GUEST EDITORIAL PREFACE

Special Issue on Computing Solutions to Tackle Real-Time and Critical Problems
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The 2013 IEEE Jordan Conference on Applied Electrical Engineering and Computing Technologies (AEECT) was held at the University of Jordan, Amman, Jordan from 3 to 5, December, 2013. This conference is the second of a series of biannual conferences organized by the IEEE – Jordan Section. The section plans to organize the next AEECT conference in December 2015.

AEECT 2013 focused on using technology for solving national & regional problems by discussing solutions offered by global experts. The focus of the conference reflects the importance of the use of electrical engineering and computing technologies in solving many technical problems that face Jordan and other countries.

This international conference aims to provide a unique forum to discuss practical approaches and state-of-the-art findings in using these technologies to solve problems of national priority related to energy, information and communications, management, health, business, and other areas.

AEECT 2013 was divided into 5 tracks: Communication & Networking, Control & Mechatronics, IT Applications & Systems, Power & Energy Systems, and Signal Processing & Applications.

AEECT 2013 has received 153 papers in its five tracks. Each of these papers was sent to at least three expert reviewers. Out of the 153 received papers, only 64 papers were accepted for inclusion in the printed conference proceedings and for presentation in the twelve technical sessions. Successfully presented papers were also published in IEEE Xplore Digital Library.

The conference program had also six distinguished keynote speakers who delivered interesting speeches in Semiconductor Research, Unmanned Ground Vehicle, Biomedical engineering for optogenetic implants, Performance of Grids and Clouds, Social Serious Game; and Optical Communications.

Authors of the papers that have received high score in the reviewers' evaluation have been invited to submit an extended version

for this special issue. Each of these extended papers was sent to three expert reviewers. Only 40% of the invited papers were accepted after guaranteeing at least 40% extension from the conference version.

The lead article, "*Diagnosis and Classification of Chronic Renal Failure Utilising Intelligent Data Mining Classifiers*", authored by Abeer Al-Hyari, Ahmad Al-Taee, and Majid Al-Taee, presents a new clinical decision support system for diagnosing patients with Chronic Renal Failure (CRF). This paper aims at improving performance of the CRF diagnosis system which was based on Artificial Neural Network, Decision Tree and Naïve Bayes classification algorithms. The improvement was achieved by utilizing more efficient data mining classifiers, Support Vector Machine and Logistic Regression, in order to: (i) diagnose patients with CRF and (ii) determine the rate at which the disease is present. The performance of the developed decision support system is assessed in terms of diagnosis accuracy, sensitivity, specificity and decisions made by consultant specialist physicians. The obtained results showed that Support Vector Machine is more accurate (93.14%) than Logistic Regression as well as other classifiers reported in previous studies. A complete system prototype has been developed and tested successfully with the aid of NHS, UK collaborators to support both diagnosis and long-term management of the disease.

State-of-the-art GPU-based systems offer unprecedented performance advantages through accelerating the most compute-intensive portions of applications by an order of magnitude. GPU computing presents a viable solution for the ever-increasing complexities in applications and the growing demands for immense computational resources. Yaser Jararweh, Moath Jarrah, and Abdelkader Bousselham in the second paper entitled "*GPU Scaling: From Personal Super-Computing to the Cloud*" investigate different platforms of GPU-based systems, starting from Personal Supercomputing (PSC) to cloud-based GPU systems. The authors explore and evaluate the GPU-based platforms and present a comparison discussion against the conventional high performance cluster-based computing systems. Evaluation shows potential advantages of using GPU-based systems for high performance computing applications while meeting different scaling granularities.

Khaldoon Mhaidat, Mohammad Alali, and Inad Aljarrah in their paper entitled "*Efficient Low-Power Compact Hardware Units for Real-Time Image Processing*", present an efficient low-power compact hardware designs for common image processing functions including the median filter, smoothing filter, motion blurring, emboss filter, sharpening, Sobel, Roberts, and Canny edge detection. The designs were described in Verilog HDL. Xilinx ISE design suite was used for code simulation, synthesis, implementation, and chip programming. The designs were evaluated in terms of speed, area (number of LUTs and registers), and power consumption. Post placement and routing (Post-PAR) results show that they need very small area and consume very little power while achieving good frame per second rate even for HDTV high resolution frames. This makes them suitable for real-time applications with stringent area and power budgets.

Emad Abdallah, Ibrahim Al-Oqily, Alaa Abdallah, Ahmed Otoom, and Ayoub Alsarhan in their paper "*Spectral Graph and Minimal Spanning Tree for 3D Polygonal Meshes Fingerprinting*" present a robust three-dimensional fingerprint algorithm for verification, indexing, and identification. The core idea behind their technique is to apply the eigen-decomposition to the mesh Laplacian matrix, and then compute minimum spanning trees (MST) of several concentrations of the mesh shape structure. The fixed size hash vector of a 3D mesh is defined in terms of the MST values and number of the initial patches. Extensive experimental results on several 3D meshes prove the uniqueness of the extracted hash vectors and the robustness of the proposed technique against the most common attacks including distortion-less attacks, compression, noise, smoothing, scaling, rotation as well as mixtures of these attacks.

Finally, as geographical routing algorithms, mobile nodes rely on geographical position to

make routing judgments. Researchers frequently discuss such routing algorithms in (2D) space. However, in reality, mobile nodes spread in (3D) space. Accordingly, Alaa Abdallah, Mohammad Bsoul, Emad Abdallah, Ibrahim Al–Oqily, and George Kao in their paper entitled "*Cluster Based online routing protocols for ad hoc network*" present four new 3D geographical-based routing algorithms Cylinder, Greedy-Cylinder, Cluster-Cylinder, and Greedy-cluster-Cylinder. In Cylinder routing, nodes are locally projected on the inner surface of a cylinder, perimeter routing is executed after that. Greedy-Cylinder starts with Greedy routing algorithm until a local minimum is reached. The algorithm then switches to Cylinder routing. Cluster-Cylinder elects a dominating set for all nodes and then uses this set for projection and routing. The fourth algorithm Greedy-cluster-Cylinder is a combination between Greedy-Cylinder and Cluster-Cylinder. The authors evaluate the new algorithms and compare them with many classical known algorithms. The simulation outcomes show a substantial enhancement in delivery rate over other algorithms.

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