

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

JECEI is devoted to the research in Electrical and Computer Engineering. The editors would like to welcome you to the Tenth issue (Vol. 5, No. 2), that contains ten papers focusing on research works in Combining and steganography of 3-D face textures, Nonlinear control of affine systems, Market-based analysis of natural gas and electricity export, A 12-bit 76MS/s SAR ADC in 0.18 $\mu$ m CMOS technology, Estimating underwater network cardinalities, 3D RF coil design for MRI, Color watermarking based on RDWT-SVD, Highly efficient InGaN/Si double-junction solar cell, Alleviating the small-signal oscillations of the SMIB power system, and Design of a single-layer circuit analog absorber.

The first article entitled “Combining and Steganography of 3-D Face Textures,” by M. Moradi and M.R. Sadeghi, deals with steganography of 3-D face images such that detecting by curious people be impossible. As in detecting face only, its texture is important, authors separate texture from shape matrices, for eliminating half of the extra information. Steganography is done only for face texture, and for reconstructing a 3-D face, uses any other shape. Moreover, it is indicated that by using two textures, how two 3-D faces can be combined. For a complete description of the process, first, 2-D faces are used as an input for building 3-D faces, and then 3-D face and texture matrices are extracted separately from the constructed 3-D face. Finally, 3-D textures are hidden within the other images.

The article “Design of a Novel Framework to Control Nonlinear Affine Systems Based on Fast Terminal Sliding-Mode Controller,” by M. Keshavarz and M.H. Shafiei, proposes a novel approach for finite-time stabilization of uncertain affine systems by designing a fast terminal sliding mode (FTSM) controller based on the input-output feedback linearization of the nonlinear system with considering its internal dynamics. Two main advantages of the proposed approach are that only the outputs and external states of the system should be measured and to realize finite-time convergence of the output variables, a set of switching manifolds with a recursive procedure is utilized.

In the third article, entitled “Market-Based Analysis of Natural Gas and Electricity Export via System Dynamics,” by A. Movahednasab et al., authors represent long run analysis of natural gas export from Iran to Turkey as a case study, considering direct transfer and exporting via the power market. The uncertainty of natural gas price is modeled by Markov Chain Monte Carlo (MCMC) for a long run period and four generation technologies including coal-fired, combined cycle gas turbine (CCGT), gas turbine (GT) and wind participate in the power market with a uniform price structure. The results show that exporting the natural gas at real time price is profitable, while its conversion into electricity and exporting at market price is disadvantageous, even by expanding the renewable resources.

The forth article “A 12 bit 76MS/s SAR ADC with a Capacitor Merged Technique in 0.18 $\mu$ m CMOS Technology,” by S. Mahdavi, proposes a new high-resolution and high-speed fully differential Successive Approximation Register (SAR) Analog to Digital Converter (ADC) based on capacitor merged technique. The total capacitance and the ratio of the MSB and LSB capacitor are decreased by exerting the suggested method. In addition to increasing the speed and accuracy of the ADC, a 12-bit resolution ADC at 76MS/s sampling rate is attained. Furthermore, the power consumption of the proposed ADC is 694 $\mu$ W with the power supply of 1.8 volts. The proposed post-layout SAR ADC structure is simulated in all process corner conditions and different temperatures of -50 $^{\circ}$ C to +50 $^{\circ}$ C, and performed using the HSPICE BSIM3 model of a 0.18 $\mu$ m CMOS technology.

In the fifth article, entitled “A Signal Processing Approach to Estimate Underwater Network Cardinalities with Lower Complexity,” by S. Asif Hossain et al., a new method for estimating underwater network cardinalities by an inspection of signal processing approach is proposed. A statistical tool called cross-correlation technique, which is a significant aspect in signal processing approach is used. The mean of cross-correlation function (CCF) of the cardinalities is the estimation parameter in order to reduce the complexity compared to the former techniques. CHIRP signal is used for the estimation purpose which can ensure higher performance for harsh underwater practical conditions. The process for both two and three sensors cases is verified by a simulation in MATLAB.

The sixth article, “3D RF Coil Design Considerations for MRI,” by M. Shiravi and B. Ganji, analyzes the self and mutual inductances of local radio frequency transmit/receive coil in a typical medical MRI. Other parameters, including electromagnetic shielding, frequency, and distance, which influence voltage and power transfer are investigated. Theoretical formulas and simulation models proposed in this paper are implemented by using MATLAB and ANSYS-MAXWELL and ANSYS-SIMPLOER Finite Element (FE) packages for determining the performance and properties of the coil.

In the seventh article entitled “Research on Color Watermarking Algorithm Based on RDWT-SVD,” by Y. Han et al., a color image watermarking algorithm based on Redundant Discrete Wavelet Transform (RDWT) and Singular Value Decomposition (SVD) is proposed which selects blue component of a color image to carry the watermark information since the Human Visual System (HVS) is least sensitive to it. To increase the robustness especially towards affine attacks, RDWT is adopted for its excellent shift in-variance. In addition, the SVD technique can also ensure the robustness due to the eminent properties of singular values. It is worth mentioning that the watermark information is not processed by SVD in embedding procedure, which prevents the occurrence of false positive detection. Meanwhile, to acquire a balance between imperceptibility and robustness, various scaling factor values are used towards different sub-bands. Experimental results show that the proposed algorithm has outstanding security, imperceptibility and robustness.

Eighth paper “Design and Simulation of a Highly Efficient InGaN/Si Double-Junction Solar Cell,” by S.M. Ahmadi and F. Parandin, aims at proposing a new highly efficient InGaN/Si double-junction solar cell structure. This cell is designed to be used in a real environmental situation, so only structural parameters are optimized. In this structure, a thin layer of Cd-S is used as the anti-reflector window layer. The cell is simulated using ATLAS-SILVACO software and its maximum efficiency is computed to be 37.23%. Considering the supposed structure, the findings show that the efficiency of this solar cell, which is 37.32%, is so far the highest reported efficiency amongst all solar cells.

In the next article entitled “Alleviating the Small-Signal Oscillations of the SMIB Power System with the TLBO-FPSS and SSSC Robust Controller,” by H. Shaeghi et al., a Static Synchronous Series Compensator (SSSC) is used in Single-Machine Infinite-Bus (SMIB). To control the signal of the output voltage of SSSC, a robust controller is used. Also, a hybrid control method to adjust the PSS voltage using Teaching-Learning Based Optimization (TLBO) algorithm and Fuzzy Inference System (FIS) is proposed. Objective functions of designing parameters are based on Integral of Time multiplied by Absolute value of the Error (ITAE). The time-variations of angular speed deviations are investigated in different modes, including: with SSSC/PSS, without SSSC/PSS, different input mechanical power, and different system parameters.

Finally, the tenth research work entitled “Design of a Single-Layer Circuit Analog Absorber Using Double-Circular-Loop Array via the Equivalent Circuit Model,” by M. Basravi et al., deals with a broadband Circuit Analogue (CA) absorber using double-circular-loop array. A simple equivalent circuit model is presented to accurately analyze this CA absorber. The circuit simulation of the proposed model agrees well with full-wave simulations. Optimization based on the equivalent circuit model, is applied to design a single-layer circuit analogue absorber using double-circular-loop array. Simple guidelines for designing the CA absorber are then formulated. It is demonstrated that the fractional bandwidth of 125.7% is realized for at least 10 dB reflectivity reduction with angular stability to 40° for both TM and TE modes. The total thickness of the absorber design is  $0.093\lambda_L$  at the lowest operating frequency.

The editors of JECEI wish to take this opportunity to thank the scientists and reviewers around the world who have contributed their time and expertise in the preparation of the Tenth issue of the journal.

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