Special Issue on Selected Papers of the Thirteenth International Conference on Computer and Information Technology (ICCIT 2010)

Guest Editorial

Syed Mahfuzul Aziz
(Lead Guest Editor)
School of Electrical & Information Engineering, University of South Australia
Mawson Lakes, SA 5095, Australia

Vijayan K. Asari
Department of Electrical & Computer Engineering, University of Dayton
300 College Park, Dayton, OH 45469-0232, USA

Alamgir Hossain
School of Computing, Engineering and Information Sciences, Northumbria University
Newcastle Upon Tyne, NE1 8ST, UK

Mohammad Ataul Karim
Office of Research, Old Dominion University
4111 Monarch Way #203, Norfolk, VA 23508, USA

Mariofanna Milanova
Department of Computer Science, University of Arkansas at Little Rock
EIT 564, 2801 S. University Avenue, Little Rock, AR 72204, USA

Computers and information technology (IT) are the key factors influencing the growth of the modern world by accelerating innovations in almost all sectors of life. Introduction of new computational methodologies and architectural optimizations in the hardware and software arena is leading to more powerful automations in both industrial and public sectors shaping economic, social and cultural growth. The optimum use of emerging technological developments in the area of computers and information technology also play an important role in supporting human health care and medical sciences. The availability of advanced modelling methodologies with high performance algorithms and data processing techniques provides an appropriate platform for understanding natural phenomena and environmental issues. These are becoming possible due to outcomes of various research and development activities being conducted by scientific communities around the world. These research findings should be shared with the public for enabling further developments. Since 1997 the series of IEEE International Conferences on Computer and Information Technology (ICCIT) being organized by different public and private universities in Bangladesh has been successful in bringing together academics, researchers, IT professionals and IT managers to disseminate state of the art research activities and outcomes in these fastest growing fields.

This Special Issue presents selected papers from the Thirteenth International Conference on Computer and Information Technology (ICCIT 2010) held at the Ahsanullah University of Science and Technology (AUST), Dhaka, Bangladesh during December 23-25, 2010. The first one of this conference series was held in Dhaka, Bangladesh, in 1998, which evolved from the National Conference on Computer and Information Systems (NCCIS) held in 1997 at the Dhaka University, Bangladesh. Since then the conference has grown to one of the largest computer and IT related research conferences in the South East Asian region, with participation of academics and researchers from many countries around the world. Authors are required to submit full length papers to the conference for review. A double blind review process is followed whereby each paper is reviewed by at least two independent reviewers of high international standing. The acceptance rate of papers in recent years has been around 33% or less. This is an indication of the quality of work in the papers accepted for the conference. The proceedings of ICCIT have been included in IEEExplore since 2008, enhancing the visibility of research activities of the participating researchers with possible citations in a wider sense.

In 2010, a total of 410 full papers were submitted to the conference of which 136 were accepted after reviews conducted by an international program committee comprising of 81 members from 16 countries. From the 136 papers accepted for the conference 37 highly ranked papers were invited for the special issues of *Journal of Communications,*

Journal of Computers, Journal of Multimedia, and *Journal of Networks*. Ten papers were categorized for the special issue of the *Journal of Computers*. The authors were invited to enhance their conference papers significantly, with at least 30% extension, and submit the same for review. Only six papers were successful in meeting the expectations of the review process and have been selected for inclusion in this special issue. The authors of these papers represent academic and/or research institutions from Bangladesh, Canada and Japan. These six papers cover three domains of computing namely Content Addressable Memory (CAM), Fuzzy Logic Control and Application Specific Algorithms.

The first paper in this special issue is titled "An Energy Efficient Design of High-Speed Ternary CAM Using Match-Line Segmentation and Resistive Feedback in Sense Amplifier" by Syed Iftekhar Ali and M. S. Islam. It presents the design of a low energy high-speed content addressable memory. The sensing scheme in the design uses a selective pre-charge approach which compares the ternary CAM words to eliminate the mismatched words from further comparison. A positive feedback used in the sense amplifiers speeds up the search operation and reduces energy consumption. The remaining portions of those words which were matched in the previous phase are scanned to find the fully matched words. Lower resistance in the charging path of the sense amplifier in the second phase causes fast match detection. This approach shows significant speed enhancement and energy reduction when compared to other classical state of the art methods at the cost of insignificant area overhead and small voltage margin degradation.

The next two papers are in the area of modelling and/or design of Fuzzy Logic Controllers. The paper titled " Modelling and Control of a Two-link Flexible Manipulator using Fuzzy Logic and Genetic Optimization Techniques" by Tahmina Zebin and M. S. Alam presents a theoretical investigation into the dynamic modelling and characterization of a constrained two-link flexible manipulator using the finite element method. A fuzzy logic control strategy based on Genetic Algorithm (GA) has been presented to reduce the end-point vibration of a flexible manipulator without sacrificing its speed performance. An uncoupled fuzzy logic controller approach has been employed with individual controllers at the shoulder and the elbow link utilizing hub-angle error and hub-velocity feedback. The fitness function of GA optimization process has been formed by taking weighted sum of multiple objectives to trade off between system overshoot and rise time. The second paper in the category of Fuzzy Logic Control was "Design and Implementation of an Effective Fuzzy Logic Controller based on Quantum Inspired Evolutionary Algorithm" by Pintu Chandra Shill, M. Amjad Hossain, M. Kowsar Hossain, M. Faijul Amin, and Kazuyuki Murase. This paper parents a new approach based on quantum inspired evolutionary algorithm for effective selection and definition of fuzzy if-then control rules as well as the shapes of membership functions (MFs) to design fuzzy logic controllers (FLCs). It is a self-learning adaptive method and decomposes a problem in such a way that it leads to more effective knowledge acquisition and improved control performance with the FLCs. The effectiveness of the self-learning adaptive method has been verified by employing a standard test-bed namely the truck backer-upper problem. It also demonstrates the effect of different fuzzification and defuzzification methods on the response of the FLCs. The center of gravity (COG) and modified COG are used as defuzzifier to analyze the results of the fuzzy controller.

There are three papers in the category of Application Specific Algorithms. The first paper titled "A Tableau Based Automated Theorem Prover Using High Performance Computing" by M. Zahidul Islam, Ahmed Shah Mashiyat, Kashif Nizam Khan, and S.M. Masud Karim presents a powerful automated theorem proving systems capable of solving immensely difficult problems. This paper describes a detailed implementation of a sequential tableau algorithm for propositional and first order logic using a procedural language rather than using a logic programming language. It illustrates a tableau based proof system in a distributed environment using the Message Passing Interface. Two distinct approaches for parallel and distributed implementation have also been investigated. The second paper in this category was the paper titled "Efficient *k*-dominant Skyline Computation for High Dimensional Space with Domination Power Index" by M. Anisuzzaman Siddique and Yasuhiko Morimoto, which addresses the problem of k-dominant skyline objects for high dimensional dataset. The new algorithm can efficiently compute k-dominant skyline queries to reduce the pair-wise comparison between the k-dominant skyline objects and the dataset. By applying domination power strategy, a huge number of comparisons between the k-dominant skyline objects and the dataset have been reduced. The third paper titled "Automated Essay Scoring Using Generalized Latent Semantic Analysis" by M. Monjurul Islam, and A. S. M. Latiful Hoque presents the development of an Automated Essay Grading (AEG) system using Generalized Latent Semantic Analysis which makes n-gram by document matrix instead of word by document matrix. The performance of the system has been evaluated using details representation. The new AEG system achieves higher level of accuracy as compared to human grader.

Twelve reviewers from five countries have assisted the guest editors in reviewing the papers submitted to the Special Issue during two rounds of review processes. They have contributed immensely to the process by responding to the guest editors in the shortest possible time and by dedicating their valuable time to ensure that the Special Issue contains high-quality papers with significant contributions. The guest editors would like to express their sincere gratitude to all the reviewers, namely: M.S. Hasan, Abusaleh M. Jabir, Darak Sumit Jagdish, Joarder Kamruzzaman, A.S. Madhukumar, Babu Mailachalam, Hau Ngo, Minh Duc Pham, Vinod A. Prasad, Praveen Sankaran, Hasan Shaheed, and N.H. Siddique.

Editor Biographies

Syed Mahfuzul Aziz received Bachelor and Masters Degrees, both in electrical & electronic engineering, from Bangladesh University of Engineering & Technology (BUET) in 1984 and 1986 respectively. He received Ph.D. degree in electronic engineering from the University of Kent (UK) in 1993 and a Graduate Certificate in higher education from Queensland University of Technology in 2002. He was a Professor in BUET until 1999, and led the development of the teaching and research programs in integrated circuit design in Bangladesh. He joined the University of South Australia in 1999, where he is currently an associate professor. In 1996, he was a visiting scholar at the University of Texas at Austin when he spent time at Crystal Semiconductor Corporation designing advanced CMOS integrated circuits. He has led many industry sponsored projects, and has attracted research funding from the Australian Research Council, Australian Defence Science and Technology Organisation, and the Cooperative Research Centre, Australia. Prof Aziz has authored over 100 research papers. His research interests include digital CMOS IC design and testability, modelling and design of high performance processors, biomedical engineering and engineering education. He is currently leading multidisciplinary research teams in biomedical engineering projects related to characterisation of gut function and profiling of bone tissue oxygenation. He is a senior member of IEEE and has received numerous professional and teaching awards including the *Prime Minister's Award for Australian University Teacher of the Year (2009)*. Prof Aziz served as member of the program committee for many international conferences and was the organising secretary of the inaugural ICCIT in 1998. Among the journals he has reviewed in the last five years are the *IEEE Transactions on Computer, IEEE Transactions on Image Processing, IEEE Transactions on Education, IEEE Communications Letters, Electronics Letters, Computers & Electrical Engineering – An International Journal.*

Vijayan K. Asari is the Ohio Research Scholars Endowed Chair in Wide Area Surveillance and Professor in Electrical and Computer Engineering at the University of Dayton, Dayton, Ohio, USA, and Director of Vision Lab at UD. He received the Bachelor's degree in electronics and communication engineering from the University of Kerala (College of Engineering, Trivandrum), India, in 1978, the M. Tech and Ph. D degrees in electrical engineering from the Indian Institute of Technology, Madras, in 1984 and 1994 respectively. He had been working as an Assistant Professor in Electronics and Communications at the University of Kerala (TKM College of Engineering), India. In 1996, he joined the National University of Singapore as a Research Fellow and led the research team for the development of a vision-guided microrobotic endoscopy system. He joined the School of Computer Engineering, Nanyang Technological University, Singapore in 1998 and led the computer vision and image processing related research activities in the Center for High Performance Embedded Systems at NTU. Dr. Asari joined Old Dominion University in fall 2000 as an Associate Professor in Electrical and Computer Engineering and promoted to Full Professor in 2007. He joined the University of Dayton in February 2010. He has published more than 290 research articles including 58 peer reviewed journal papers. His current research interests include signal processing, image processing, computer vision, pattern recognition, neural networks, and high performance and low power digital architectures for application specific integrated circuits. Dr. Asari is a Senior Member of the IEEE, Senior Member of the Society of Photo-Optical Instrumentation Engineers (SPIE), and Member of the IEEE Computational Intelligence Society (CIS), IEEE Computer Society, IEEE Circuits and Systems Society, and the American Society for Engineering Education (ASEE). He was awarded two United States patents in 2008 with his former graduate students.

M. Alamgir Hossain is a Professor of Computer Science in the Northumbria University, Newtcastle Upon Tyne, UK. He received the DPhil degree from the University of Sheffield. Prior to this he has held academic positions at Sheffield University, UK (Research Fellow); University of Bradford, UK (Senior Lecturer); Sheffield Hallam University, UK (Senior Lecturer) and University of Dhaka, Bangladesh (Chairman & Associate Professor of the Computer Science & Engineering Department). He also served in the University Lumiere Lyon 2, France (Visiting Professor) and MDIS, Singapore (guest lecturer). He has extensive research experience in computational intelligence, system biology, optimisation, internet security, real-time and adaptive control. He led two large EU funded projects: eLINK (about 5.5 million EURO) which has ten partners from Asia and Europe and EAST-WEST (Asia link) project of about 400K with six partners from Asia and EU countries. Prof. Hossain is currently supervising five PhD students mostly to the area of intelligent systems, Systems Biology, Internet security and optimisation. In the past, he was involved with various funded research projects and joint research with companies, including Balfour Beaty Rail, Goodrich Engine Design, Bobtec Ltd, Aramco (Saudi Arabia), NEC (Japan) etc. Prof. Hossain acted as programme chair, organising chair and IPC member of various international conferences. He is currently serving as chair of advisory board of SKIMA 2011 and as an editor and member of the editorial board of three journals. He has reviewed many journal papers, including IEEE transaction on SMC, Networking, Aerospace and Electronic Systems, IET journals, Elsevier Science etc. Prof. Hossain has published over 150 refereed research articles and 12 books. He received the "IET- F C Williams 1996" award for a journal paper and 'Best Paper Award' for his CSBio 2010 conference paper. He is a member of IEEE and Secretary of the CLAWAR Association.

Mohammad Ataul Karim is Vice President for Research of Old Dominion University in Norfolk, Virginia. Until 2004, he served as dean of engineering at the City College of New York of the City University of New York. His research areas include information processing, pattern recognition, computing, displays, and electro-optical systems. Professor Karim is author of 18 books, 7 book chapters, and over 350 articles. He is North American Editor of *Optics & Laser Technology* and an Associate Editor of the *IEEE Transactions on Education*. He has served as guest editor for over 25 journal special issues. Professor Karim is an elected fellow of the Institute of Electrical and Electronics Engineers, Optical Society of America, Society of Photo-Instrumentation Engineers, the Institute of Physics, the Institution of Engineering & Technology, and Bangladesh Academy of Sciences. He received his BS in physics in 1976 from the University of Dacca, Bangladesh, and MS degrees in both physics and electrical engineering, and a Ph.D. in electrical engineering from the University of Alabama respectively in 1978, 1979, and 1981.

Mariofanna Milanova is a professor of Computer Science in the Department of Computer Science at the University of Arkansas at Little Rock, USA. She received her M. Sc. degree in Expert Systems and AI in 1991 and her Ph.D. degree in Computer Science in 1995 from the Technical University, Sofia, Bulgaria. Professor Milanova did her post-doctoral research in visual perception at the University of Paderborn, Germany. She had grants from the German Research Foundation, the Brazilian FAPESP State of Sao Paulo Research Foundation, the US National Science Foundation, the European Community, NATO, from the US Department of Homeland Security and from US Air Force. Dr Milanova is a Senior Member of the IEEE and Computer Society, member of IAPR, member of the IEEE Women in Engineering, member of the Society of Neuroscience and a member of the Cognitive Neuroscience Society. Milanova serves as a book editor of two books and associate editor of several international journals. Her main research interests are in the areas of artificial intelligence, biomedical signal processing and computational neuroscience, computer vision and communications, machine learning, and privacy and security based on biometric research. She has published and co-authored more than 80 publications, over 43 journal papers, 11 book chapters, numerous conference papers and 2 patents.