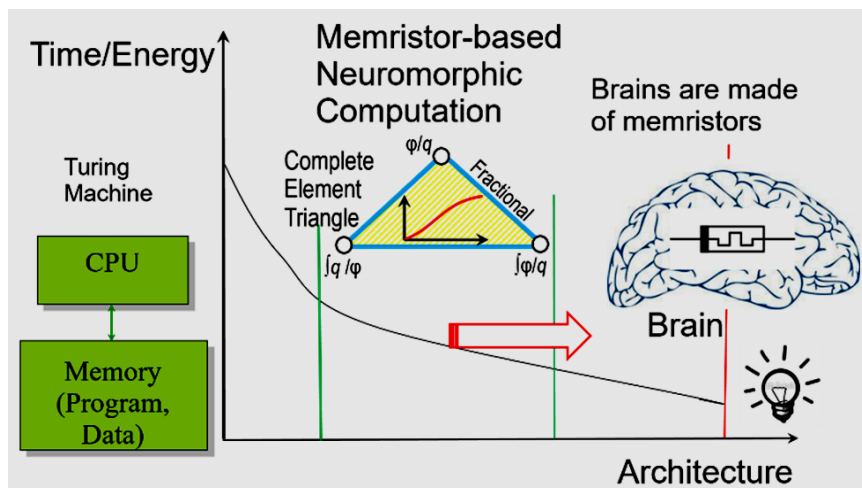


Fig.1 Our memristor-based neuromorphic computation is technically positioned between the brain and the traditional computer. Brains are thought to be made of memristors-like elements. By nature, memristor is a 2-in-1 element combining both memory and computation functions.

Deep learning was inspired by the 1981 Nobel Prize work by David H. Hubel & Torsten Wiesel, who found a cascading model in the human brain [6]. We are building a computer that works similarly to the human brain and could be useful for modern simulation and modelling. Most of previous efforts to build brain-like computers have failed because it took about the same silicon area to emulate a CMOS synapse as that needed to emulate a neuron. In theory, any realistic implementation of a synapse should ideally be at least four orders of magnitude smaller than that required to build a neuron. The invention of the memristor opens a new way to implement synapses. A vast number of memristors could be integrated together with other CMOS elements, in a brain-like machine.

References

- [1] L. Chua, "Memristor—The Missing Circuit Element" IEEE Transactions on Circuit Theory CT-18(5), 1971: 507-519.
- [2] L. Chua, V. Sbitnev & H. Kim, "Hodgkin–Huxley axon is made of memristors", Int. J. Bifurcation and Chaos 22, 1230011-1–48, 2012.
- [3] F.Z. Wang, "A Triangular Periodic Table of Elementary Circuit Elements", IEEE Transactions on Circuits and Systems, V.60, Issue 3, pp.616, 2013. DOI: 10.1109/TCSI.2012.2209734.
- [4] Frank Z. Wang, Ling Li, Luping Shi, Huaqiang Wu, and Leon O. Chua, "Φ memristor: Real memristor found", Journal of Applied Physics 125, 054504, 2019.
- [5] F. Z. Wang, L. O. Chua, X. Yang, N. Helian, R. Tetzlaff, T. Schmidt, L. Li, J. M. Carrasco, W. Chen and D. Chu, "Adaptive Neuromorphic Architecture (ANA)", Special Issue on Neuromorphic Engineering: from Neural Systems to Brain-Like Engineered Systems, Neural Networks, Vol.45, September 2013, pp.111-116, Elsevier, online in March 2013. doi.org/10.1016/j.neunet.2013.02.00.
- [6] Hubel, D. H.; Wiesel, T. N., "Receptive fields of single neurones in the cat's striate cortex". The Journal of Physiology. 124 (3): 574–591. doi:10.1113/jphysiol.1959.sp006308, 1959.

Biography

Frank Z. Wang is the Professor in Future Computing and Head of School of Computing (2010-2016), University of Kent, the UK. The School of Computing was formally opened by Her Majesty the Queen. His led school achieved an amazing result in the 2014 UK government REF (Research Excellence Framework): the research intensity was ranked 12th out of over 150 computing departments in the UK. Professor Wang's research interests include brain-like computer, memristor theory and applications, deep learning, cloud computing, big data, and green computing, etc. He has been invited to deliver keynote speeches and invited talks to report his research worldwide, for example at Princeton University, Carnegie Mellon University, CERN, Hong Kong University of Sci. & Tech., Tsinghua University (Taiwan), Jawaharlal Nehru University, Sydney University of Technology, and University of Johannesburg. In 2004, he was appointed as Chair & Professor, Director of Centre for Grid Computing at CCHPCF (Cambridge-Cranfield High Performance Computing Facility). CCHPCF is a collaborative research facility in the Universities of Cambridge and Cranfield (with an investment size of Sterling 40 million). Prof Wang and his team have won an ACM/IEEE Super Computing finalist award. Prof Wang is Chairman (UK & Republic of Ireland Chapter) of the IEEE Computer Society and Fellow of British Computer Society.



10.45 – 11.05: Refreshments

Wednesday, March 27 11:05 - 12:25

Wed.am2.A: Papers 2, 3, 4, 18

Chair: Glenn L Jenkins (Cardiff Metropolitan University, United Kingdom (Great Britain))

11:05 *The Optimum Location for Access Point Deployment Based on RSS for Indoor Communication*

Oras Ahmed Al-ani and Maan M. Abdulwahid (Middle Technique University, Iraq); Mahmood Mosleh (Electrical Engineering Technical College & Middle Technical University, Iraq); Raed A Abd-Alhameed (University of Bradford, United Kingdom (Great Britain))

In indoor wireless communication networks, the optimal locations had been known to deploy the access points (AP's) which has a significant impact on improving various aspects of network coverage, operation and management, In addition, to develop the behavioral characteristics of the wireless network. The most used approach for localization purposes was based on Received Signal Strength (RSS) measurements, which is widely used in the wireless network. As well as, it can be easily accessed from different operating systems. In this paper, we proposed an optimal AP localization algorithm based on RSS measurement obtained from different received points. This localization algorithm works as a complementary to the 3D Ray tracing model based REMCOM wireless InSite software and considered two-step localization approach, data collection phase and localization phase. Obtained result give relatively high accuracy to select the optimum location for AP compare with other selected locations. It is worth to mention that effect of different building materials on signal propagation has been considered with specifying the optimum location of deployment. Furthermore, channel characterizations that based on path losses have been considered as a confirmation for the optimum location being selected.

11:25 *Outdoor Transmitter Localization Using Multiscale Algorithm*

Oras Ahmed Al-ani and Karrar Muttair, K. (Middle Technique University, Iraq); Mahmood Mosleh (Electrical Engineering Technical College & Middle Technical University, Iraq)

In today era, demand for wireless communications has increased continuously, especially on localization services in determining optimal transmitter location through intelligent wireless communications. Using Received Signal Strength (RSS), localization of optimum transmitter location has been realized. In this paper, we simulate model for a case study, where Wireless InSite program has been used to investigate the wave propagation with the reasonable RSS. Different locations of directional antenna transmitters have been selected to get a better coverage area in the selected case study using multi- omnidirectional antenna receivers. An algorithm has been built using MATLAB program to determine average signal quality, the average received power and the probability of best receiver points which received power. We find significant effects of the changing the location of the transmitter which is affected by the environment including the presence of barriers and its related- material properties.

11:45 *An Orchestration Framework for IoT Devices Based on Public Key Infrastructure (PKI)*

Justice O Agyemang and Kponyo J. Jerry (Kwame Nkrumah University of Science and Technology, Ghana)

Internet of Things (IoT), allows communication among heterogeneous devices including everyday existing objects, embedded intelligent sensors, context-aware computing, traditional computing networks and smart objects that differ in their design, systems, protocols, intelligence, applications, vendors, and sizes. The direct connection of these heterogeneous devices to the Internet poses security risks. Some of these devices are sometimes compromised and used in attacks such as DoS. This paper presents an orchestration framework for IoT devices based on public key infrastructure (PKI) aimed at providing logical isolation of IoT devices in situations where these devices have been compromised. We evaluate the performance of the proposed framework based on the computational time of the cryptographic algorithm, performance overhead when the framework was implemented on an IoT device and access revocation/restoration time.

12:05 *Octree-based Implementation of the Monte Carlo Algorithm for Solving Three Dimensional Radiative Transport Problems on an Unstructured Mesh*

Kelvin Donne and Tim Bashford (University of Wales Trinity Saint David, United Kingdom (Great Britain))

Computational modelling of light-tissue interaction problems typically requires the determination of the volumetric deposition of incident low-energy photons and then subsequently incorporating this distribution in a time-dependent thermal calculation. In a clinical context the starting point is often an arbitrary 3D geometry approximated by a tetrahedral mesh. This paper considers the challenges of achieving a computationally efficient approach to solving the initial radiative problem.

12.30 - 1.35: Lunch

Wednesday, March 27 1:45 - 3:00

Wed.pm1.A: Papers 5, 6, 8

Chair: Taha Osman (Nottingham Trent University & School of Science and Technology, UK.

1:45 Development of High Accuracy BiCMOS Current-Sensor and Error-Amplifier in Current-Mode DC-DC Boost Converter

Chan-Soo Lee (Chungbuk National University, Korea)

This study aims at presenting a novel integrated BiCMOS amplifier and a current -sensing circuit for a high accuracy and high performance DC-DC boost converter. A high gain amplifier and an accurately sensed inductor current are obtained in the feedback control circuit. The proposed current-sensing circuit uses a simple current-mirror instead of an op-amplifier as a voltage follower so that it can provide high accuracy without the reduction of power efficiency. The chip is fabricated from the 0.35 μm 2-poly 4-metal BiCMOS process. Bipolar transistor is applied to the current sources of the sensing circuit to obtain high current driving capability. The measurement shows that the current-sensing circuit operates with an accuracy of higher than 92 % at the frequency of 50 KHz. The converter with a chip-size of 1 mm² operates at the output voltage of 4 ~ 7 V with minimum power consumption of 59mW. The HSPICE simulation results demonstrate the validity of both the current-sensor and the error amplifier that are proposed in this study.

2:10 Customized Mixed Model Stochastic Assembly Line Modelling Using Simulink

Ranjith Baby Kuriakose (University of Technology & Central University of Technology, South Africa); Hermanus Vermaak (Central University of Technology, Free State, South Africa)

Assembly lines have been critical to the successful operation of manufacturing plants over the years. This is mainly attributed to the ability of assembly lines to adjust to the needs of the industry at any given time. Therefore, it is imperative that assembly lines adjust to the era of smart manufacturing commonly termed as Industry 4.0. This latest trend in industrial revolution has many facets, changing the way products are designed, manufactured and delivered. One such standout feature of Industry 4.0, is how it has changed the way products are ordered. Industries are moving from a conventional make-to-stock approach to a make-to-order approach. This paper looks at how a customized ordering system can be modeled for a mixed model assembly line. The research is based on a case study using a water bottling plant which can bottle 500 ml and 750 ml bottles. The economic viability and a preliminary model for the project was done and documented previously. This paper is structured such that it initially provides an introduction to the research. Secondly, it provides an overview of the previous model and its limitations. Thirdly, the paper shows how the current model has been developed in MATLAB to introduce customized ordering. Finally, the results obtained from the simulation are shown. The primary aim of this research is to develop a MATLAB model for customizing the input of a water bottling plant. This model can then be used to optimize the time to manufacture water bottles and contribute to the broader research area of Mixed-Model Assembly Line Balancing

2:35 Notes Recommendation e-Book System

Mohammed Abdel Razek (Al-azhar University, Saudi Arabia); Abdullellah Al Sulaimani (King Abdulaziz University & Faculty of Educational Graduate Studies, Saudi Arabia); Redhwan Nour (Taibah University, Saudi Arabia)

Nowadays there are many teachers, students accessing e-Book through digital devices. For students, books are the main entity in teaching and learning activities. Not only adults but also children have been introduced with Digital Books. Most of the eBook readers allow to add notes; however, they do not allow to search or sort, these notes. This paper provides Notes Recommendation e-Book System which allows a user to write, search, filter and recommend notes. We use a collaborative filtering technique based on subject, user preference, and credibility.

Refreshments

Wednesday, March 27 3:20 - 4:30

Wed.pm2.A: Papers 10, 11, 12

Chairs: Glenn L Jenkins Cardiff Metropolitan University, United Kingdom
David Al-Dabass Nottingham Trent University, United Kingdom

3:20 *Green Supply Chain Management Practices in Developing Countries - Case Study from Jordan*

Hadeel Abdellatif and Stephanie Graham (Queen's University Belfast, United Kingdom (Great Britain))

Purpose-Organizations worldwide adopt different Green Supply Chain Management (GSCM) practices in response to raising environmental concerns regarding pollution, climate change, natural resources depletion, and environmental degradation. Most of GSCM research has been conducted in developed countries; only few studies addressed developing countries. There is a dearth of research in the Middle East region, and even avoid of research in Jordan. Therefore, this paper aims to fill this gap by exploring the adoption of GSCM practices in the context of a developing country which is Jordan. Design/methodology/approach-A single case study is used to collect rich and in-depth information to explore how organizations adopt GSCM practices. Data is collected through semi-structured interviews and documentation. Data is coded and analyzed using Nvivo 12. Findings - Using data from Jordan, this paper demonstrates that manufacturers in developing countries are showing interest and commitment towards protecting the environment despite the absence of governmental regulations by adopting a range of GSCM practices. Originality/value-The paper provides some insights on the adoption of GSCM practices in developing countries context.

3:40 *A Conceptual Framework for Assessing Anonymization-Utility Trade-Offs Based on Principal Component Analysis*

Maurizio Naldi and Giuseppe D'Acquisto (University of Rome "Tor Vergata", Italy)

An anonymization technique for databases is proposed that employs Principal Component Analysis, and aims at releasing the least possible amount of information, while preserving the utility of the data released in response to queries. The general scheme is described, and alternative metrics are proposed to assess utility, based respectively on matrix norms; correlation coefficients; divergence measures, and quality indices of database images. This approach allows to properly measure the utility of output data and incorporate that measure in the anonymization method.

4:00 IR Sensors Array for Robots Localization Using K Means Clustering Algorithm

Israa Sabri Abdulameer AL-Forati (University of Basrah & Basrah Iraq, Iraq); Abdulmuttalib Rashid (University of Basrah, Iraq); Alaa Al-Ibadi (The University of Salford, United Kingdom (Great Britain))

The position of multi-robot system in an indoor localization system is successfully estimated using a new algorithm. The localization problem is resolved by using an array of IR receiver sensors distributed uniformly in the environment. The necessary information about the localization development is collected by scanning the IR sensor array in the environment. The scheme of scanning process is done column by column to recognize and mention the position of IR receiver's sensors, which received signals from the IR transmitter that is fixed on the robot. This principle of scanning helps to minimize the required time for robot localization. The k-means clustering algorithm is used to estimate the multi-robot locations by isolating the labeled IR receivers into clusters. Basically the multi-robot position is estimated to be the middle of each cluster. Simulation results demonstrate the advances algorithm in estimation the multi-robot positions for various dimensional IR receiver's array.

Close of Day-1 and Photo Opportunity

Thursday, March 28 9:10 - 10:25

Thur.am1.A: Day-2 Opening Session and Papers 19, 20, 21

Chairs: David Al-Dabass Nottingham Trent University, United Kingdom,
Taha Osman (Nottingham Trent University & School of Science and Technology, United Kingdom)

11:35 *Medical-Laboratory Algorithm WTH-MO for Segmentation of Digital Images of Blood Cells: A New Methodology for Making Hemograms*

Ana Carolina Monteiro, Ana (University of Campinas, Brazil); Yuzo Iano (UNICAMP, Brazil); Reinaldo Padilha, Rei (University of Campinas, Brazil); Rangel Arthur (Universidade Estadual de Campinas - Faculdade de Tecnologia, Brazil)

Inter-disciplinarity has been responsible for solving several problems in the medical areas, being that many of which are derived from the use of engineering techniques. One problem that affects a large part of the world's population is the difficulty of access to health, often caused by a lack of financial resources. One of the most requested medical tests due to its ability to detect a wide range of diseases is the hemogram. However, this methodology is often inaccessible due to its cost, which for disadvantaged populations can be seen as high. Based on this, the present study aims to develop an algorithm for the segmentation of digital images of blood smears, which is capable of detecting and counting erythrocytes, leukocytes and platelets simultaneously, with high accuracy and low cost. The algorithm was developed in the Matlab software environment, based on the Watershed Transform, Transformed Hough methodologies and operations methodologies. The hybrid algorithm was named WHT-MO. The experiments were conducted using 10 digital blood smear images. The results showed high accuracy (90% and 100%) in the detection of the three cell types. Therefore, the WHT-MO algorithm demonstrates that the hemogram can be performed using a simple computer, dispensing with the need to acquire high-cost hematological equipment, which directly impacts the final price of the examination for patients. In addition, high accuracy demonstrates that it is possible to perform the hemogram at a reduced cost without loss of quality and reliability.

11:55 Proposal of Improvement for Channels with Rician Fading Through the Methodology CBEDE

Reinaldo Padilha, Rei (University of Campinas, Brazil); Yuzo Iano (UNICAMP, Brazil); Ana Carolina Monteiro, Ana (University of Campinas, Brazil); Rangel Arthur (Universidade Estadual de Campinas - Faculdade de Tecnologia, Brazil)

Many technological advances have aided in the evolution of society and in the improvement of many services. Where many of the existing methodologies present large consumption of computational memory as well as slowness in sending data. With this focus, the present study aims to develop DES (Discrete Event Simulation) based model. This model is called CBEDE (Coding of Bits for Entities by means of Discrete Events) and aims to improve the transmission of content in wireless telecommunication systems. The present study implemented a model CBEDE applied to a system, and advanced modulation format DBPSK in a simulation environment, the Simulink simulation environment of the MATLAB software, improving the transmission of data, through a pre-coding process of bits applying discrete events in the signal before of the modulation process. The signal transmission on the channel occurs in the discrete domain with the implementation of discrete entities in the process of bit generation applied at a low level of abstraction in a wireless telecommunication system. The simulation considered the advanced Differential Binary Phase Shift Keying (DBPSK) as the modulation format for signal transmission in an AWGN channel. The results show improvements of 79.89% in memory utilization, related to information compression, in the context of the research.

12:15 Challenges of the Promise of Internet of Things (IoT) in Multi-hop Communications System

Chowdhury Sajadul Islam (UU, Bangladesh); Md. Sarwar Hossain Mollah (DIU, Bangladesh)

This paper centers around solutions for the Internet of Things (IoT) challenges in multi-hop connections and the execution of a physical layer network coding (PNC) model for relay broadcasts. For multi-hop transmission, PNC is contemplated as a vigorous solution for multi-hop packet transaction in the linear network topology. The PNC usage has numerous troubles, almost remarkably Carrier-Frequency Offsets (CFO) and timing synchronization. Within the Multiple Access (MA) phase, the relay has to acquire a signal from 2 sources, tracking the CFOs from 2 transmitters when their signals are applied to one of the principal complications. Focusing on practical and implementation concerns of PNC systems, various challenges have been covered and a Software Defined Radio (SDR); PNC technology established on Universal Software Radio Peripheral (USRP) techniques are proposed and applied. Afterward, big computer simulation and experimental outcomes are depicted to evaluate the operation of the urged algorithms in contrast with presently applied technology.

10.25 – 10.45 Refreshments

Thursday, March 28 10:45 - 12:25

Thur.am2.A: Papers 13, 14, 15, 16, 17

Chairs: Glenn L Jenkins (Cardiff Metropolitan University, United Kingdom)
Taha Osman (Nottingham Trent University & School of Science and Technology, United Kingdom)

10:45 *Interpolated Rigid Map Neural Networks for Anatomical Joint Constraint Modelling*

Glenn L Jenkins and Paul Angel (Cardiff Metropolitan University, United Kingdom (Great Britain))

The demand for accurate individual and general kinematic joint models is increasing with growing applications in fields such as animation, biomechanics, motion capture, ergonomics and robot human interaction modelling. Many approaches have exploited unit quaternions to eliminate singularities when modelling orientations between limbs at a joint, leading to the development of a number of novel joint constraint validation and correction methods. A number of machine learning approaches have been applied to this modelling problem, as depending on training data either individual or general joint models can be created. Recent work has demonstrated the use of Rigid Maps to model regular conical constraints on the orientation of the limb. In this paper we extend this work deploying a modified Rigid Map Network with a continuous output.

11:05 *Pre-Processing for Neural Model Design in A Real Industrial Problem*

Valentina Colla (Scuola Superiore Sant'Anna, Italy); Silvia Cateni (Scuola Superiore Sant'Anna, Italy); Antonella Vignali and Alessandro Maddaloni (Scuola Superiore Sant'Anna, Italy)

In the last years, the artificial neural networks have been effectively applied to several industrial problems in order to improve knowledge and get a deeper insight into correlations among different factors which affect production processes. In many applications Neural Networks are applied to predict the relationship between available input process variables and the target to be forecasted. Data pre-processing is an important step in developing a neural network application, which could affect the accuracy and the results of the developed models and applications. In the present paper an approach is proposed for data pre-processing, concerning a particular application related to the steel production. Such approach is tested on one row dataset coming from a real industrial context and the obtained results demonstrate the effectiveness of an accurate and appropriate pre-processing phase.

11:25 *Performance of Static Slicing Algorithms for Petri Nets*

Reggie Davidrajuh and Albana Roci (University of Stavanger, Norway)

This paper focuses on algorithms for static slicing of Petri Nets. This paper presents the implementation of some of these algorithms on the General-purpose Petri Net Simulator (GPenSIM). Also, a new place-invariant based algorithm for static slicing is presented which is more robust to changes in the selection criterion, thus more suitable for model verification stages. However, the experiments presented in the latter part of this paper suggest that all the known static algorithms are impractical for verification of Petri Net models of large real-life systems. Since most of the real-life discrete-event dynamic systems (notably, manufacturing systems) are cyclic (or repetitive), and the Petri Net models of those systems are event graphs. The existing static slicing algorithms are not useful for event graphs as they return the entire Petri Net as the slice. The other type of slicing algorithms - the dynamic algorithms - only works for specific instances of Petri Nets; thus, the applicability of dynamic slicing for model checking is also limited. Therefore, this paper concludes that more work is needed on the static slicing for model verification of large real-life discrete-event systems.

11:45 Optimization Heuristic for Dynamic Vehicle Routing Problem

Ludovica Adacher (Roma Tre, Italy)

The management of goods delivery is becoming very important. The on time delivery is a critical criterion taking into account customers point of view. But the delivery company must also pay attention to the economic considerations. There are many variations on this issue, but all of them are of great computational complexity. It means that the exact solutions are unavailable for large size problem. The paper proposes the Surrogate Method for the Dynamic Vehicle Routing Problem (DVRP). The aim of DVRP is to find a set of routes to serve multiple customers while the travelling time between point to point may vary during the process. The aim is to schedule the vehicle routes minimizing the number of the required vehicles and the completion time. The presented approach uses some common assumptions but different optimization method. Finally, the proposed heuristic is compared with the genetic algorithm.

12:05 A Comparison of Exact and Heuristic Methods for a Facility Location Problem

Maurizio Naldi (University of Rome "Tor Vergata", Italy); Andrea Pacifici (Università di Roma "Tor Vergata", Italy); Gaia Nicosia and Simone Argenziano (Università Roma Tre, Italy)

We formulate a facility location problem where the demand of any single client must be allocated to a single facility and a prize is obtained by allocating the demand of a client to a certain facility, i.e. a prize-based variant of the Single Source Capacitated Facility Location Problem. For this problem we pursue both an exact approach through Integer Linear Programming and a heuristic approach based on a local search algorithm. We compare both approaches by considering 50+ instances. The heuristic approach allows to obtain a reduction of the computational time exceeding hundredfold in 64% of instances and tenfold in 92% of instances. The time reduction is obtained with a small sacrifice in the value of the objective function that is achieved, smaller than 10% in nearly 70% of cases.

Close of Day-2 and Photo opportunity

Lunch and

Cambridge Tour: Book at registration desk

Friday, March 29 9:10 - 10:20, Fri.am2.A, Keynote Speaker-2, Prof Gareth Loudon

Chairs: David Al-Dabass (Nottingham Trent University, United Kingdom)
Glenn L Jenkins (Cardiff Metropolitan University, United Kingdom)

The Design and Role of Simulated Environments in Evaluating New Design Concepts

Gareth Loudon

**Cardiff School of Art and Design, Cardiff Metropolitan University
Email: gloudon@cardiffmet.ac.uk**

The user testing of a new design concept and prototype is an important part of the design process to help discover if and why certain aspects of a new design do not fully meet the needs and satisfaction of target users - and to help find out what needs to be changed. However, how user testing is conducted is also an important factor to consider, as context can play a part in the insights gained. Testing in a traditional laboratory environment provides control, confidentiality, and ease of conducting repeatable tests, but often does not discover all key design flaws as some flaws are only revealed when a prototype is tested in the real context of use. However, testing a new design prototype in a real context, during the design and development process, is often impossible - for example, the design of a new surgical medical device for use in an operating theatre.

To address these challenges we have developed a new laboratory, called the Perceptual Experience Laboratory (PEL), which enables the evaluation of new design concepts in a simulated environment. The aim is to have the advantages of laboratory based testing, but also to consider the importance of context. PEL uses a mixed reality approach to simulate context, combining a 200 ° panoramic visual surround screen with physical objects. In addition, it simulates context through the use of artificially generated smells, temperature control and 3D ambisonics to try and create a sense of immersion and presence. The talk will share details on design features of PEL; lessons learnt so far in terms of key design features affecting feelings of immersion and presence; and how the simulated environment has already helped in the new design and evaluation of products.

Biography

Gareth Loudon is a Professor of Creativity at the Cardiff School of Art and Design, Cardiff Metropolitan University and one of the co-founders of the Human-Centred Design research group at the university. He is also co-founder and Director of the Centre for Creativity Ltd that undertakes research, training and consultancy in key areas of creativity. Gareth's research interests focus on creativity and the innovation process, combining ideas from anthropology and psychology, engineering and design. Previously he worked for Apple Research and Ericsson Research in the design and development of new software and computer embedded products. Gareth has over 30 years of experience in academic and industrial research and has taken several research ideas all the way through to commercial products for companies, including Apple. He has also helped many companies with their innovation strategies and in the development of new products and services.



Gareth has several patents to his name and over 70 publications in total. He has won many awards including Best Software Product Award at COMDEX Asia, and for his concept design work from IDSA/BusinessWeek. Gareth is a Chartered Engineer, a Fellow of the Institution of Engineering and Technology and a Fellow of the Higher Education Academy.

10.20 - 10.35: Refreshments

Friday, March 29 10:35 - 11:35

Fri.am2.A: Papers 1, 7, 9

Chairs: Glenn L Jenkins (Cardiff Metropolitan University, United Kingdom)
David Al-Dabass (Nottingham Trent University, United Kingdom)

10:35 *Developing a Toolbox for Modeling and Simulation of Elevators*

Reggie Davidrajuh (University of Stavanger, Norway)

The objective behind this paper is to present a MATLAB Toolbox for elevator simulations; this toolbox is known as 'ElevatorSIM', and it is still under development. ElevatorSIM is based on the GPenSIM, which is software for modeling, simulation, performance analysis, and control of discrete-event systems. In this paper: firstly, the software GPenSIM (General-purpose Petri Net Simulator) is introduced. Secondly, the toolbox ElevatorSIM is presented; the components of ElevatorSIM and some of the functions are also presented. Finally, an application example is given to show the usefulness of the toolbox. The application example compares the performance of two different elevator algorithms. The idea behind the development of ElevatorSIM is to measure the performance of elevators through simulations; for this purpose, steps have been taken to collaborate with a high-tech elevator company. However, this paper - the first paper on ElevatorSIM - is to introduce the existence of the toolbox.

10:55 *Functional Encryption Technique in UAV Integrated HetNet: A Proposed Model*

Diwankshi Sharma, Aabid Rashid and Sumeet Gupta (Shri Mata Vaishno Devi University, India); Sachin Kumar Gupta (Shri Mata Vaishno Devi University (SMVDU), Katra, J&K, India)

In the dense urban scenarios, the data users are increasing at an exponential rate. Owing to an increase in the variety of users, a shift occurred from traditional homogeneous network to Heterogeneous Network (HetNet). But the prime concern of HetNets is to provide better Quality of Service (QoS) parameters to the users. For achieving better QoS results, Unmanned Aerial Vehicles (UAVs) can be used along with HetNets. The HetNet deployed can be assisted by UAV so that the users can be managed properly. However, in HetNets assisted by UAVs, plenty of users and devices are operating. In such a huge variety, intruder nodes can operate very easily and can spread various malicious activities in the network. This makes the overall communication in the network vulnerable to various kinds of security attacks. Hence, to secure this communication, we will be using Functional Encryption (FE) technique that will help to secure the data against the intrusion attacks. In FE technique, the decryption of messages allows the users to learn only about particular information in the message. The need to decrypt the whole message is not required. In this paper, the whole process of implementing FE in UAV-HetNet is proposed in two phases: first one between User Equipment (UE) & Micro Base Station (MBS) and second one between MBS & UAV. The proposed idea will be validated using Automated Validation of Internet Security Protocols and Applications (AVISPA) tool. High-Level Protocol Specification Language (HLPSL) codes will be written for validation. It is expected that after implementation of FE concept UAV integrated HetNet will be able to provide secure communication in the dense urban area.

11:15 Bluetooth and ZigBee: A Network Layer Architecture Gateway

Amina Khan, Swastik Gupta and Sumeet Gupta (Shri Mata Vaishno Devi University, India); Sachin Kumar Gupta (Shri Mata Vaishno Devi University (SMVDU), Katra, J&K, India)

Deployment of Wireless Sensor Network (WSN) plays a key role in the efficient development of solutions for many domains like home automation, disaster management, healthcare, environment monitoring, etc. Improvement in technology has resulted in a major focus on smart and energy efficient buildings wherein one of the major concerns is efficient power management. On-line, "any place any time", monitoring of the power status of various equipment in large buildings using smartphones/tablets requires remote communication between local sensor networks and remote user which may be operating on diverse network protocols like ZigBee and Bluetooth. There is a need for an efficient Gateway for mediating communication between sensor networks, which work generally using IEEE 802.15.4 based ZigBee and the users, who normally use equipment with support for either IEEE 802.15.1 or IEEE 802.11. The architecture of an efficient Gateway between IEEE 802.15.4 & IEEE 802.15.1 is presented in this paper with details of the data flow mechanism between the Bluetooth and ZigBee gateway. The proposed gateway mechanism is capable of converting IEEE 802.15.4 protocol data to IEEE 802.15.1 protocol data and vice-versa and is flexible enough that it can be used in any network that has Bluetooth enabled facility at its sink node

Friday, March 29 11:35 - 12:35, Fri.am3.A: Keynote Speaker-3: Prof Qiang Shen

Chairs: David Al-Dabass (Nottingham Trent University, United Kingdom)
Glenn L Jenkins (Cardiff Metropolitan University, United Kingdom)

Feature Selection: Harmony Search Based Approach

Prof Qiang Shen

**Director, Institute of Mathematics, Physics and Computer Science
Aberystwyth University, Wales, UK.
Email: qqs@aber.ac.uk**

Abstract

Feature selection (FS) addresses the problem of selecting those system descriptors that are most predictive of a given outcome. Unlike other dimensionality reduction methods, with FS the original meaning of the features is preserved. This has found application in tasks that involve datasets containing very large numbers of features that might otherwise be impractical to model and process (e.g., large-scale image analysis, text processing and Web content classification), where feature semantics play an important role.

This talk will focus on the development of FS mechanisms based on harmony search. Such techniques provide a powerful means by which multiple feature subsets can be obtained simultaneously, offering significant flexibilities for systems modelling, including applications for regression and classification. In addition to introducing the basic concepts of harmony search-based FS (HSFS), the talk will extend to covering the topics of feature selection ensembles and learning classifier ensembles inspired by HSFS. It will conclude with an outline of opportunities for further development.

Biography

Professor Qiang Shen received a PhD in Knowledge-Based Systems and a DSc in Computational Intelligence. He holds the Established Chair of Computer Science and is Pro Vice-Chancellor: Faculty of Business and Physical Sciences at Aberystwyth University. He is a Fellow of the Learned Society of Wales and a member of the Computer Science and Informatics panel for the UK Research Excellence Framework (2008-2014 and 2014-2021). He has been a long-serving Associate Editor or Editorial Board member of many leading international journals (e.g., IEEE Transactions on Cybernetics and IEEE Transactions on Fuzzy Systems), and has chaired and given keynotes at numerous international conferences.



Professor Shens current research interests include: computational intelligence, learning and reasoning under uncertainty, pattern recognition, data modelling and analysis, and their applications for intelligent decision support (e.g., space exploration, crime detection, consumer profiling, systems monitoring, and medical diagnosis). He has authored 2 research monographs and over 380 peer-reviewed papers, including an award-winning IEEE Outstanding Transactions paper. He has served as the first supervisor of 60+ PDRAs/PhDs, including one UK Distinguished Dissertation Award winner.

12.35 Close of Conference, Photo Opportunity

Lunch and Depart.