Editorial

S. V. Raghavan^{1,2} · Navakanta Bhat³

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Chief Editor and Special Editor

We are indeed happy to bring to you the June 2019 issue of CSI Transactions on ICT with outstanding brief reports from work in progress in India in various institutions and laboratories. I am sure the readers will find it interesting to notice that so much cutting edge research is going on in our country. The credit for summarization goes to Prof Navakant Bhat, who serves on the Academic Committee of the Sir Visvesvaraya Program and readily agreed to be our Special Editor. Happy reading.

✉ S. V. Raghavan
sv.raghavan@gov.in

Navakanta Bhat
navakant@iisc.ac.in

- ¹ Department of Computer Science and Engineering, Indian Institute of Technology Madras, Chennai 600036, India
- ² Office of the Principal Scientific Advisor, Government of India, New Delhi, India
- ³ Centre for Nano Science and Engineering (CeNSE), Indian Institute of Science, Bangalore, Karnataka, India

The first paper, “CommSense: A Communication Infrastructure based Sensing for Environment Monitoring” by Sardar et. al. proposes the development of an LTE based system for channel estimation and environmental perturbation detection. This system is a non-intrusive, passive receiver only device which is simple, and requires less computation and power. The paper also evaluates the feasibility of using LTE-CommSense for vehicle detection and subsequent classification using practical data captured with the receiver, and demonstrates more than 90% accuracy in detection and classification.

The second paper, “An overview of the research work on Multispectral imaging, hand gesture recognition, EEG and ECG signal processing” by Ari, presents a summary of different feature extraction techniques in a variety applications. Local neighbourhood information is exploited to exploit features from satellite images. Discrete Wavelet Transform (DWT) and Fisher-ratio (F-ratio) based technique is used extract features from hand gestures. ECG arrhythmia detection technique is developed using Convolution Neural Network (CNN) for feature extraction and classification.

The paper by Naik and Mudavath, “Analysis and Minimization of Crosstalk Noise for High-Speed VLSI Interconnects”, evaluates signal integrity issues in high speed VLSI chips. Considering 32 nm CMOS technology node, capacitive and inductive coupling noise in interconnect design is presented. With an aggressor and victim line spacing as parameter, an analytical model is presented for noise coupling and is validated through simulation study.

The paper “Methodologies for CAM and ADC Design” by Dandapat presents low power design techniques for Content Addressable Memory (CAM) and Analog to Digital Converters (ADC). A brief review of design techniques is presented.

Srinivasan presents techniques for next generation process automation and control, in his paper titled “Smart Process Measurement and Automation – Challenges, Solution and Future direction”. Different algorithms such as Proportional Integral Derivative (PID) Controller, Model Predictive Controller (MPC) have been reviewed in the context of industrial process control.

The paper titled “Thin Film Deposition from Dual Ion Beam Sputtering System” by Mukherjee demonstrates optimization of stoichiometry of thin films for a given application. MgZnO thin films are optimized to realize photodetectors with up to 146% External Quantum Efficiency (EQE). Optimized Yttria thin films are used in memresistive applications. The use of DIBS is also demonstrated for MgZnO/CdZnO heterostructure based HEMTs, Ga:MgZnO (GMZO) thin film based solar cells and ZnO nanorods for gas sensor applications.

Jain et. al. explore the compiler optimization techniques with an objective to generate reduced size executable of programs in their paper, “An Analysis of Executable Size Reduction by LLVM passes”. In particular, standard compiler like LLVM is considered, on standard benchmarks of SPEC CPU 2017. The series of transformation passes are divided into various logical groups; with each group performing a specific variety of optimization, such as canonicalization, loop optimization, dead code elimination, vectorization, etc. The effect of these groups as well as combinations of groups on executable size.

Jana’s paper titled “Cavity Solitons in VCSEL: a single pane solution of optical information technology”, explores cavity soliton based a variety of information technology applications including storage, on-chip microscopy, 3D scanning, and miniature sensor. Using vertical cavity surface emitting laser (VCSEL) as the key component, coupled with graphene saturated absorber, a technique for cavity soliton generation is proposed.

The paper on “Utilizing Gestures to Enable Visually Impaired for Computer Interaction” by Modanwal and Sarawadekar, presents technological interventions for visually impaired people. A gesture elicitation study is done with 25 visually impaired users and quantitative rating analysis is performed with them, to arrive at an optimal set of gestures. Based on this analysis, a dactylology is proposed for the visually impaired users to interact with computers. Further, a recognition module is developed to recognise the dactylology symbols.

Srivastava and Gaur analyse the electronics properties of amorphous oxides and amorphous oxynitrides in their paper “Understanding electronic transport in multi-component amorphous semiconductors”. They use ab initio density functional based code Quantum Espresso, to obtain detailed electronic structure of Indium Gallium Zinc Oxide and Zinc oxy nitride. This approach helps in material

design for developing new materials with desired electronic properties.

“CNN based Framework for Representative Detection of Liver Images for CAD and Tele-sonography Applications” by Rajalakshmi et. al. presents Convolution Neural Network (CNN) based algorithm which enables reduced data communication requirement for telemedicine application. For this study, ultrasound images of liver have been used, and it is demonstrated that the proposed algorithm can classiy representative and non-representative images of the liver with an accuracy of 99.21%.

Sengupta and Roy propose signature free DSP IP core protection mechanism to combat IP piracy in their paper “Impact of Hardware Steganography on DSP Core Datapath”. For the validation, 8-point Discrete Cosine Transformation (DCT) datapath architecture evaluated. A systematic design methodology is presented to achieve the protection, for a designer provided entropy threshold value.

Rashi Dutt et. al. describe “Discrete Wavelet Transform based Methodology for Radar Pulse Deinterleaving” in electronic warfare application., i.e., the radar antenna scan pattern, is used as a novel parameter to accurately deinterleave the radar pulses from the information captured through a single sensor. The algorithm has low complexity and easy to implement.

Ravi Kumar et. al. present a simulation based system design of optical communication devices in their paper “Integrated optic devices for Visible Light Communications”. The light emitting diodes (LED), electro-optic modulators and Integrated Wavelength Division Multiplex (WDM) receivers are considered. GaN/InGaN based multi quantum well (MQW) LEDs at 550 nm wavelength have been evaluated. Mach–Zehnder modulator based on Potassium Niobate, instead of conventional Lithium Niobate, are designed with insertion loss of 0.2632 dB, and extinction ratio of 26 dB. Integrated WDM receivers with a Czerny-Turner spectrometer is explored.

The paper “Unforeseen data estimation in Water Distribution System”, by Natarajan et. al. describe the use of Customized Kalman Filter (CKF), i.e. window based Kalman Filter (KF), is explored for the analysis of missing, unforeseen data for application towards automated smart Water Distribution System (WDS). The WDS at the National Institute of Technology-Tiruchirappalli (NIT-T), is considered as for the case-study and the flows across the pipes and head level of the reservoir tanks are used as measurement variables in a distribution network comprising of 50 nodes and 57 pipes.

The last paper by Anuj Dhavan titled “Design and Development of Plasmonic and Nanophotonic Devices”, deals with plasmonic and nanophotonic devices. In particular, a novel design of cross bridged bow-tie nano hole array is proposed for Surface Enhanced Raman Scattering

(SERS) sensor. The design offers SERS sensitivity enhancement factor of 10^9 . For the Surface Plasmon Resonance (SPR) based sensor, narrow groove plasmonic

nano-gratings with gold thin films are presented to achieve better performance for biosensor application.