Welcome to the Journal of Electrical and Computer Engineering Innovations (JECEI)

JECEI is devoted to the research in different disciplines of Electrical Engineering such as Communications, Control, Electronics, and Power, Computer Engineering and Computer Science. The editors would like to welcome you to the Twelfth issue (Vol. 6, No. 2), that contains twelve papers focusing on research works in Secure Routing in VANET, Congestion Control in WSNs, Tracking Error Signal Extraction in IR Seeker, Spatio-Temporal Compressive Sensing in WSNs, CNTFET-based Reversible Sequential Circuits, RFID Search Protocol, Low-Area/Low-Power CMOS Op-Amp, Room Temperature Methanol Sensor Based on $CoFe_2O_4$, Design of Time-of-Use Program, Robot Arm Reconfiguration, Clustering a Big Mobility Dataset, and Image Registration, respectively.

In the first article entitled "A New Framework for Secure Routing in VANET," by S. Goli-Bidgoli and M. Mousa SofarAli, the main goals are improving the throughput and performance of VANET through reliable and stable routes with low overhead. Verifying all issues related to the reliable routing, different effective internal, external and environmental factors on route reliability are led to a secure routing protocol which uses a trust management system to detect and neutralize the black-hole attack. Simulation results show that the presented trust-based framework can increase the reliability of the networks by decreasing the effect of the malicious nodes in the routing process.

The article "Congestion Control Approaches Applied to Wireless Sensor Networks: A Survey," by S. Shams Shamsabad Farahani, deals with congestion as an important issue in wireless sensor networks (WSNs) which affects loss rate, channel quality, link utilization, number of retransmissions, traffic flow, network lifetime, delay, energy, and throughput. In this paper, a comprehensive review of different congestion control schemes in WSNs is provided. In particular, different congestion control techniques are classified according to the way congestion is detected, notified and mitigated. Furthermore, congestion mitigation algorithms are classified. Also, different performance metrics are used to compare congestion control algorithms. Finally, the current work attempts to provide specific directives to design and develop novel congestion control schemes.

The third article, entitled "Improving the Tracking Error Signal Extraction in IR Seeker with Stationary Wagon Wheel Reticle over all Field of View," by O. Abbas et al. focuses on the accuracy of target position detection in IR seeker which depends on the accuracy of tracking error signal (TES) extraction from seeker field of view (FOV). In this paper, the stationary wagon wheel reticle is used, which makes the type of the output signal as FM modulation in the linear region of FOV, but the signal will be distorted by changing the radius of target image spot (TIS) in the nonlinear region of FOV. The Hilbert transform-based algorithm is proposed and its performance is compared with that for the conventional algorithm in the linear region of FOV to decrease the effect of changing the radius of TIS. Moreover, a new method is used in the nonlinear region to extract the TES. The results show improvement in TES accuracy extraction in the linear and nonlinear regions over the FOV for different radii of TIS.

In the fourth article "STCS-GAF: Spatio-Temporal Compressive Sensing in Wireless Sensor Networks- A GAF-Based Approach," by M. R. Ghaderi et al., a new Spatio-temporal compressive sensing (STCS) technique based on the geographic adaptive fidelity (GAF) protocol is proposed which can effectively reduce the communication cost and energy consumption in wireless sensor networks. In the proposed method, temporal data is obtained from a random selection of temporal readings of cluster head (CH) sensors located in virtual cells in the clustered sensors' area and spatial data is formed from the data readings of CHs located on the routes.

In the fifth article, entitled “Performance Analysis of Reversible Sequential Circuits Based on Carbon Nano Tube Field Effect Transistors (CNTFETs),” by M. Shaveisi and Abbas Rezaei, the various forms of sequential reversible circuits such as D, T, SR and JK flip-flops are investigated based on carbon nanotube field-effect transistors (CNTFETs). All reversible flip-flops are simulated in both 0.5V and 0.3V voltages. Results show that the proposed structures achieve a significant improvement in terms of the number of reversible gates, quantum cost, number of constant inputs, the number of garbage outputs, delay, and average power consumption. The HSPICE H-2013.03-SP2 software was used to simulate these circuits based on the 32nm CNTFET technology.

The sixth article, “RSPAE: RFID Search Protocol based on Authenticated Encryption,” by M. Eslamnezhad Namin et al., presents an RFID-based search protocol. An encryption technique is used that is referred to as authenticated encryption to boost the security level, which can provide confidentiality and integrity, simultaneously. Furthermore, since the proposed protocol belongs to the lightweight protocols category, it is appropriate for applications that require many tags and costs must be low. In terms of the security, the analysis results give a satisfactory security level and it is robust against different RFID threats like replay, traceability and impersonation attacks. Using Ouafi-Phan model, BAN, and AVISPA, the security correctness of the suggested protocol is tested.

The seventh article entitled “Low-Area/Low-Power CMOS Op-Amps Design Based on Total Optimality Index Using Reinforcement Learning Approach,” by N. Sayyadi Shahraki and S. H. Zahiri presents the application of reinforcement learning in automatic analog IC design. In this work, the multi-objective approach by learning automata is evaluated for accommodating required functionalities and performance specifications considering optimal minimizing the MOSFETs area and power consumption for two famous CMOS op-amps. The results show the ability of the proposed method to optimize the aforementioned objectives, compared with three MO well-known algorithms. The performance of the circuits is evaluated through HSPICE and the approach is implemented in MATLAB.

In the eighth paper, “Room Temperature Methanol Sensor Based on Ferrite Cobalt ($CoFe_2O_4$) Porous Nanoparticles,” by P. Halvaee Khankahdani and M. Sadegh Beigi, porous nanoparticles of ferrite cobalt were prepared by dissolving $CoCl_2.6H_2O$ and $FeCl_3$ in ethylene glycol in a hydrothermal process. Using ethylene glycol instead of DI water as a solvent would cause to provide a porous structure of ferrite cobalt. 0.05 ml of colloidal fluid of fabricated nanostructure was injected on interdigitated electrodes (IDE) on a printed circuit board (PCB) substrate by a drop-casting process. Morphological and structural characterizations of the structure were investigated by X-ray diffraction and scanning electron microscopy and the obtained results of analyses show the porous nanostructure of the material. Sensor's performance in detection of gas vapors was evaluated in different temperatures which has the best response for methanol vapors at room temperature.

In the next article, entitled “Responsive Load Model Integration with SCUC to Design Time-of-Use Program,” by M. Nikzad and A. Samimi, time of use (TOU) as an important scheme of demand response (DR) is linearly introduced based on the concepts of self and cross price elasticity indices of load demand. To construct an effective TOU program, a combined optimization model over the operation cost and customers’ benefit is proposed based on the security-constrained unit commitment (SCUC) problem. Supplementary constraints are provided at each load point with 24-hour energy consumption requirement along with DR limitations. IEEE 24-bus test system has been employed to investigate the different features of the presented method. By varying DR potential in the system, TOU rates are determined and then their impacts on the customers' electricity bill, operation cost, and reserve cost, as well as load profile of the system, are analyzed. Besides, the effect of network congestion as a technical limitation is studied. The results demonstrate the effectiveness of the proposed method.

The tenth research work, entitled “Robot Arm Reconfiguration to Minimization Moving Parts,” by A. Nourollah and N. Behzadpour, presents a new optimization problem in the field of linkage reconfiguration. This is the problem of minimizing moving parts of a given robot arm for positioning the end effector of the given robot arm at the given target point as well as minimizing the movement of the movable parts. Initially, formal modeling is accomplished by minimizing the movement problem. At this time, a criterion called arithmetic measure (AM) is introduced, and this criterion is used to quantify the motion of the linkage. Afterward, it is indicated that the presented problem is an NP-Hard problem. Consequently, a greedy heuristic algorithm is presented to minimize the movement of the robot's moving components. After identifying the moving components and the movement of these parts, an algorithm is provided to determine the final configuration of the robot arm.

In the eleventh paper, entitled " Clustering a Big Mobility Dataset Using an Automatic Swarm Intelligence-Based Clustering Method," by I. Behravan et al., a new clustering method for big datasets is introduced which is based on particle swarm optimization (PSO) algorithm. PSO is a heuristic algorithm with high ability in searching the solution space and finding the global optimum point. The proposed method is a two-stage algorithm which first searches the solution space for the proper number of clusters and then searches to find the position of the centroids. Its performance is evaluated on 13 synthetics and a biological microarray dataset. Finally, 2 real big mobility datasets, are investigated and analyzed using the proposed clustering method.

Finally, in the twelfth paper entitled " Image Registration Based on Sum of Square Difference Cost Function," J. Khosravi et al. employe a mathematical framework based on the Newton method for image registration (IR). This framework is suitable for any efficient cost function such as the sum of square difference (SSD) which is used in this work. Also, an effective strategy to avoid sticking in the local minima is provided. Scale and Rotation as two variables of the problem have been treated solely in a different iteration and results indicate the effectiveness of the proposed model.

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The author is solely responsible for the validity of scientific material is written.