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A Review of Various MOSFET Fabrication Techniques

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Abstract

In this paper a brief review of various fabrications techniques adapted for MOSFETs is provided. The MOSFETs (Metal Oxide Semiconductor Field Effect) due to their reduced dimensions, faster response/switching times, and reduced cost have been used in number of applications in fields not limited to Digital Design, Analog Design, Mixed signal Design, Microprocessors, Power electronics etc. MOSFETs due to their unique quality of sustaining larger scalability have been deployed in limitless application areas demanding miniaturization. The reason for such numerous and unique properties have been to large extent the state of art fabrication methods that have been developed and standardized exclusively in case of MOSFETs. Thus in this paper emphasis has been laid to explain the very basic and fundamental MOS fabrication processes like Wafer processing, N-Well/P-Well techniques, Twin Tub Techniques, CVD, and Photolithography and also study the various performance bottlenecks in them. This papers also highlights the various design bottlenecks faced by all these fabrication techniques and the various trade-offs made therein. In addition to above the concept of masking and designing the mask in case of MOS Fabrication is also explained here.

Keywords: MOS Fabrication;, CMOS Devices; CVD; Photolithography.

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Parameter Estimation of Permanent Magnet Synchronous machine using Gravitational Search Algorithm

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***Abstract*—Permanent magnet synchronous machine (PMSM) is widely used and has influenced most of the fields where PMSM is employed. This research has been attributed to estimate the parameters of electrical equivalent circuit of PMSM. This paper proposed a method in which Gravitational search algorithm (GSA) has been used to minimize the objective function. GSA which is an optimization method based on Newton's law. The objective function is an error function of estimated values and measured values of current. The formulated optimization problem is programmed in MATLAB and results using GSA have been obtained and compared with measured experimental data. The obtained estimated results found close agreement with the experimental one, which thereby validate the developed parameter estimation algorithm.**

Keywords—parameter estimation; permanent magnet synchronous machine; Gravitational Search Algorithm and vertical axis wind turbine.

I NOMENCLATURE

E_f = Nolaod voltage (volts)
V_t = terminal voltage (volts)
I_q = q-axis armature current (apms)
I_d = d- axis rmature Current (amps)
R_a = armature resistance (ohms)
X_d = d- axis reactance (ohms)
Δ = power angle
I_a = armature current (amps)
P_o = output power (watts)
η = efficiency
Reg_i = regulation
E_o = no-load voltage phase voltage (volts)
E_{ph}= phase voltage (volts)
X_a= armature reactance (ohms)
B_o =average flux density in the airgap (wb/m^2)
B_g = flux density in the airgap (wb/m^2).

II INTRODUCTION

The parameter estimation is an important aspect of synchronous machine (SM) and has been receiving good attention from the researchers for several decades. In some parameter estimation methods, power, voltage and current are considered for the parameter estimation of PMSM. An accurate method for obtaining armature and field parameters is through a standstill test which comes with the inherent disadvantages that the test has to be performed at standstill. The common method for computing machine parameters is the customary short circuit and open circuit tests to calculate the various machine parameters. The major drawback with this method, despite of its invasive nature, is its failure for

Network connected generators. Identification has been made with varying degrees of success using different algorithms to produce detailed picture of armature d-axis and q- axis parameters. Algorithms like gradient decent, evolutionary strategies, genetic algorithm, etc. have been utilized in search of appropriate and more efficient methods for parameter identification. Chaudhari and Fernandes [1] proposed an equivalent circuit for PMSM to predict the steady state performance of motor and also estimate the value of capacitor required for balanced operation for desired load. Schulte et al. [2] have evaluated a design procedure for a 6-phase, claw pole alternator synchronous machine by using equivalent circuit model. The parameters estimated using theoretical approach is compared with measured one [3].

It has been observed that electrical parameters of PMSM can be identified by using classical as well as artificial intelligent techniques such as gradient search, least square method, swarm intelligence, genetic algorithm, and various hybrid techniques [4]. Lee et al. [5] have determined the parameters while considering the magnetic nonlinearity. Lukko et al. [6] have used nonlinear flux-based control optimization for estimating the parameters of PMSM. Equivalent circuit is very useful method in determining the circuit parameters. Arkkio and Pyrhönen [7] has computed the parameters of 6 poles synchronous motor using multiple rotor damping circuits. These parameters have been determined using series of nonlinear equations. In addition to an energy perturbation approach, two kinds of approach have been suggested, offline and online study of Parameters. Underwood et al. [8] have developed a new parameter estimation technique which combines two instance of recursive least square method. Hadef et al. [9] on the other hand used an inverse problem approach for parameter estimation. The proposed approach estimates the d and q axis synchronous reactance and the open circuit flux [10]. Gol and Najafabadi [11] have used a conventional impedance model which is employed for designing of an auxiliary machine. Akbar et.al [12] has presented a new method for estimating equivalent circuit parameters of PMSM. It is based on magneto static-analysis. Gustavo et al. [13] have proposed a robust methodology using real and simulated data to estimate the model parameters. In this method a non-linear parameter estimator is presented for synchronous machine based on unscented Kalman filter. Certain method uses Disturbance for estimation of parameters [14-15]. The parameters can be

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estimated using steady state operating data. In some methods observer can be designed with graphical user interface (GUI) which can be used for estimating the parameters [16-17]. Wamku et. al. [18] have proposed a hybrid model for identification of synchronous machine parameters from saturated load rejection test. The load rejection test of a combined resistive load is performed for parameter identification where online symmetrical three phase short circuit test is proposed for the model cross validation [19]. Cari et al. [20] have proposed a method in which line voltage perturbation is used to evaluate the parameters.

In this paper the estimation of parameters of electrical equivalent circuit of PMSM has been estimated using Gravitational search algorithm (GSA). The gravitational search algorithm is based on Newton's law of gravitational forces and was proposed by Rashedi in 2009[21] [22]. These types of algorithms are well suited to solve the complex computational problem [23-25]. The GSA has already used in economic dispatch problem, unit commitment problem, optimal load flow etc. [26-29]. In this optimization algorithm the objects are referred to solution and each solution are having different masses. These masses are the variables of a particular solution. The entire group of masses exert the force on each other this force cause's movement of masses which are attracted towards heavier masses. These masses move with less speed as compared to others because they represent optimum solution in the search space [30].

In this paper, the error between estimated and measured values of current has been taken as objective which has been minimized using GSA. The GSA algorithm has been successfully implemented and results have been compared with experimental values. This research opens the scope for GSA to solve design problems of PMSM.

III. ELECTRICAL EQUIVALENT CIRCUIT OF PMSM

It is important to analyze the electrical equivalent circuit of the PM synchronous machine, which is closely matching to the conventional synchronous machine from the view point of performance and configuration. The stators of the most of synchronous machine configuration are identical. The steady state analysis has been done in terms of components along the direct axis (pole axis) and quadrature axis (inter-polar axis). Now, consider a synchronous machine (alternator) which is operating under steady state while neglecting core losses, the mathematical equations have been evaluated using phasor diagram as shown in Fig. 1.

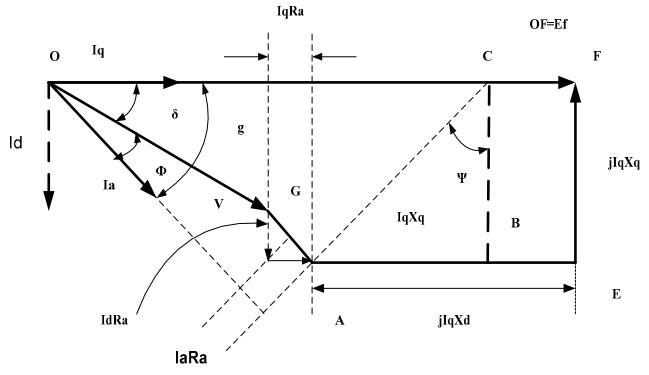

Fig.1Phasor diagram of PM synchronous generator

$$E_f = V_t + I_q R_a + I_d X_d \quad (1)$$

$$V_t \sin\delta = I_q X_q - I_d R_a \quad (2)$$

The direct and quadrature axis current can be found using above relationship using phasor diagram [15].

$$I_d = \frac{V_t(X_q \cos\delta - R_a \sin\delta)}{{R_a}^2 - X_d X_q} \quad (3)$$

$$I_q = \frac{V_t(R_a \cos\delta - X_d \sin\delta)}{X_d X_q - {R_a}^2} \quad (4)$$

These equations are the governing equations for equivalent circuit of PM synchronous machine. The phasor diagram of electrical equivalent circuit is as shown in the Fig. 1, which comprises of E_f, X_d, X_q, R_a, R_l, X_l. These are the parameters of the permanent magnet synchronous generator. Several studies are associated with electrical equivalent circuit.

- This electrical equivalent circuit is used in various analyses which includes stabilities studies, fault analysis etc. [12] [13] [24].
- In control system applications, the equivalent circuit is used to obtain the transfer function for analyzing the response of the system [8].
- The steady state analysis is also used to find the performance indices such as efficiency and regulation. [10][15][16].

IV. GRAVITATIONAL SEARCH ALGORITHM

The GSA is discussed herewith using following steps

Step1. Consider a system with N agents and the position of the i^{th} agent is defined as

$$P_i = (p_i^1, \ldots\ldots p_i^d, \ldots\ldots p_i^n) \quad (5)$$

For i=1, 2, .N

Step2. Formulation and evaluating the fitness value of objective function. This objective function may be a minimization or maximization problem.

$$Fitness_i = f(p_i^1, \ldots\ldots p_i^d, \ldots\ldots p_i^n) \quad (6)$$

Step3. The gravitational mass and the inertial mass depends upon the fitness value of the objective function and is given by following equations

$$M_{ai} = M_{pi} = M_{ii} = M_i \quad (7)$$

$$m_i(t) = \frac{fitness_i(t) - worst(t)}{best(t) - worst(t)} \quad (8)$$

$$M_i(t) = \frac{m_i(t)}{\sum_{j=1}^{N} m_j(t)} \quad (9)$$

Here

$fitness_j(t)$ acts as the fitness value of the object i at time t, and, $worstfitness(t)$ and $bestfitness(t)$ are given as:

$$bestfitness(t) = \min_{j\in(1\ldots\ldots N)} fitness_j(t) \quad (10)$$

$$worstfitness(t) = \max_{j\in(1\ldots\ldots N)} fitness_j(t) \quad (11)$$

Step4. Calculation of force acts on mass i from mass j. This force is given as:

$$F_{ij}^d = G(t)\frac{M_{pi}(t)\times M_{aj}(t)}{R_{ij}+\varepsilon}(p_j^d(t) - p_i^d(t)) \quad (12)$$

Here, G(t) is gravitational constant. M_{aj} acts as active gravitational mass of object*j*, M_{pi} is the passive gravitational mass of object*i*.

Where, R_{ij} is Euclidian distance between two masses.

$$R_{ij}(t) = \|P_i(t), P_j(t)\| \quad (13)$$

The total force acting on $mass_i$ in the d^{th} dimension in time *t* is given as follows:

$$F_{Ti}^d(t) = \sum_{j \in Kbest, j \neq i}^{N} rand_j F_{ij}^d(t) \quad (14)$$

Where $rand_j$ is a random number in the interval [0, 1], *K best* is the set of initial K *objects* with the best fitness value.

The acceleration of mass *i* in time t in the d^{th} dimension as given as follows

$$a_i^d = \frac{F_{Ti}^d(t)}{M_{ii}(t)} \quad (15)$$

Step5. The velocity (*u*) and position (*p*) of agents are updated as,

$$u_i^d(t+1) = rand_i \times u_i^d(t) + a_i^d(t) \quad (16)$$

$$p_i^d(t+1) = p_i^d(t) + u_i^d(t+1) \quad (17)$$

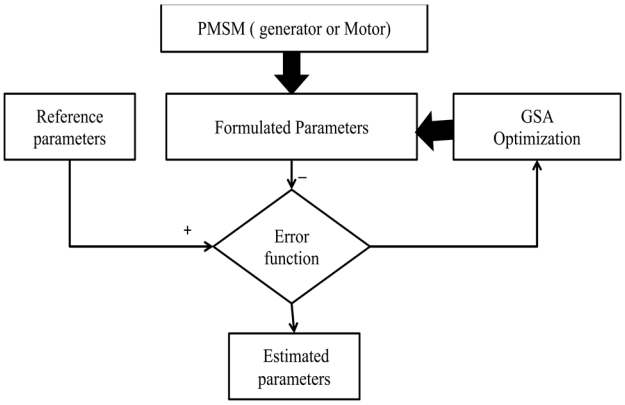

Fig.2 Parameter Estimation Technique using GSA

The Fig. 2 shows the parameter estimation technique using GSA, here the formulated parameters have been compared with the reference or measured values to form the error function which is optimized using GSA. The parameter may be voltage, current, power, torque of a machine.

V.PROBLEM FORMULATION

In this proposed work, error function is considered as the objective function. The objective function is formulated by using all the parameters which are going to be estimated like E_f, X_d, X_q, R_a. These parameters are obtained from the electrical equivalent of the PMSM. The objective function of the problem can be formulated as minimization function. It can be given as:

$$F(t) = min(E(t)\text{^}2) \quad (19)$$

The error function has been formulated as

$$E(t) = I_a(t) - \left(\frac{E_f(t)\left(X_q^2 + (R_l + R_a)^2\right)}{(R_L + R_a)^2 + X_d X_q}\right) \quad (20)$$

The error function is minimized when the values of the parameters having the estimated value in their specified range. The others performance parameters like output power, efficiency, regulation have been calculated using estimated values.

- Output Power :-

$$P_o = 3(E_f I_q - I_d I_q(X_d - X_q) - R_a I_a^2) \quad (21)$$

- Efficiency:-

$$\eta = \frac{P_o}{(P_o + iron_{loss} + copper_{loss})} \quad (22)$$

- Regulation:-

$$Reg_i = \left(\frac{E_o - E_{ph}}{E_{ph}}\right) \times 100 \quad (23)$$

Where

$$E_o = (E_{Ph} + (I_a R Cos\theta + I_a X_a Sin\theta)\frac{B_o}{B_g} \quad (24)$$

VI. RESULTS AND DISCUSSION

Here, the error between observed and measured value of current has been taken as objective function and minimized using GSA. As seen from Table I the values E_f, R_a, X_d, $X_q$of a 3.3kV, 500KVA, 3-phase, 50Hz, 600-rpm, turbine driven direct derived; PMSM have been estimated and close to measured value, which justifies the effectiveness of the optimizing technique used for estimating the parameters of the machine. The performance parameters like output power, efficiency, and regulation have been calculated. As the error gets minimized the parameters are estimated close to their measured value. The error function gets minimized within 40 iterations. The Fig.3 (a) shows the optimizing curve of GSA and here the population size is taken 30 with 100 iterations. The optimal result is obtained within 40 iterations which indicate better convergence.

TABLE I: - Design Data and performance result for inner rotor design

Parameters	Range Of Parameters	Measured Value Of parameters	Estimated Parameters using GSA
E_f(V)	1850-2000	1905.058	1909.203
R_a (Ohms)	0.1-.2	0.124	0.1181
X_d(Ohms)	1-2	1.58	1.6212
X_q(Ohms)	1-2	1.30	1.2552
I_d(A)		20.67	20.02
I_q(A)		81.27	81.67
I_a(A)		83.84	84.23
Pout (KVA)		460	463
Efficiency (%)		95.12	94.89
Regulation at 0.8 p.f.		31.123	29.971

The variations of the parameters like E_f, X_d, X_q, R_a, have been shown in Fig. 3(b), Fig. 3(c), Fig. 3(d) and Fig. 3(e) initially these parameters very The estimation technique has been developed and implemented to solve the formulated problem. The variation of performance parameters like regulation, efficiency and output power has been shown in Fig. 3(f), Fig. 3(g) and Fig. 3(h) respectively.

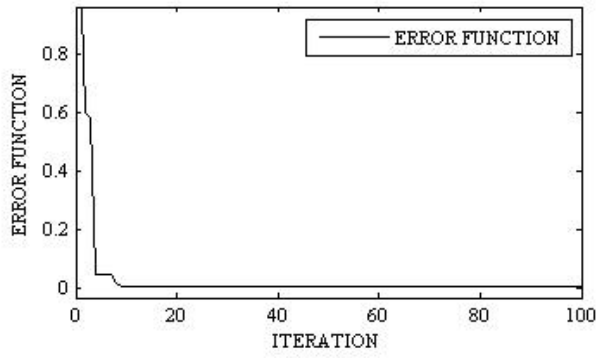

Fig.3 (a) Optimizing curve of GSA for minimizing error function

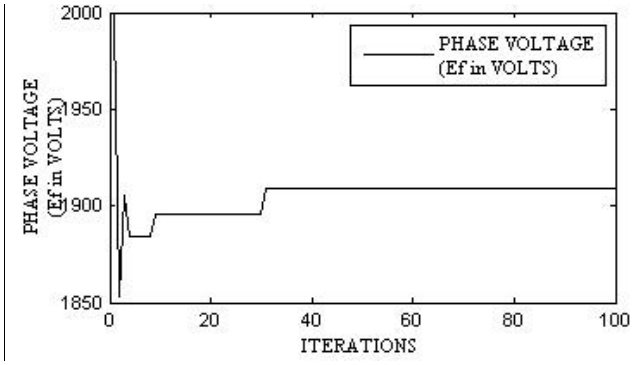

Fig. 3(b) Behaviour of phase voltage (E_f) as individual parameters for GSA

The error function of current is minimized within 40 iterations. Similarly, the parameters of electrical equivalent circuit of PMSM like voltage, resistance, reactance (*X_d and X_q)* optimized to their measured values. They also vary up to 40 iterations and settle to their optimal values.

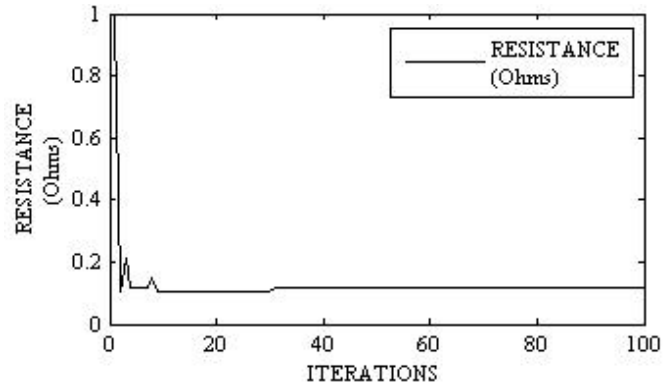

Fig. 3(c) Behaviour of Resistance (R_a) as individual parameters for GSA

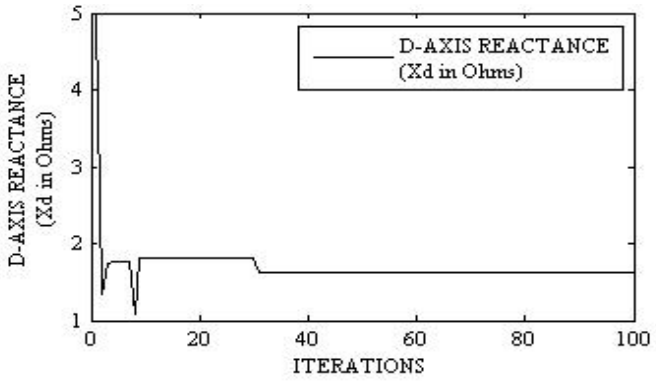

Fig. 3(d) Behaviour of d-axis reactance (X_d) as individual parameters for GSA

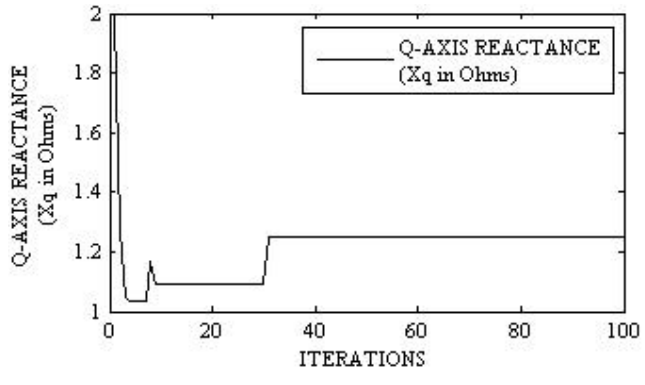

Fig. 3(e) Behaviour of q-axis reactance (X_q)individual parameters for GSA

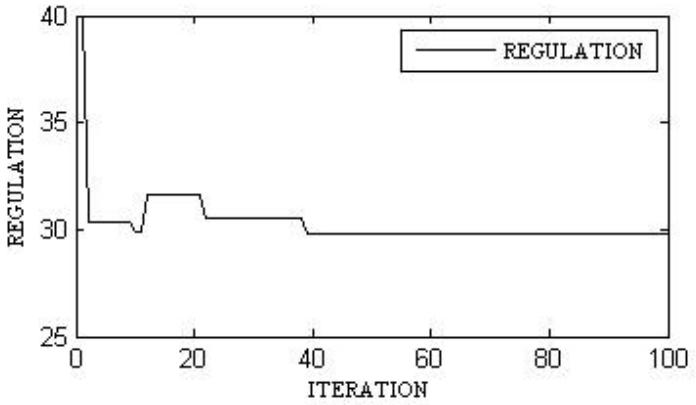

Fig. 3(f) Behaviour of Regulation (Performance Indices)

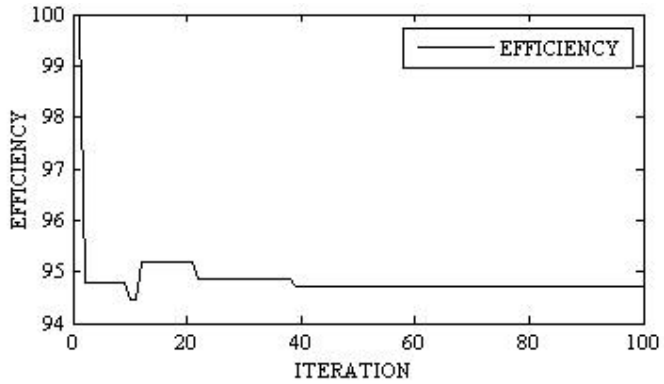

Fig. 3(g) Behaviour of Efficiency (Performance Indices)

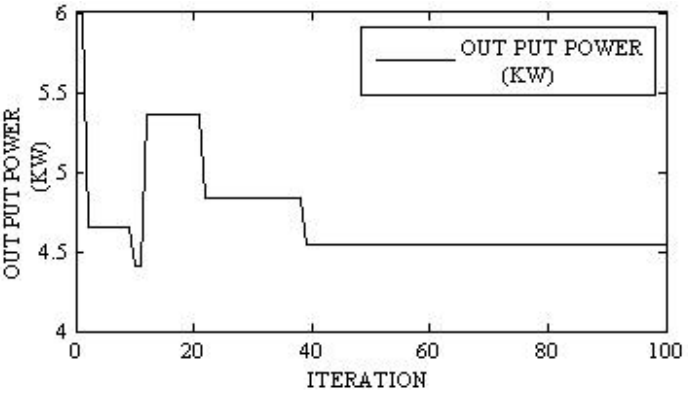

Fig. 3(h) Behaviour of Output Power (Performance Indices)

VII. CONCLUSION

The parameters of the given generator has been estimated while the error function is minimized using GSA. The GSA algorithm has been successfully implemented and the evaluated results are compared with measured values. The variation of performance indices like output power, efficiency, and regulation has been evaluated. It has been seen that the estimated values and calculated results are very close to measured values. This shows the GSA is an efficient tool for minimizing the error while estimating the parameters.

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Message from IEEE Region10 (Asia-Pacific) Director

Ramakrishna Kappagantu

Warm Greetings form Region10!

TENCON is a great flagship event of Asia-Pacific Region10 of IEEE bearing significant importance.

We are happy to have Singapore, one of the most vibrant and strong IEEE sections, as the host for this gigantic event which means lot to R10.

I am glad to understand that there is over whelming response for this year TENCON. With excellent theme, variety of tracks, eminent speakers and enthusiastic delegates, I am sure that this version of TENCON will certainly break many records in all aspects. It would make not only Singapore Section but also IEEE R10 very proud.

Region 10 has also slated few tracks collocated within and outside TENCON which show-case several successful new initiatives of IEEE and Region 10. I am sure that all the TENCON tracks will truly reflect the ideologies, objectives and standards of IEEE

Meaningful engagement and member satisfaction of Industries, Young Professionals, Women Engineers besides Academicians, Researchers and Students are top priority targets of IEEE Region 10 Technical and Professional Teams. The concerned Vice Chairs of R10 with their teams untiring efforts have designed fabulous formats for the purpose, and few of them can be experienced at this year TENCON.

Singapore is the most desired destination of many. Coupled with the great hospitality and grandeur provided by TENCON and Singapore Volunteer leaders, I am confident that every one of you will take home, haunting memories. Wish you all a successful TENCON 2016.

Sincerely,
Ramakrishna Kappagantu
IEEE Region10 (Asia-Pacific) Director

Message from General Chairs

Dr. Arokiaswami Alphones

Dr. Rajnish Gupta

Dr. Michael Ong

Welcome to IEEE TENCON 2016.

On behalf of the Organizing Committee, we would like to warmly welcome you to participate in TENCON 2016,which will be held for the fourth time in Singapore during 22–25November 2016 at the Marina Bay Sands.

Started in 1980, TENCON in the Asia-Pacific region has become one of the most important annual events, and this year being the special for golden jubilee celebrations of Region 10. The conference provides a unique opportunity for international scientists, engineers and scholars to share and exchange experiences.

The organization of the TENCON 2016 has been a joint effort by a large number of volunteers — members of the Technical Program Committee who compiled an exciting technical program, other members of the Organizing Committee who have worked tirelessly to ensure the meeting runs smoothly. We are very grateful to all of those volunteers and reviewers for their contributions in making this Conference a very successful event.

All the technical sessions will be held on the level 4 of the Convention Centre including a large number of special sessions on recent topics organized by the distinguished researchers. The rooms are large, spacious, and accessible from one corridor. A person can easily move from room to room to keep track of papers of interest in the eight parallel sessions. An exhibition will be held in parallel with the conference, and is conveniently located at the same level combined with tea break and lunch.

The Social Program features a banquet dinner on November 24. Lunch will be provided in order to establish a convenient and conducive environment not only for scientific presentations but also for technical discussions and business opportunities. As a part of TENCON event, Young professionals organizing IEEE Hardtech summit on November 26 at NTU campus. Also the region 10 committee on entrepreneurship is running a workshop at NTU campus on November 26 on innovation in forensic, biomedical and bio-informatics.

Aside from attending this conference, please also take advantage of your stay in Singapore to explore its geographical beauty and colorful cultural diversity. Singapore is a cosmopolitan city and everyone will find something of his or her delight, with interesting attractions for the visitor, ranging from shopping to sightseeing. We look forward and encourage you to visit and enjoy our multi-racial city.

Last but not least, we are indebted to the sponsors that have contributed generously not only in monetary terms but also in their enthusiasm and relentless support.

We hope you will find the Conference most valuable and informative and wish everyone an enjoyable and successful visit to Singapore.

Dr. Arokiaswami Alphones **Dr. Rajnish Gupta** **Dr. Michael Ong**

General Chairs – IEEE TENCON 2016

Welcome Message by Technical Program Chairs

Dr. Sahoo S. K.

Dr. P. N. Suganthan

Dr. Maode Ma

Welcome to IEEE TENCON 2016 which is a premier international technical conference of IEEE Region 10, comprising 57 Sections, 6 Councils, 21 Subsections, 514 Chapters and 1159 Student Branches in the Asia Pacific region.

On behalf of the Organising Committee, we thank you for your participation at IEEE TENCON 2016. Over the next 3 days, 510 oral presentations and 334 Oral Interactive Forum presentations will be delivered and displayed during the technical sessions. Despite the increasing presence of related conferences, we appreciate your continuous support in selecting IEEE TRENCON as the platform to publish your latest research. Besides the submitted papers, there are 3 keynote lectures by very prominent experts. Head of the Smart Nation Programme Office in the Prime Minister's Office Mr. Tan Kok Yam talks about "Responding to the Digital Revolution", Mr. Rudy Schalk, Director Rolls-Royce@NTU Corporate Lab talks about "Accelerating Technology & Innovation for Vision 20 and Beyond" and IEEE President and Chief Executive Officer Prof. Dr. Barry L. Shoop offers his talk in "How Advances in Technology are Changing Face of Leadership".

You are cordially invited to join us in this meaningful event. Not with standing the challenging economic outlook, IEEE TENCON continues to receive strong support from our sponsors. MEDs Technologies is our Gold Sponsor, Silver sponsors are CST and Infineon and Bronze by Rolls-Royce, Plexim, Keysight Technologies, Rohde & Schwarz and Springer as tabletop sponsors. Lanyard is sponsored by CST Microwave Studio. We would like to take this opportunity to thank them, as well as our partner U Associate for their publicity support. The 3 days equipment exhibition that is held in conjunction with the conference remains an important activity of IEEE TENCON, both financially and technically. There are 8 exhibitors from both local and international companies. We thank them for choosing IEEE TENCON as the conference to showcase their latest technologies. Many of them are taking a leading role in the market, especially in advanced technologies. Please visit their booths for more information during the tea and lunch breaks.

We hope everyone will have a rewarding experience over the conference period.

Dr. S. K. Sahoo **Dr. P. N. Suganthan** **Dr. Maode Ma**

Technical Program Chairs – IEEE TENCON 2016

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Conference Secretariat
C & M Consultants, Singapore

Keynote Talk I	**Singapore's Smart Nation Initiative**
Speaker	**Dr Tan Guan Hong**
Date/Time	Wednesday, 23 November 2016 / 9.30 am – 10.15 am
Venue/Room	Melati Main Ballroom 4001AB-4 & 4101AB-4

Biography

Dr Tan Guan Hong joined GovTech as Senior Director (Smart Nation Systems & Solutions) on 1 August 2016. He has over 36 years of working experiences as various roles in a MNC (Philips Electronics 1980-1993), a Technology Start-up Company (SysEng 1994-2009), a Listed Company (Tritech Group 2009-2012), President of Singapore Industrial Automation Association (2006 -2012) and Director for Technology in A*STAR I2R (2012-2016). He has extensive cross domain experiences in Electrical, Electronics, Civil, Water and Business Management throughout his Engineering journey.

He founded SysEng (S) in 1994 as a Test Engineering Company. In 2002, he developed Real Time Monitoring systems for Construction Industry in Deep Excavations, Tunnels, Bridges and High Rise Buildings. In 2008, he expanded into Real Time Water Quality & Quantity monitoring business. SysEng was acquired by the Tritech Group in 2009 to expand into China and India. He was the conference chair for IoTAsia 2016 and active in the IoT applications. In I2R, he was responsible for Technology Development and Productivity Programme to help SMEs improve Productivity using ICT. He was also the Cluster head for Robotics and Autonomous Vehicle Programmes.

He graduated from University of Sheffield with B.Eng. (1976) and Ph.D. (1980) in Electrical Machines

Abstract

The digital revolution has brought about a staggering pace of change for societies, companies and individuals. There will be new opportunities and also new risks, from dis-intermediation to cyber-attacks. The Smart Nation Programme encapsulates Singapore's approach to make the best use of this change, to improve urban living, and create value and opportunity. Fundamental to this is our collective ability to engineer new ways of solving old problems.

Keynote Talk II	**Accelerating Technology & Innovation for Vision 20 and Beyond**
Speaker	**Mr. Rudy Schalk**, *Director of Rolls-Royce@NTU Corporate Labs, Singapore*
Date/Time	Wednesday, 23 November 2016 / 10.15 am – 11.00 am
Venue/Room	Melati Main Ballroom 4001AB-4 & 4101AB-4

Biography

Mr. Rudy Schalk is Director of Rolls-Royce@NTU Corporate Labs. Rudy brings over 25 years of experience in technology development and commercialization. This includes leading various research collaborations with Stanford and Ohio State Universities, together with roles working with industry including Lockheed Martin, Flextronics, Xiaomi & Google. Over the past decade Rudy has served as a Director and held P & L responsibility for several business units at Flextronics in both the USA and Singapore. Rudy has been involved in technology development in Singapore for the past 5 years, interfacing with organizations such as ETPL, IPI and IDA.

Abstract

At Rolls-Royce, our vision is to be themarket-leader in high performance power systems where our engineering expertise, global reach and deep industry knowledge deliver outstanding customer relationships and solutions. We operate across five businesses: Civil Aerospace, Defence Aerospace, Power Systems, Marine and Nuclear.

In 2015, Rolls-Royce invested £1.2 billion on research and development.We also support a global network of 31 University Technology Centres, which position our engineers at the forefront of scientific research.

In Singapore our Applied Technology Group (ATG) is an important part of our R & D investment, developing advanced technologies to support core business areas. These include research of materials support technology, computational engineering, electrical power and control systems and manufacturing technology.

Building on our advanced data analytics, Rolls-Royce continues to invest in digital capability including R & T, digital manufacturing, developing digital platform solutions for our customers and creating 'Facilities of the Future' for maintenance repair and overhaul.

Keynote Talk III	**How Advances in Technology are Changing Face of Leadership**
Speaker	**Professor Barry L. Shoop**, *IEEE President and Chief Executive Officer*
Date/Time	Wednesday, 23 November 2016 / 11.30 am – 12.15 pm
Venue/Room	Melati Main Ballroom 4001AB-4 & 4101AB-4

Biography

Barry L. Shoop is Professor of Electrical Engineering and Head of the Department of Electrical Engineering and Computer Science at the U.S. Military Academy at West Point. During his 20 years at West Point he has served in a number of key leadership positions including Director of the Photonics Research Center and Director of the Electrical Engineering Program. Currently as Professor and Head he is responsible for an undergraduate academic department with over 79 faculty and staff supporting ABET accredited programs in electrical engineering, computer science, and information technology. The department engages over 1800 students each year and has 4 affiliated research centers including the Cyber Research Center, Network Science Center, Photonics Research Center and a burgeoning Robotics Program. Dr. Shoop holds 1 patent and has authored or co-authored 8 books and book chapters, and over 146 publications. He received a B.S. from the Pennsylvania State University in 1980 and Ph.D. from Stanford University in 1992, both in electrical engineering. His research interests include optical information processing, neural networks, image processing, disruptive innovations and educational pedagogy. He is a Fellow of the IEEE, OSA and SPIE, and a member of Phi Kappa Phi, Eta Kappa Nu, and Sigma Xi. He is a licensed Professional Engineer in the Commonwealth of Virginia.

Abstract

Technology has reshaped our world repeatedly since the foundations of IEEE were laid over a century ago; it continues to reshape it today. Recently, however, the role and influence of technology on the human experience has fundamentally changed. Previously, technology played a secondary and supportive role while social, political and cultural dimensions played a primary role. Today, technology is actually leading these dimensions in the influence on humanity. To be successful in this changed environment, increased emphasis and value is being placed on written and oral communication skills, teamwork, critical thinking, innovation and entrepreneurship. While some leadership skills are immutable, there are others that technology professionals will need to add to be competitive and successful.

Tutorial I	**Computational Intelligence for Optimization, Forecasting and Classification**
Speaker	**Prof. Dr. Ponnuthurai Nagaratnam Suganthan**, *Associate Professor, School of Electrical & Electronic Engineering, College of Engineering, Nanyang Technological University, Singapore*
Date/Time	Tuesday, 22 November 2016 / 08.30 am – 10.30 am (30 mins break), 10.30 am 12 noon (3 hours)
Venue/Room	Melati Main Ballroom 4001AB-4 and 4101AB-4

Biography

Prof. Dr. Ponnuthurai Nagaratnam Suganthan, received the B.A degree, Postgraduate Certificate and M.A degree in Electrical and Information Engineering from the University of Cambridge, UK in 1990, 1992 and 1994, respectively. After completing his PhD research in 1995, he served as a pre–doctoral Research Assistant in the Dept of Electrical Engineering, University of Sydney in 1995–96 and a lecturer in the Dept of Computer Science and Electrical Engineering, University of Queensland in 1996–99. He moved to NTU in 1999. He is an Editorial Board Member of the Evolutionary Computation Journal, MIT Press. He is an associate editor of the IEEE Trans on Cybernetics (2012 –), IEEE Trans on Evolutionary Computation (2005 –), Information Sciences (Elsevier) (2009 –), Pattern Recognition (Elsevier) (2001 –) and Int. J. of Swarm Intelligence Research (2009 –) Journals. He is a founding co–editor–in–chief of Swarm and Evolutionary Computation (2010 –), an SCI Indexed Elsevier Journal. His co–authored SaDE paper (published in April 2009) won "IEEE Trans. on Evolutionary Computation" outstanding paper award in 2012. His former PhD student, Dr Jane Jing Liang, won the IEEE CIS Outstanding PhD dissertation award, in 2014. IEEE CIS Singapore Chapter wonthe best chapter award in Singapore in 2014 for its achievements in 2013 under his leadership. His research interests include swarm and evolutionary algorithms, pattern recognition, big data, deep learning and applications of swarm, evolutionary & machine learning algorithms. His publications have been well cited. He was selected as one of the highly cited researchers by Thomson Reuters in 2015 in computer science, also known as the World's Most Influential Scientists–2015. He served as the General Chair of the IEEE SSCI 2013. He has been a member of the IEEE (S'90, M'92, SM'00, F'15) since 1990 and an elected AdCom member of the IEEE Computational Intelligence Society (CIS) in 2014–2016.

Additional details available at: http://www.ntu.edu.sg/home/epnsugan/

Abstract

This tutorial will introduce computational intelligence methods such as evolutionary computation, neural networks and decision trees and their applications in optimization, time series forecasting and pattern classification. This tutorial will also present case studies from diverse electrical engineering domains as well as from finance as illustrative examples to cater to the diverse interests of TENCON attendees.

Tutorial II	**The Modular Multilevel Converter**
Speaker	**Prof. Josep Pou**, *Associate Professor, School of Electrical & Electronic Engineering, College of Engineering, Nanyang Technological University, Singapore*
Date/Time	Tuesday, 22 November 2016 / 08.30 am – 10.30 am (30 mins break), 10.30 am 12 noon (3 hours)
Venue/Room	Melati Main Ballroom 4001AB-4 and 4101AB-4

Biography

Prof. Josep Pou, received the B.S., M.S., and Ph.D. degrees in electrical engineering from the Technical University of Catalonia (UPC), in 1989, 1996, and 2002, respectively. He graduated first in the Bachelor graduating class, received the Master Degree with honours, and was awarded the outstanding Ph.D. Thesis Award at UPC.

In 1990, he joined the faculty of UPC as an Assistant Professor, where he became an Associate Professor in 1993. From 2003 to 2007, he was Director of the Power Quality and Renewable Energy (QuPER) group, and from 2007 to 2013 he was Director of the Terrassa Industrial Electronics Group (TIEG), both research groups at UPC. From February 2013 to August 2016, he was a Professor with the University of New South Wales (UNSW), Sydney, Australia. In UNSW, he was technical research stream leader for the Solar Flagships Program Research Agenda, the result of a $19-million investment from the Commonwealth Government of Australia in world class laboratories developed to study solar power conversion and its impact on the grid. He is currently an Associate Professor with the Nanyang Technological University, Singapore, where he is co-Director of the Electrical Power Systems Integration Lab @ NTU (EPSIL@N), and Program Director of Power Electronics at the Energy Research Institute @ NTU (ERI@N).

From February 2001 to January 2002, and February 2005 to January 2006, he was a Researcher at the Center for Power Electronics Systems, Virginia Tech, Blacksburg. From January 2012 to January 2013, he was a Visiting Professor at the Australian Energy Research Institute, UNSW, Sydney. Since 2006, he has collaborated with Tecnalia Research & Innovation as a research consultant. He has authored over 220 published technical papers, is a co-inventor of 7 patents, and has been involved in several industrial projects and educational programs in the fields of power electronics and systems. He has authored the chapter "Multilevel converters: Topologies, Modulation and Control" of the book "Control Circuits in Power Electronics: Practical Issues in Design and Implementation," (Ed. IET). He has received 6 scholarship and fellowship awards, including the Endeavour Research Fellowship Award, sponsored by the Australian Government – Department of Education, Employment and Workplace Relations. He received the best paper award at the conference IEEE PEDS 2015. His research interests include modulation and control of power converters, multilevel converters, renewable energy generation, energy storage, power quality, and HVDC transmission systems.

He is IEEE Senior Member, and Associate Editor of the IEEE Transactions on Industrial Electronicsand the IEEE Journal of Emerging and Selected Topics in Power Electronics. He was invited Chief-Editor of the Special Section on Hybrid Multilevel Converters for the IET Power Electronics.

Abstract

The modular multilevel converter (MMC) is an advanced converter topology that is changing the scenario of high-voltage direct current (HVDC) transmission systems. The MMC was first proposed in 2003 by Marquardt, and since then it has been an important focus of research for industry and universities. A three-phase MMC is integrated by six arms (two per phase-leg), each of them involving many cascaded submodules. The MMC offers an expandable and redundant configuration capable of generating a large number of voltage levels operating with high efficiency and reduced switching losses. This tutorial will introduce the operation principles of the MMC and some recent research advances, including modulation techniques, capacitor voltage balancing and control techniques for the circulating currents.

Session	**Industry Track**
Track Chair	**Dr. Amit K. Gupta**, *Chief of Electrical Capability Group, Rolls-Royce Singapore Pte Ltd.*
Date/Time	Tuesday, 22 November 2016 / 01.30 pm – 05.30 pm
Venue/Room	Lotus Junior Ballroom

Duration	Minutes	Topic	Speaker
13:30 – 14:00	30	Challenges for Designing IOT systems for Smart Sensing, 5G Infrastructures and Automotive Radar	Dr. Winfried Simon, *Senior Engineer, IMST GmbH MEDs Technologies Pte Ltd, Singapore*
14:00 – 14:25	25	Electrical and Mechanical Co-Design of a Modern Smart Watch	Dr. Klaus Krohne, *Sales and Support Manager CST- Computer Simulation Technology*
14:25 – 14:50	25	Frontier of high power IGBT technology: high temperature, high power density and easy expandability	Dr. Kwokwai Ma *Director – Industrial Power Control Infineon Technologies Hong Kong Ltd*
14:50 – 15:10	20	Technologies for Efficient Simulation of Complex Power Converters	Mr. Orhan Toker *VP Sales & Marketing Plexim GmbH, Technoparkstr. 1, CH-8005 Zürich*
15:10 – 15:30	20	The path of mobile IoT towards 5G	Dr. Michael Leung *Regional Manager, Internet Infrastructure Solutions, Communications Solutions Group Keysight Technologies Co. Ltd*
15:30 – 15:50	20	Power Conversions and Distributions Technologies for More Electric Aircraft	Dr. Amit K. Gupta, *Chief of Electrical Capability Group, Rolls-Royce Singapore Pte Ltd.*
15:50 – 16:15	25	Industry Networking Tea Break	
16:15 – 16:30	15	Panasonic's Automotive & Industrial Development Strategy for New Businesses... Reaching 3-5 Years Ahead	Mr. Chan Kim Koon, *Head of Singapore Technology Center, Singapore Technology Center, Panasonic Industrial Devices Singapore*
16:30 – 16:45	15	Motor Drives and Power System, the Electronics Cardiology and Neurology	Dr. Clare Loke, *Manager Motor Drives and Power Systems, Dyson Singapore Pte Ltd*
16:45 – 17:30	45	Panel Discussion on 'How Industry and Academia can work together to make next generation work force?' The panel includes five distinguished experts from Academic and Industry.	

Session	**IEEE HardTech Summit 2016**
Date/Time	26 November 2016 / 9.00 am – 5.00 pm
Venue/Room	School of Humanities And Social Science (HSS) Auditorium, HSS-B1-14, 14 Nanyang Drive, Nanyang Technological University, Singapore 637332.

Time	Activity
9:00 AM	Welcome Note – IEEE HardTech Summit 2016 *Nivas Ravichandran – IEEE Region 10 Young Professionals Coordinator*
9:10 AM	Creating a Driverless World – Opportunities & Challenges *Han Boon Siew – A*STAR Driverless Vehicle Program*
9:40 AM	Trends in Power Engineering : Innovation Challenges *Amit K Gupta & Rejeki Simanjorang – Electrical Capability Group | Rolls-Royce*
10:10 AM	Refreshments & Networking Break
10:40 AM	Breathe Easier with an Indoor Air Monitor *Dustin Jefferson – Co-Founder uHoo Air Monitor*
11:10 AM	Scaling your Hardware Technology & Expectations of an HardTech investor *Fireside Chat with Alex Toh – Angel Investor & Entrepreneur*
11:40 AM	Panel Discussion – Hardware Technology Opportunities & Challenges *Alexa Zotova | Tan Eng Tong | Sydney Shi | TBD*
12:25 PM	Lunch & Networking Break
1:25 PM	Sustainable Alternative Lighting – SALT *Aisa Mijeno – Co-Founder & CEO | SALT*
1:55 PM	EPICS in IEEE – Funding for Hardware Technology Products *Supavadee Aramvith – EPICS in IEEE Program & IEEE R10 EA Coordinator*
2:10 PM	Managing Energy for the Better *William Temple | Director – Ampotech*
2:30 PM	Challenges of Indoor Navigation *Alejandro | Co-Founder & CTO Infinium Robotics*
3:00 PM	Refreshments & Networking Break
3:30 PM	How to pitch your Hardware Technology Product? Expectations & Reality *Professional Activities Session*
4:00 PM	Cracking communication across devices with an Egg *Sydney Shi – CEO & Co-Founder | SmartEgg*
4:30 PM	Product Battlefield – Product Pitch Competition *7 Startups Demo their Products*

Workshop

Session	**IEEE Region 10 AdHoc Committee on Entrepreneurship, Internship and Innovation— Workshop on Innovations in Forensic, Biomedical & Health Bioinformatics**
Organizers	Dr. Amit K. Gupta, *Chief of Electrical Capability Group, Rolls-Royce Singapore Pte Ltd.* Prof. Stefan Mozar, *Chair – IEEE R10 EII – Innovations Subcommittee,* *Past President – IEEE Consumer Electronics Society*
Date/Time	Saturday 26 November 2016 / 9.00 am - 1.30 pm
Venue/Room	LHS-LT, Hives, NTU, Singapore

Time	Activity
09.00 – 10.00	Registration and High Tea
10:00 – 10:45	**Big genomics and clinical data analytics strategies for precision disease outcome prediction** Dr. KUZNETSOV Vladimir, *Principal Scientist and Head of the Genome and Gene Expression Data Analysis Division BII, A*STAR- Singapore*
10:45 – 11:30	**Biomedical and Clinical App Labs: Revolutionizing Smartphones into Pocket Lab Equipment** Dr. Gan Samuel Ken, *Antibody and Product Development Division at the Bioinformatics Institute (BII), A*STAR – Singapore*
11:30 – 12:00	Networking Tea Break
12:30 – 12:45	**How Consumer Electronics is changing the face of Healthcare** Dr. Stefan Mozar, *Dynexsys, Sydney Australia, Fellow- IEEE*
12:45 – 13:30	**Translational and Health Bioinformatics in Biomedical Era – Where do we stand?** Panel Discussion Dr. Stefan Mozar, *Dynexsys, Sydney Australia, Fellow- IEEE* Dr. Amit K. Gupta, *BioAxis DNA Research Centre, Hyderabad, India* Dr. Gan Samuel Ken, *A*STAR – Singapore* Dr. KUZNETSOV Vladimir, *A*STAR – Singapore*
13:30 – 14:30	Lunch and Disperse

Special Session 1	Computational Intelligence Techniques and Applications
Chair	**Dr. Teng Teck Hou**, *Singapore Management University*

Computational Intelligence Techniques and Applications

Computational intelligence (CI) techniques encompass good-old-fashion AI (GOFAI), soft computing and deep learning techniques. The ebb and flow of these CI techniques closely tracks the technology cycles. CI techniques such as evolutionary techniques, swarm intelligence, artificial neural network (ANN) and fuzzy logic were mere research topics for decades before suitable computing hardware is available for their use in a broad spectrum of industrial and consumer applications. Recent computing hardware and sensor technologies have also fast-tracked the research and development of many emerging CI techniques.

Topics and Areas of Interest

This special session solicits papers addressing original works in topics and areas of interest including, but are not limited to

1. Fundamental CI Methodologies

- Deep learning techniques
- Reinforcement learning techniques
- Supervised learning techniques
- Unsupervised learning techniques
- Evolutionary computing techniques
- Artificial Neural Networks
- Swarm Intelligence
- Graphical Models
- Bayesian Statistics

2. CI in Real-World Applications

- Time Series Prediction
- Sensor Networks
- Recommender Systems
- Robotic Systems
- Intelligent Transportation System
- Big Data
- Pattern Recognition
- Computer Vision and Image Understanding
- Intelligent Control Systems

Contacts

Justin Dauwels, *Nanyang Technological University*
Erdal Kayacan, *Nanyang Technological University*
Teng Teck Hou,*Singapore Management University*

Special Session 2	Radio Frequency Identification (RFID)
Chair	**Dr Qing Xianming**, *Institute for Infocomm Research (I2R)*

Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) technology provides wireless identification and tracking capability that is more convenient than the use of bar codes and optical scanners. The RFID uses wireless and semiconductor-based technology as a means of identifying and tracking items, it is an exciting multidisciplinary field with numerous applications. In this session, we target to invite both academic and industry peers to interact the new progress in development and market of RFID technologies and applications.

Contacts

Dr Qing Xianming, *Institute for Infocomm Research (I2R)*
Dr. Lau Pui Yi, *Invengo*

Special Session 3	Power Electronics and Drives
Chair	**Dr. SEE Kye Yak**, *Nanyang Technological University*

Power Electronics and Drives

Special Session 4	Recent Advances in Security and Safety for Intelligent Transportation Systems
Chair	**Dr. Guo Huaqun**, *Institute for Infocomm Research (I2R)*

Recent Advances in Security and Safety for Intelligent Transportation Systems

The cities of the future will increasingly be smart and intelligent for people's everyday lives, which are supported by various cyber-physical infrastructures. For today's urban transportation systems like metro/subway rapid transit system or Mass Rapid Transit (MRT) system, buses, and for future systems like those involving autonomous vehicles, there is the inherent complexity due to both the coupling of cyber and physical components and the interactions between various sub-systems and humans. Thus, for a city with dense population, the security, safety and reliability of its intelligent transportation systems are critical. This track will present the advanced technologies and research results in Security and Safety for Intelligent Transportation Systems.

Special Session 5	Magnetism and Spintronics
Chair	**Dr. S. N. Piramanayagam**, *Nanyang Technological University*

Magnetism and Spintronics

The Magnetics and Spintronics session of Tencon will feature about four invited talks, covering various aspects of magnetism and Spintronics. The invited speakers are from various parts of the world and present work on spin-torque oscillators, ferrite thin films for microwaves, magnetostrictive materials and magnonics. In addition, papers focusing on magnetism and Spintronics will be presented.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Hard Magnetic materials
- Soft Magnetic materials
- Magnetic devices
- Spintronic materials
- Spintronic devices
- Magnonics
- Spin wave physics
- Graphical Models

Special Session 6	Monitoring and Prognostics
Chair	**Dr. Abhisek Ukil**, *Nanyang Technological University*

Monitoring and Prognostics

In many industries, particularly engineering ones, condition monitoring and device diagnostics are of utmost importance, as schedule-based maintenance is increasingly becoming difficult due to cost and performance reasons. Based on real-time monitoring, prognostics, i.e., prediction of the remaining useful lifetime is very valuable as well. This session will cover the current and best practices on those topics from industry and academia. Topics would include case-studies utilizing electrical machines, automation devices, signal processing, sensors, analog/digital electronics, etc.

List of Topics

Condition Monitoring, Prognostics, Remaining Useful Lifetime, Physics of Failure, Electrical Machines, Motor, Generator, Transformer, Circuit Breaker, Process Instrumentation, Sensor, Signal Processing, Real-time Embedded Systems.

Contacts

Dr. Abhisek Ukil, *Nanyang Technological University*
Dr. Wang Dan Wei, *Nanyang Technological University*

Special Session 7	New Satellite Technologies and Applications
Chair	**Dr. Low Kay Soon**, *Nanyang Technological University*
Co-Chair	**Dr. Soh Wee Seng,**, *Nanyang Technological University*
Co-Chair	**Dr. Peng Xiaoming**, *Institute for Infocomm Research, Singapore*

New Satellite Technologies and Applications

The rapid advancement of space technology and new approaches has resulted in the miniaturizing of the size and weight of the satellites. Satellites that weigh less than 150kg such as micro-satellites and nano-satellites have been very actively researched and developed by both the industry and university in recent years. Various applications such as communication, navigation, climate study, remote sensing and scientific experiment have been reported. In this special session, we invite authors to submit papers related to microsatellite and nanosatellite missions. This special session provides an opportunity for the academic researchers and the satellite communities from the industry to present their research findings or share their latest satellite's results on performance analysis, development methodology, in-orbit experimental results, new control and sensing technique, and new applications.

Special Session 8	Computer Vision and Machine Learning
Chair	**Dr. Zhang Lei**, *Chongqing University, China*

Computer Vision and Machine Learning

Transfer learning, domain adaptation and multi-task learning methods are emerging topics in machine learning, intelligent systems, computer vision and heterogeneous data analysis. Heterogeneous data is often caused by many factors such as sensing devices (e.g. image sensor parameters), sensing principle (e.g. angles or views), sensing environment (e.g. illumination), etc. In vision applications, the (target) domain of interest contains very few labeled samples with limited knowledge, while an existing (auxiliary or source) domain is often available with a large number of labeled examples and useful knowledge but lying different distribution from target domain. This special session serves as a forum for researchers all over the world to discuss their works and recent advances in machine learning techniques and applications in heterogeneous data analysis.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Transfer learning and domain adaptation for large-scale multimedia analysis
- Supervised/semi-supervised/un-supervised adaptation methods
- Transfer/cross-domain deep learning methods for multimedia analysis
- Multi-view/Multi-task transfer learning for vision analysis
- Heterogeneous olfaction/electronic nose data analysis
- Transfer learning for concept drift compensation
- Structured semantic transfer for multimedia understanding
- Knowledge transfer based representation learning
- Cross-domain subspace learning
- Sparse/low-rank representation for subspace transfer learning
- Face recognition/object recognition/image classification/action recognition

Special Session 9	Renewable Energy-based Microgrids and Sustainable Development
Chair	**Dr. Taha Selim Ustun**, *School of Electrical and Computer Engineering, Carnegie Mellon University*

Renewable Energy-based Microgrids and Sustainable Development

Scope and Topics of interest include, but are not limited to:

- Novel techniques for Rural Electrification
- Sustainable Development through Electrification
- Novel technologies, business models enabling Rural Electrification
- Policy issues regarding implementation and financing of electrification projects
- Water-Energy-Developmen Nexus
- Use of Microgrids for post-disaster recovery in developing/developed countries

Special Session 10	Smart Distribution Systems: Technologies and Management
Chair	**Dr. Sivanand Kumar**, *National University of Singapore*
Co-Chair	**Dr. Dipti Srinivasan**, *National University of Singapore*

Smart Distribution Systems: Technologies and Management

Smart grid is an emerging paradigm of transforming the legacy electric power systems into a more advanced, eco-friendly and intelligent systems to allow the plug-and play operations of distributed renewable generation sources, energy storage systems, controllable loads and smart loads. Among various components of smart grid, smart distribution systems are most vital and attracted major focus of the technology innovators and stake-holders due to the integration of on-site generation and storage systems. However, the active nature induced into the distribution systems by integrating distributed energy generation and storage systems presents new challenges in their management. Besides the active nature, the two way data communication requirements to control and coordinate with various components in the system brings in more opportunities for Information and Communication Technologies (ICT) and challenges for electric utility operators in moving towards the smart power distribution systems.

Topics and Areas of Interest

Authors are invited to submit the papers of their original and unpublished work. Topics of interest include:

- **Microgrids and Distributed Generation (DG):**DG placement and sizing, microgrid control and management, smart microgrids, advances in renewable energy generation forecast.
- **Energy Efficiency and Demand side Management:** Energy analytics and demand response.
- **Active Distribution Network Management:** Energy management systems, energy storage integration and their socio-economic effects, voltage control and reactive power management.
- **Uncertainty management:** Impact of supply uncertainties and their handling strategies, measurement data uncertainty handing, distribution systems state estimation.
- **Electric Vehicles:** Impact of EV integration, cost-effective charging strategies, V2G management, ancillary service support, charging standards, battery swapping station management.
- **Self-healing systems:** Technologies for building the resilient distribution systems, new protection schemes, for active distribution networks, fault or outage management strategies, Automation.

Please be informed that the topics not covered by the above listed areas will fall out of the scope of this special session.

Special Session 11	Wireless Technology and Internet of Things (IoT) for Healthcare
Chair	**Dr. S.M. Sameer**, *National Institute of Technology Calicut, India*
Co-Chair	**Jithin Krishnan**, *Sree Chitra Tirunal Institute for Medical Sciences and Technology, India*

Wireless Technology and Internet of Things (IoT) for Healthcare

The domain of Healthcare is witnessing tremendous changes and growth propelled by the adoption of the Internet of Things (IoT). In IoT, devices gather and share information directly with each other and the cloud, making it possible to collect, record and analyze new data streams faster and more accurately. With the help of sensors, high-speed connectivity, efficient algorithms, signal processing techniques, wearables and healthcare apps, wireless IoT devices are contributing heavily to this exciting area. Healthcare providers who are under increasing pressure to maximize patient outreach and minimize costs look for technology solutions to optimally collect, process and infer huge volume of sensitive data. Wireless IoT in healthcare enables many patients to live more independently without the need for in-hospital care or constant medical appointments and also better serves the underserviced and remote populations. Further supporting people living in remote areas, widely available LTE/Wi-Fi will facilitate services that require high-speeds such as remote video consultation and specific diagnostic procedures. Wireless Body Area Networks (WBANs) based healthcare applications are in early development stage but offer valuable contributions to support to IoT enabled services with lower power consumption and better networking features. As the health information is very sensitive and vital, security must be ensured at all stages of data processing in healthcare application. Hence Wireless Technology and IoT for Healthcare manifest as an exciting area where researchers from Academia, R&D organizations, and Industries can collaborate and contribute.

Scope and Topics of interest include, but are not limited to:

- Algorithms and protocols for IoT in Healthcare
- Big data analysis techniques for patient data management
- Wireless sensor networks (WSN) as applied to healthcare systems
- Telemetric medicine
- Electronically controlled drug delivery
- Patient monitoring and chronic disease management through IoT
- Wireless body area networks (WBANs)
- RFID applications for healthcare
- Transmission Technologies for IoT in Healthcare
- Design of sensors and medical wearables
- Privacy, security and trust management in IoT based healthcare
- Cloud computing techniques for healthcare
- Safety measures for healthcare
- Machine-to-machine (M2M) communications in IoT for healthcare
- Cyber-physical and other IoT systems for healthcare

Special Session 12	Enhancing Power Quality, Reliability and Economic Performance of Microgrids
Chair	**Dr Gooi Hoay Beng**, *Nanyang Technological University*
Co-Chair	**Dr Abhisek Ukil**, *Nanyang Technological University*

Enhancing Power Quality, Reliability and Economic Performance of Microgrids

Microgrids as a platform to incorporate renewable and alternative energy resources can provide intelligence for monitoring and control of distribution systems. They can mitigate the intermittent nature of renewable energy sources and can improve the power balance between supply and demand, the reliability and economic performance of microgrids as well as the power quality of the supply. For these purposes, forecasting and generation scheduler, intelligent energy management, demand response management (DRM), real-time maximum demand control, hybrid energy storage, e.g., batteries and supercapacitors, and unified power quality conditioner (UPQC) are highly required in microgrid applications. This session will cover the current and best practices on those topics from industry and academia. Topics would include case studies utilizing forecast, generation scheduling and dispatch, power optimization, hybrid energy storage, battery, supercapacitor, fuel cell, UPQC, power electronics converters, demand response, etc.

Scope and Topics of interest include, but are not limited to:

- **Intelligent Energy Management:** Demand Response Market and Management, Maximum Demand Control, Contracted Capacity Optimization and Time-of-Use Tariffs and Electricity Pricing for Smart Grid.
- **Enhancing Power Quality and Reliability of Microgrids:**Energy Storage, Battery, Supercapacitor, Unified Power Quality Conditioner, DC/DC Converters, and DC/AC Inverters.
- **Forecasting and Generation Scheduling for Microgrids:** Power Forecast, Generation Scheduling and Their Applications in Renewable Energy Resources such as PV, Wind with Intermittencies and Uncertainties.

Special Session 13	Lighting: Controls, Technology and Applications
Chair	**Dr. Ciji Pearl Kurian**, *Manipal Institute of Technology, Manipal University, India*

Lighting: Controls, Technology and Applications

Recent studies have shown that energy savings in lighting applications can be affected by a combination of higher efficacy lamps, more efficient luminaires, better controls and intelligent use of light. Energy savings with the benefit of visual and thermal comfort can be achieved when systems integration strategies are competently designed. They require a high level of expertise and familiarity with new design techniques. Solid-State Lighting is revolutionizing the lighting market, which represents a transformational change in how interiors and exteriors are lit. LED luminaires are versatile and incredibly energy-efficient, and as their color stability and lumen efficacy continue to increase, they are finding their way into an ever expanding range of general illumination applications. Multi-channel LED luminaires are getting importance in many different lighting applications, by spectral tuning it is possible to derive, multi-color effects as well as white color stabilizing which finds its suitability for various societal and environmental applications. This platform will provide an opportunity for academics, industry participants and researchers to contribute towards the evolving world of lighting. This session also commemorates the initiative taken by the UN in raising global awareness about how light-based technologies promote sustainable development and provide solutions to global challenges.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Daylight - Artificial light integration
- Solid state lighting and controls
- Communication protocols and networking
- Human centric lighting
- Advances in sensors and controls
- Modelling and simulation
- Building energy management
- Interior and exterior lighting design
- Street lighting
- Automobile lighting
- Lighting for horticulture
- IOT for lighting
- Lighting market and applications
- Standards, commissioning and certification
- Lighting devices and materials

Special Session 14	Recent Advancements in Power Systems
Co-Chair	**Dr. S. Prabhakar Karthikeyan**, *VIT University, India*
Co-Chair	**Dr. Sarat Kumar Sahoo**, *VIT University, India*

Recent Advancements in Power Systems

Development in the field of power systems has given rise to new challenges and issues in the system. Transferring bulk power from generating station to the load point, special protection schemes which can suit the complex power system network and the unsolved problems in deregulation of electricity markets are some among them.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- High Voltage AC and DC transmission technologies
- Application of PMUs/Micro PMUs -placements, calibration, testing
- Remedial Action Schemes (RAS)/System Integrated Protection schemes (SIPS), numerical relaying schemes
- Voltage Stability/Frequency stability -monitoring, control under steady state/dynamic conditions
- Application of Nano technology for power systems problems
- Grid congestion, restructuring and deregulation of electricity market
- Load forecasting and reactive power management

Special Session 15	Human-Machine Intelligent Interfaces (HMII)
Chair	**Dr. Dakshina Ranjan Kisku**, *National Institute of Technology Durgapur, India*

Human-Machine Intelligent Interfaces (HMII)

With the advancement of computing technologies, human affects are becoming the key issues to study and development of affective computing interfaces which will demonstrate the robust algorithms and systems that can recognize, interpret, process and simulate the mental states and emotional affects of human beings. Investigating of socially and emotionally adept spontaneous technologies is becoming necessity in modern days for understanding of inference of various human actions including body postures, gestures, facial expressions, vocal nuances and other physiological signals as well as it will become an interesting study to bring humanistic actions in robotic devices, avatars, biometric systems and other intelligent interfaces. Human emotions are fundamental in influencing cognition, perception, learning, randomized actions, communication, knowledge representation, perceptual interpretations and decision making. To understand and demonstrate the key areas of affective computing, this special session on Human-Machine Intelligent Interfaces aims to provide a vibrant forum for experienced and young researchers, academics and industry people to discuss the problems, new proposals, exchange ideas and finding solutions for the existing as well as for new the problems of human affects computing and raw ideas on human - machine interactions.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Psychological models of human affects
- Intelligent interfaces - both software and hardware based
- Cognitive reasoning
- Computational models of intelligence
- Human activity recognition
- Mood detection
- Emotion recognition
- Human behaviour and physiological affects
- Facial expressions, gesture and posture analysis in identity verification
- Affective interfaces (games, learning, knowledge representation and interpretations, etc.)
- Affective data representation and database indexing techniques
- Human robot interactions
- Social aspects of affective computing
- Intelligent diagnostic interfaces
- Emotions in machines and intelligent devices
- Humanistic analysis of mental and psychological affects
- Biometrics (face, fingerprint, palm, ear, gait, iris, signature, etc.)
- Vocal affects inference
- Robots for autism
- Mind reading machines
- Affects in virtual reality
- Theoretical aspects of human emotions
- Environmental effects on bodily manifestations

Special Session 16	Wearable Medical Devices and Healthcare Computing
Co-Chair	**Dr. M. Sabarimalai Manikandan**, *Indian Institute of Technology (Bhubaneswar), India*
Co-Chair	**Dr. R. Barathram Ramkumar**, *Indian Institute of Technology (Bhubaneswar), India*

Wearable Medical Devices and Healthcare Computing

This special session aims to establish an international forum for academic, industry and medical professionals to present their research experiences and the recent technological and scientific developments in this area, and to explore and discuss various developmental issues of wearable medical devices, medical cyber physical systems, internet of things, medical imaging system technologies and their applications. This special session will provide excellent opportunities for the presentation of interesting new research clinical and experimental results, leading to knowledge transfer and the generation of new ideas. The authors are invited to submit full papers describing original, previously unpublished, not currently under review by another conference or journal, addressing state-of-the-art research and development in the areas emerging and developing in the field of wearable medical devices and healthcare computing. All submitted papers will be judged based on their originality, technical and/or research content, relevance to conference, contributions, and readability through peer-review process.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Biosignal Processing: Noise Removal, Signal Quality Assessment, Event Detection and Classification, Delineation
- and Parameter Extraction, Compression and Encryption
- Medical Image Processing: Image Enhancement, Segmentation, Registration, Watermarking, Compression, Quality Assessment
- Biomedical Circuits: Compressive Sensing, ASIC design and System-on-Chip (SoC)
- Applications of Physiological Signals: Human Physical Activity, Biometric and Affective Recognition
- Body and Personal Area Networks
- Embedded Medical Systems
- Mobile and Pervasive Healthcare Computing
- Security and Privacy Issues in Wearable Medical Devices
- Point-of-Care Devices
- Assisted Living and Rehabilitation Systems
- Cloud Computing in Healthcare
- Bigdata Analytics in Healthcare
- IoT for Healthcare
- Healthcare ICT- m-Health and e-health, Telemedicine
- Augmented Reality, Virtual Reality and Mixed Reality
- Robotic Surgery

Special Session 17	Action, Behavior Recognition and Understanding (ABRU)
Chair	**Dr. Md. Atiqur Rahman Ahad**,*University of Dhaka, Bangladesh*

Action, Behavior Recognition and Understanding (ABRU)

Action, activity and behavior analysis, understanding, recognition, etc. are very crucial vision problems for diverse applications. This special session concentrates on the developments of these arenas in the field of computer vision, HCI, robotics, etc. All accepted papers in this session will be invited for a Special Journal Issue in the International Journal of Computer Vision and Signal Processing and another (working on for another journal's special issue). For any query or before submitting papers, please contact **atiqahad@du.ac.bd.**

Special Session 18	Smart Power Flow Control and Self Healing Grid Architecture for Large Interconnected Power Network
Chair	**Dr. Rajendra Kumar Pandey**, *Indian Institute of Technology (Banaras Hindu University), Varanasi, India*

Smart Power Flow Control and Self Healing Grid Architecture for Large Interconnected Power Network

Special Session 19	Smart and Ubiquitous Computing for Vehicle Navigation Systems
Co-Chair	**Dr. P. K. Gupta,**,*University of Pretoria, South Africa*
Co-Chair	**Dr. S.K. Singh,**, *Indian Institute of Technology (Banaras Hindu University), Varanasi, India*

Smart and Ubiquitous Computing for Vehicle Navigation Systems

With the growth of technology and advancements in computing field, it has now become possible to connect the billions or trillions number of objects using the internet for their monitoring. Smart and Ubiquitous computing eases the existing traffic scenarios on roads. It enables the users to find the best route, inform about traffic jams, road accidents, blockage of roads etc. Technologies like Internet-of-Things, Cloud computing, Context aware computing, Sustainable computing, etc. allows users to design applications for building smart nations. The nature of these applications may vary from traditional desktops to wearable navigational systems focusing into many sectors like eTransportation, smart operations, environment monitoring, and smart security solutions, etc. Smart and ubiquitous computing provides the platform for designing such type applications. However, there are many challenges such as security, interoperability, and communications are associated with smart and ubiquitous computing that needs to be addressed by the industry and academia.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Smart and ubiquitous computing for intelligent environments
- Human-object interaction using ambient and IoT in smart cities
- IoT and Ubiquitous Sensing in eTransportation
- Ubiquitous computing in industrial application.
- Smart computing for analysing traffic pattern
- RFID based ubiquitous vehicle navigational systems
- IoT-based cloud computing for secure and faster transmission of information

Special Session 20	Wireless Power Transfer
Co-Chair	**Dr. Van-Tung Phan**, *Newcastle University, UK (Singapore campus)*
Co-Chair	**Dr. Kishore Naik Mude**, *Amrita Vishwa Vidyapeetham University, Bengaluru campus, Bangalore, India*

Wireless Power Transfer

The impact of various technologies is growing at a faster face to meet society needs, and one of such technologies is Wireless Power Transfer (WPT). Charging using wireless power transfer technology is gaining momentum due to its convenient feature of transferring power without contacts to charge the batteries of mobiles, electronic gadgets and electric vehicle. Recent advancements in WPT charging are evolving towards cost-effective and efficient systems. Nevertheless, need of much innovations in this technology is required to profligate the charging infrastructure. This special session intends to collect scientific and technical papers dealing with WPT pertaining to WPT and its applications. We are inviting researchers from both academia and industry to present technological trends, original solutions and in-progress research pertaining to WPT system.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Physics of the WPT
- Modeling, simulations and control of WPT systems and components
- WPT system and component design
- Wireless data communication in WPT systems
- WPT system monitoring
- EMI/EMC and shielding methodologies
- WPT safety requirements
- WPT for consumer electronics
- WPT for Bio-medical applications

Special Session 21	Terahertz Technology for Smart Sensing, Imaging and Communications
Chair	**Dr. Ranjan Singh** , *Nanyang Technological University*

Terahertz Technology for Smart Sensing, Imaging and Communications

Terahertz (THz) Waves for smart sensing, imaging, spectroscopy and communication have seen rapid development of technology recently. Considered as an extension of the microwave and millimeter wave bands, the THz frequency offers greater communications bandwidth than is available at microwave frequencies. The development of sources and detectors for this frequency domain has been driven by other applications such as spectroscopy, imaging, impulse ranging, and sensing. Only recently modulators and filters have been added to enable the development of communications applications. Therefore, the significance of terahertz waves in the areas of spectroscopy, sensing, imaging, and communications could be unprecedented even in the context of developing the next generation technologies for a smart nation.

Topics and Areas of Interest

This special session would be focused on original works on terahertz science and technology for practical THz sensing, imaging, and communication. The list of topics are as follows:

- Terahertz modulators
- Terahertz portable sources and detectors for communication system
- Terahertz filters
- Terahertz plasmonics
- Terahertz metamaterials
- Terahertz active photonics
- Terahertz wireless communications
- Terahertz sensors
- Terahertz Imaging
- Terahertz antennas

Special Session 22	Terahertz Technology for Smart Sensing, Imaging and Communications
Chair	**Dr. Chee-Kong Chui** , *National University of Singapore, Singapore*
Co-Chair	**Dr. Damon Wong** , *Institute for Infocomm Research, Singapore*

Engineering in Medicine and Biology

This special session focuses on the development and application of engineering concepts and methods to provide new solutions to medical, biological and healthcare problems for example, computer aided surgery which encompasses robotics, imaging, image processing and visualization, preoperative planning, training, operating room control and simulation. The multidisciplinary field demands mechanical/electrical engineers and computer scientists who know biomedical sciences and biomedical engineers. The special session serves as a forum for researchers and engineers to discuss their work and recent advances in engineering in medicine and biology.

Topics and Areas of Interest

This special session solicits papers addressing original works in topics and areas of interest including, but are not limited to:

- Biomechanics
- Biomedical and Health Informatics
- Biomedical Signal Processing
- Biomedical Imaging, Image Processing and Visualization
- Diagnostic Systems and Computer Aided Diagnosis
- Medical Instrumentation and Sensors
- Medical Robotics
- Medical Simulation and Education
- Personalized Medicine
- Physiological and Multiscale Modeling
- Surgical Navigation
- Therapeutic Systems

Contacts

Dr. Chee-Kong CHUI, *National University of Singapore, Singapore*
Dr. Damon WONG, *Institute for Infocomm Research, Singapore*
Dr. Jiayin ZHOU, *Institute for Infocomm Research, Singapore*

Special Session 23	Topics and Areas of Interest
Chair	**Dr. Hla Nu Phyu** , *Data Storage Institute, Singapore*

IEEE Women in Engineering (WIE)

IEEE Women in Engineering (WIE) special session is dedicated to promoting the profile of women scientists and engineers for better recognition in the work place and empower them for career advancement to contribute in the technological developments in science and engineering. We would like to invite Women engineers, scientists, educators, students and policymakers from academic sector, government, industry and non-governmental organizations to discuss, share and promote current works and recent accomplishments across all aspects of electrical, electronic, computer engineering and information technology as well as women empowerment in workforce.

Topics and Areas of Interest

Scope and Topics of interest of this special sessions are aligned with the conference theme:

- Power, Energy and Power Electronics (PEPE)
- Signal and Image Processing (SIP)
- Communication Systems (CS)
- Computational Intelligence (CI)
- Computing Technologies (CT)
- Devices, Materials and Processing (DMP)
- Biomedical Engineering (BE)
- Emerging Technologies (ET)
- Transportation Technologies (TT)

Contacts

Dr. Hla Nu Phyu,*Data Storage Institute, Singapore*
Dr. Huang Shaoying, *Singapore University of Technology and Design (SUTD), Singapore*

Special Session 24	Computer Graphics, Vision and Imaging
Chair	**Dr. Rajesh Siddavatam** , *Pro Vice Chancellor, Adamas University, Kolkata, India*

Computer Graphics, Vision and Imaging

The recent advances in cancer detection and allied areas of Computer Graphics and Visualization in conjunction with Computer Vision and Imaging are an important facet of today's research in Health-care. Many methods of imaging and vision will help us to understand the behaviour and process of cure in health care. Computer Graphics, Vision and Imaging increasingly rely on one another in Computer Science and real world applications. High Quality Research papers are solicited in Computer Graphics, Computer Vision, Image Processing, Geometry Processing, Virtual Reality, Machine Vision and Imaging Technology under this Special Session.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Computer Graphics: Modeling, Rendering, Human-Computer Interaction, Computer Games, Scientific Visualization, Information Visualization, Computer-aided design, Animation, Virtual/Augmented Reality
- Computer Vision: Motion and Video Analysis, Stereo Vision, 3D Shape and Structure Analysis, 3D Modeling and Visualization, Pattern Analysis and Recognition, Satellite Data Analysis and Interpretation, Stereo and Structure from Motion, Illumination and Reflectance Modeling, Shape Representation and Matching, Early and Biologically-Inspired Vision, Computational Photography and Video, Robot Vision
- Imaging: Image and Video Retrieval, Imaging Model and Simulation, Image Security, Biometric Image Processing, Image Forensics, Video Forensics, Image Reconstruction, Image Compression

Contacts

Dr. Rajesh Siddavatam, *Pro Vice Chancellor, Adamas University, Kolkata, India*
Dr. Sachi Nandan Mohanty, *KIIT University , India*

Special Session 25	Computer Graphics, Vision and Imaging
Chair	**Dr. Dipti Srinivasan** ,*National University of Singapore*
Co-Chair	**Dr. Anupam Trivedi** ,*National University of Singapore*

Evolutionary Optimization Methods Applied to Smart Grid

The operation of modern power systems with an increasing focus on incorporating the smart grid features such as distributed generation, energy storage systems, plug-in electric vehicles, and demand-side management, has become a complex problem. Hence, new algorithms are necessary for the efficient operation of the modern power systems. This special session is intended to bring together the most recent advances in the application of Evolutionary Algorithms to Smart Grid problems. The submissions can focus on addressing the challenges and opportunities to enhance the future power systems' sustainability, reliability, and efficiency.

Topics and Areas of Interest

Development and application of Evolutionary Algorithms for problems related to design and control of Smart Grid such as:

- Optimal allocation and management of distributed generation sources
- Efficient integration and control of energy storage systems
- Charging scheduling and real-time co-ordination of plug-in electric vehicles
- Demand response and demand-side management at the grid level
- Smart home energy management
- Resilient distribution systems

Contacts

Dr. Rajesh Siddavatam, *Pro Vice Chancellor, Adamas University, Kolkata, India*
Dr. Sachi Nandan Mohanty, *KIIT University , India*

Special Session 26	Recent Advances in Intelligent Video Surveillance Systems
Chair	**Dr. Maheshkumar Hanmant Kolekar** ,*Indian Institute of Technology (Patna), India*

Recent Advances in Intelligent Video Surveillance Systems

Surveillance is a vital technology which provides assistance for criminal activities detection in companies, home, offices and government organizations. Human action recognition is a growing research field. Comparison between existing techniques and new techniques for action recognition along with hardware applications will give greater insight for real time applications. Human behavior recognition is also vital in predicting any abnormal activity beforehand by detecting suspected activity. Multi-sensor information can be combined for action / behavior recognition for higher accuracy. Tracking a person in crowded environment by solving occlusion problem is a current growing research area and has important practical applications. Analyzing crowd behavior will help to predict any abnormal activity and has a vital contribution in security purposes. This special session serves as a forum for researchers all over the world to discuss their works and recent advances in surveillance application in activity recognition/ single and multi-person behavior recognition and human tracking with single/ multi-sensor fusion analysis.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Abnormal Human Activity recognition
- Human Behavior Analysis
- Biomedical signal based Person Identification for security purpose
- Human/ Object Tracking
- Multi-camera tracking
- Multi-sensor Data fusion
- Occlusion Handling Technique
- Crowd Behavior Analysis
- Crowd Density Estimation
- Unattended object detection
- Applications of surveillance systems at public places like airports, railway stations

Special Session 27	Advances in Sensing and Data Analytics of Active Power Distribution Networks
Chair	**Dr. Luo Fengji** ,*The University of Sydney, Australia*
Chair	**Dr. KE Meng**,*The University of Sydney, Australia*

Advances in Sensing and Data Analytics of Active Power Distribution Networks

Advanced metering infrastructure (AMI) and sensing techniques are playing a vital role in modern smart grids. The wide-area and distributed data resources and recent advances in computing and data analytics also provide opportunities to learn knowledge from the unprecedented data volumes and develop data-driven applications to optimize the operations of power distribution networks. These applications include smart home management, controllable load aggregation, load monitoring, renewable forecasting, event-based network management, etc. Therefore, the advanced sensing and optimal utilization of the big data of active distribution networks become a huge challenge in modern smart grid research. This special session aims to publish original research papers and visionary reviews on the technologies, algorithms, and case studies associated with the sensing, data analytics, and data-driven applications of active distribution networks.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Advanced load appliance monitoring techniques
- Cloud-based architecture for demand side data integration and analytics
- Service oriented architecture and applications of active distribution networks
- Agent intelligence based smart control technologies for distributed energy resources
- Architecture and protocols of demand side big data storing and processing of smart grids
- Data-driven smart home management schemes
- Pattern analysis and illegal energy utilization behavior discovery of residential users
- Data-driven distribution network management through controllable load aggregations

Special Session 28	Privacy and Security Challenges in ICT for Smart Nation
Chair	**Dr. Durgesh Kumar Mishra**, *Sri Aurobindo Institute of Technology, India*

Privacy and Security Challenges in ICT for Smart Nation

A Smart Nation is aimed to improve quality of life of its citizens by using Information and Communications Technology. To achieve the goal, the nation acquires different types of real time data. The data is captured with the help of surveillance devices deployed at public places in the Smart Cities of the Smart Nation. The captured database is continuously analyzed by security agencies to take further actions, and make the life of its citizens more secure. No doubt, the objective is good but privacy concerns are not trivial. The data collected by agencies may violate privacy rights of an individual. The Smart Nation must also rigorously work on this issue by taking feedback about the privacy of the citizens. It must also designate agencies which study the trade-off between the security and the privacy, and must ensure that the security is highest with minimum privacy violations. Best on the feedback regular modifications must be done in the security policies and procedures. Such nations must also make strong regulations which help in preventing misuse of the information gathered to achieve Smart Nation goals. Papers are invited for the session to discuss the above issues and challenges.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Information Security
- Data Privacy
- Knowledge Mining
- Big Data Privacy and Security
- Issues and Challenges for ICT Implementation

Special Session 29	Methodologies for VLSI System Optimization and Recent Advances
Chair	**Manoj Sharma** ,*Bharati Vidyapeeth's College of Engineering (BVCOE), New Delhi, India*

Methodologies for VLSI System Optimization and Recent Advances

VLSI circuit optimization is a multi-dimensional problem. Circuit design techniques and methodologies are also often constrained by the product application in question. With geometries shrinking towards the picometre realm and mobile devices becoming mainstream, the circuit optimization problem is now more critical than ever. Main parameters like power, delay, and area are inherently interdependent, requiring design engineers make tradeoffs during optimization. Process variations further complicate the optimization process. Numerous techniques have been published and used by designers for VLSI system optimization at various levels. This special session provides a platform for researchers, designers and engineers involved at different stages of the design chain to share and discourse their works and findings with colleagues in the research ecosystem.

Topics and Areas of Interest

Scope and Topics of interest include, but are not limited to:

- Optimization methods for system design, logic design, circuit design, physical design
- Analog/digital circuit optimization, gate-sizing problem, discrete gate-sizing problem, portioning for optimization, power optimization, leakage optimization, timing-based placement, buffer insertion and driver sizing (BIDS), timing and area optimization, delay detection circuit, timing yield and performance optimization, STA, SSTA, statistical optimization
- Process variation-aware optimization
- Fuzzy based optimization, FMP, FGS, nonlinear/programming/piece-wise problem based optimization, piece-wise linear formulation based optimization, statistical optimization methods
- Uncertainty in critical path delay, variation compensation, timing failure causes, remedies and optimization, green computing and optimizationProbability theory based optimization techniques
- Look-up table based techniques, prediction techniques
- Clock stretching technique, circuit optimization techniques
- Routing congestion in VLSI circuits: estimation and optimization
- CAD capabilities, challenges and optimization

Special Session 30	Recent Challenges in Biomedical Applications
Chair	**Dr. Celia Shahnaz** , *Dept. of EEE, BUET, Bangladesh*
Co-Chair	**Dr. S. A. Fattah** , *Dept. of EEE, BUET, Bangladesh*

Recent Challenges in Biomedical Applications

The field of biomedical engineering faces several challenges because of its interdisciplinary nature. The objective of this special session is to present some recent research results dealing with the challenging issues in the area of biomedical engineering. Advancement in the analysis of ECG, EEG, EMG, PPG signals, medical imaging, and different real time implementation issues for automatic disease detections are some examples of possible topics. The special session will offer concerned authors to exchange ideas and share experience with real life experimentation and enthusiastic audience will be able to get direction on potential future research trend in Biomedical Engineering.

Special Session 31	Humanitarian Technologies
Chair	**Dr. Parkash Lohana**, *Usman Institute of Technology, Karachi, Sindh, Pakistan*

Humanitarian Technologies

The world is facing a number of challenges today, with global warming, poverty, lack of drinking water, lack of proper sanitation systems, lack of education, lack of access to basic infrastructure. The challenges humanity are facing today perhaps greater than ever before in the history of mankind. Technology has raised quality, quantity, efficiency and working style of individuals. How far it reaches to the socially unprivileged citizens who do not have the means to access the benefits of the technological innovation? This is a real problem and obstacle in making nations' smart in today's environment. How to provide the technological solutions to the problems including health services, disaster relief, clean water, and water at desired temperature in both summer and winter seasons, energy, communication, education/training to disabled, etc. for improving the quality of life of unprivileged citizens, here we need solution which in reality called technologies for smart nations.

Scope and Topics of interest include, but are not limited to:

- Technologies for Sustainable Development
- Technologies for Disaster Management
- Technologies for Education and Health
- Technologies for Communication and Keeping environment green

Technical Papers

23 November 2016, Wednesday

Session	[WE1A.SS1.1] SS01: Computational Intelligence Techniques and Applications
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.30 pm
Venue	Melati Junior Ballroom 4D
Organizer(s) / Chair(s)	Justin Dauwels; Lipo Wang; Erdal Kayacan; Teck Hou Teng

178 **Artificial Neural Networks for Gesture Classification with Inertial Motion Sensing Armbands**
Ananta Srisuphab and Piyanuch Silapachote

256 **Appliance Recognition using Hall Effect Sensors and K-Nearest Neighbors for Power Management Systems**
Lester James V. Miranda, Marian Joice S. Gutierrez, Samuel Matthew Dumlao and Rosula S. J. Reyes

300 **Machine Learning Application for Refrigeration Showcase Fault Discrimination**
Adamo Santana, Yoshikazu Fukuyama, Kenya Murakami and Tetsuro Matsui

336 **Self-Organizing Neural Grove: SONG**
Hirotaka Inoue

475 **An Interpretation of Sentiment Analysis for Enrichment of Business Intelligence**
Bharat Singh, Nidhi Kushwaha and Om Prakash Vyas

503 **Application of Novel Swarm Intelligence Algorithm for Congestion Control in Structural Health Monitoring**
Vijayalakshmi Senniappan, Jayashree Subramanian and Athish Thirumal

806 **Waitress Quadcopter Explores How to Serve Drinks by Reinforcement Learning**
Efe Camci and Erdal Kayacan

Session	[WE2A.CI.1] CI: Machine Learning
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.00 pm
Venue	Lotus Junior Ballroom 4E
Chair(s)	Hiroshi Ninomiya; P N Suganthan

59 **Pyramid Stack Data Stream Mining for Handling Concept-drifting**
Zhuoran Xu, Cuiqin Hou, Yingju Xia, Jun Sun, Hiroya Inakoshi and Nobuhiro Yugami

120 **Recursive Total Error Rate Minimization**
Se-In Jang, Geok-Choo Tan and Kar-Ann Toh

232 **Enhancement of Keyphrase-Based Approach of Automatic Bangla Text Summarization**
Md. Majharul Haque, Suraiya Pervin and Zerina Begum

754 **Enhancement of EEG Signals Classification for Imaginary Movement by Detailing Discriminant Parameters**
Yulianto Tejo Putranto, Mohammad Hariadi, Tri Arief Sardjono and Mauridhi Hery Purnomo

804 **Neural Network Training based on quasi-Newton Method using Nesterov's Accelerated Gradient**
Hiroshi Ninomiya

Session	[WE3A.SS3.1] SS03: Power Electronics and Drives
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.30 pm
Venue	Melati Junior Ballroom 4011
Organizer(s) / Chair(s)	Kye Yak See; Abhijit Choudhury; S. Prabhakar Karthikeyan

207 **High-frequency Model and Simulation for the Investigation of Bearing Current in Inverter-Driven Induction Machines**
Tengiz Svimonishvili, Fei Fan, Kye Yak See, Xiong Liu, Michael Adam Zagrodnik and Amit Kumar Gupta

354 **A New Slope Suppression Technique to Compensate for Voltage Unbalance in Multilevel Inverters**
J. Anitha Roseline, M. Senthil Kumaran and V. Rajini

414 **Analysis of Nonlinear Phenomena in Digital Integral-Controlled Buck Converters**
Xin Zhao, Changyuan Chang, Yuanye Li and Zhongjie Zhou

554 **Comparison of Fuzzy and MPC Based Flying Capacitor Multicell Converter**
P. Ponnambalam, J. Belwin Edward, G. Gokulakrishnan, M. Praveenkumar J. Gowrishankar and K. Aroul

720 **A 2.2 kW SiC Based High Frequency Battery Charger for Substation Backup Power Supply**
Abhijit Choudhury

757 **A Lower Switching Noise Two-Legs Three-Phase Inverter Applying New Type Modulation Scheme**
Atsushi Hirota, Saad Mekhilef and Mutsuo Nakaoka

Session	[WE4A.SS4] SS04: Recent Advances in Security and Safety for Intelligent Transportation Systems
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.30 pm
Venue	Melati Junior Ballroom 4111
Organizer(s) / Chair(s)	Guo Huaqun; Justin Dauwels

218 **Bayesian Prediction of the Duration of Non-recurring Road Incidents.**
Banishree Ghosh, Muhammad Tayyab Asif and Justin Dauwels

462 **Simulating a Disaster-Social Solidarity in an Emergency**
Muhammad Faisal Bin Zainal Abiden, Stephen Kheh Chew Chai and Antoine Fagette

476 **SecureRails: Towards an Open Simulation Platform for Analysing Cyber-Physical Attacks in Railways**
Zhan-Teng Teo, Bao Anh N. Tran, Subhash Lakshminarayana, William G. Temple, Binbin Chen, Rui Tan and David K. Y. Yau

541 **Securing Vehicular Ad-hoc Networks from Data Falsification Attacks**
Danda B. Rawat, Bhed B. Bista and Gongjun Yan

953 **Verification of Flow of Commuters for Alleviating Congestion at the Time of Rush Hour**
Yoichi Utsunomiya and Takashi Okuda

1462 **Numerical Modelling of Train Aerodynamics in Confined Space**
Zhuan Lun Yeo and Peng Cheng Wang

Session	[WE5A.SS2] SS02: Radio Frequency Identification (RFID)
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.30 pm
Venue	Orchid Junior Ballroom 4211
Organizer(s) / Chair(s)	Qing Xianming; Lau Pui Yi; O. P. Gan

707 **U slot Multi-Resonator RFID Tag with Enhanced Bitencoding Capacity**
M. Sumi, R. Dinesh, C. M. Nijas, S. Mridula and P. Mohanan

987 **An Overview: Zero-Phase-Shift Line (ZPSL) Loop Antennas for Near-field RFID Applications**
Xianming Qing, Zeng Yunjia, Zhi Ning Chen and Jin Shi

1026 **Computer Simulations for a Site-Specific Modeling of Indoor Radio Wave Propagation**
Yuko Suzuki and Manabu Omiya

1202 **Implementation Aspects of a New RFID Anti-collision Algorithm**
K. Reshmi and Dhanesh G. Kurup

1490 **Reliable RFID Bulk Reading Using Adaptive Time and Power Control**
O. P. Gan, L. L. Aw and H. Sheng

1521 **Directional UHF Near-field RFID Reader Antenna with an Improved Magnetic Field Distribution**
Yunjia Zeng, Xianming Qing, Zhi Ning Chen and Jian-Ming Jin

Session	[WE6A.SS29] SS29: Methodologies for VLSI System Optimization and Recent Advances
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.30 pm
Venue	Orchid Junior Ballroom 4212
Organizer(s) / Chair(s)	Manoj Sharma; Jatindra Kumar Deka; Rajib Kar

250 **Optimal Design of Low Power Three-Stage CMOS Operational Amplifier Using Simplex-PSO Algorithm**
K. B. Maji, R. Kar, D. Mandal and S. P. Ghoshal

422 **Mobility Degradation in Nano-Dimensional InAlAs/InGaAs Single Gate HEMT**
Neetika Sharma, Pritam Sharma and Jyotika Jogi

474 **Implementation of High Speed Vedic BCD Multiplier Using Vinculum Method**
G. Sree Lakshmi, Kaleem Fatima and B. K. Madhavi

1083 **Design and Analysis of Low Run-time Leakage in a 10 Transistors Full adder in 45nm Technology**
Md. Masood Ahmad, K. Manjunathachari and K. Lalkishore

1383 **On-line Testing of Coexistent Stuck-at and Open Faults in NoC Interconnects**
Biswajit Bhowmik, Santosh Biswas and Jatindra Kumar Deka

1438 **Performance Variation Measurement on Commercial FPGAs under various Operating Conditions**
Takashi Asada, Makio Eguchi and Yukio Mitsuyama

Session	[WE7A.SS23] SS23: IEEE Women in Engineering (WIE)
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.30 pm
Venue	Orchid Junior Ballroom 4311
Organizer(s) / Chair(s)	Hla Nu Phyu; Celia Shahnaz; Huang Shaoying

1481 **A Hybrid Approach to Matching Taxis and Customers**
Malika Meghjani and Katarzyna Marczuk

1471 **Mobile Acoustic Emotion Recognition**
Wei Yang Quek, Dong-Yan Huang, Weisi Lin, Haizhou Li and Minghui Dong

1468 **New Migration Operator in Biogeography-based Optimization for Solving Traveling Salesman Problem**
Huynh Thi Thanh Binh and Pham Dinh Thanh

1235 **Performance Evaluation of Data Communication in Wireless Power Transfer under Multiple Terminals**
Shinpei Noguchi, Mamiko Inamori and Yukitoshi Sanada

321 **Investigation of Indoor Positioning System Using Visible Light Communication**
Y. C. See, Norliza Mohd Noor and Y. M. Calvin Tan

1336 **Sub-frame Based Apnea Detection Exploiting Delta Band Power Ratio Extracted from EEG Signals**
Celia Shahnaz, Ahmed Tahseen Minhaz and Sk. Tanvir Ahamed

1366 **FPGA Based Efficient Elliptic Curve Cryptosystem Processor for NIST 256 Prime Field**
N. Shylashree, V. Sridhar and Deepthi Patawardhan

1412 **Performance Evaluation of Moth Flame Optimization on Real Parameter Single Objective Optimization and Computationally Expensive Optimization**
Remya Kommadath and Prakash Kotecha

2102 **Investigation of the Effect of Winding Structure and MMF Harmonics on the Rotor Eddy Current Loss of High Speed Permanent Magnet Motor**
H. N. Phyu, N. L. H. Aung and Jiang Quan

Session	[WE8A.CT1] CT: Computing Architectures and Systems
Date / Time	23 November 2016, Wednesday / 2.00 pm – 3.30 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Tohari Ahmad; Rajesh C. Panicker

113 **Fast 1-itemset Frequency Count using CUDA**
Roger Luis Uy and Nelson Marcos

254 **CALVIS32: Customizable Assembly Language Visualizer and Simulator for Intel x86-32 Architecture**
Jennica Grace Alcalde, Goodwin Chua, Ivan Marlowe Demabildo, Marielle Ashley Ong and Roger Luis Uy

506 **A Software Energy Analysis Method Using ExecutableUML**
Ryusuke Yoshimoto, Tomonori Kadono, Kenji Hisazumi and Akira Fukuda

572 **Software Design Pattern Recognition using Machine Learning Techniques**
Ashish Kumar Dwivedi, Anand Tirkey, Ransingh Biswajit Ray and Santanu Kumar Rath

616 **A Hash Based Architecture of Longest Prefix Matching for Fast IP Processing**
Surajeet Ghosh and Maitraya Baliyan

800 **Design and Development of Generic Web Based Framework for Log Analysis**
Raghav Rastogi, S. Akash, G. Shobha, G. Poonam, D. Pratiba and Ankit Singh

1182 **ACO based Embedded System Testing using UML Activity Diagram**
Vikas Panthi and Durga Prasad Mohapatra

Session	[WE1B.SS1.2] SS01: Computational Intelligence Techniques and Applications
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Melati Junior Ballroom 4D
Organizer(s) / Chair(s)	Justin Dauwels; Lipo Wang; Erdal Kayacan; Teck Hou Teng

809 **Items-mapping and Route Optimization in a Grocery Store using Dijkstras, Bellman-Ford and Floyd-Warshall Algorithms**
Jennifer C. Dela Cruz, Glenn V. Magwili, Juan Pocholo E. Mundo, Giann Paul B. Gregorio, Monique Lorraine L. Lamoca and Jasmin A. Villaseñor

857 **Improved Identification of Hammerstein Plant using a Non-linear Model Trained with Symbiotic Organisms Search**
Arnapurna Panda and Sabyasachi Pani

883 **Design of Hardware Circuit Based on a Neural Network Model for Rapid Detection of Center of Gravity Position**
Masahiro Teramura, Noritaka Shigei and Hiromi Miyajima

1000 **Automobile Driving Support System Evolved by Genetic Programming**
Go Yakami, Ivan Tanev, Katsunori Shimohara, Shigeru Katagiri and Miho Ohsaki

1141 **Application of data mining techniques to build Master Plant Relationships based on heterogeneous databases**
Periasamy Karthik Raja, Gu Zhan, Sivaprakasam Gokula Krishnan and Selvaraj Sankar

1367 **Single Level Production Planning in Petrochemical Industries using Moth-flame Optimization**
Sandeep Singh Chauhan and Prakash Kotecha

Session	[WE2B.CI.2] CI: Machine Learning
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Lotus Junior Ballroom 4E
Chair(s)	Dorien Herremans; Damon Wong

810 **Comparative Study of Markov Model based Synthesis and Recognition Systems**
Himakshi Choudhury, Subhasis Mandal and S. R. Mahadeva Prasanna

811 **Optimization of HMM Parameters for Online Handwriting Synthesis**
Himakshi Choudhury, Subhasis Mandal and S.R.Mahadeva Prasanna

910 **MorpheuS: Automatic Music Generation with Recurrent Pattern Constraints and Tension Profiles**
Dorien Herremans and Elaine Chew

913 **Cluster of Tweet Users Based on Optimal Set**
Amit Paul, Animesh Dutta and Frans Coenen

1090 **An Improved Collision Avoidance Scheme using Artificial Potential Field with Fuzzy Logic**
John Paolo C. Tuazon, Ken Gilfed V. Prado, Neil John A. Cabial, Reeann L. Enriquez, Francesca Louise C. Rivera, and Kanny Krizzy D. Serrano

1137 **Effect of the Multiple Intelligences in Multiclass Predictive Model of Computer Programming Course Achievement**
Unhawa Ninrutsirikun, Bunthit Watanapa, Chonlameth Arpnikanondt and Naphongthawat Phothikit

Session	[WE3B.SS3.2] SS03: Recent Advancements in Power Systems
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Melati Junior Ballroom 4011
Organizer(s) / Chair(s)	Kye Yak See; J. Gowrishankar; Kun Xia

905 **Operation Control and Simulation Research of the Variable-speed Constant-frequency System of the Ship Shaft Generator**
Kun Xia, Zhongwei Zhang, Nan Wang and Ping Zhang

948 **Predictive Voltage Controller for T-Type NPC Inverter**
Hai N. Tran, Tuyen D. Nguyen and Tran Thanh Vu

1181 **Co-Simulation of Sliding Mode Control of Single Phase Grid Connected LCL Filtered Voltage Source Inverter using LabVIEW and Multisim**
Bandi Sudhakar and Gudey Venkata Eswara Satish Kumar

1326 **Model Predictive Current Control For T-type NPC Inverter Using New On-line Inductance Estimation Method**
Dzung Phan Quoc, Tuyen Nguyen Dinh, Tien Nguyen The and Viet Nguyen Chan

1338 **A Single Switch Two Stage Elementary Converter Based Topology For Hybrid Standalone Microgrid Applications**
Milind D. Bagewadi and Sanjay S. Dambhare

1526 **A Single Phase Hybrid Multilevel Inverter with High Step up DC-DC Converter for Photovoltaic System**
J. Gowri Shankar, J. Belwin Edward, P. Ponnambalam and K. Sathish Kumar

Session	[WE4B.SS16] SS16: Wearable Medical Devices and Healthcare Computing
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Melati Junior Ballroom 4111
Organizer(s) / Chair(s)	M. Sabarimalai Manikandan; R. Barathram Ramkumar; Ishikawa Seiji

13 **An Experimental Analysis of Active Living Technologies to Review Device Accuracy**
Geoff Skinner and Reem Altamimi

145 **Implementation of a Wearable Cardio-Respiratory Monitoring Device.**
Megha Vishwaracharya and Rajasekar Mohan

358 **A Novel Medical Priority Aware Transmission Mechanism for Cognitive Radio Based Hospital**
Ishtiak Al Mamoon, A. K. M. Muzahidul Islam, Sabariah Baharun, Shozo Komaki and Ashir Ahmed

470 **BBCast: Intuitive Design and Utility of a Cloud Based Bulletin Board**
Miguel Luis Ting, Jan Franz Palngipang and Rowel Atienza

585 **An Ego-camera Based Finger-spelling Recognition System**
Joo Kooi Tan, Satoshi Hamada, Manabu Hirakawa, Hyoungseop Kim and Seiji Ishikawa

663 **Proposal of Fall Down Detection Method using Shape of Feature Quantity Obtained by Obrid-Sensor**
Shingo Aramaki, Yudai Moriyoshi, Kanya Tanaka, Shota Nakashima and Shenglin Mu

1323 **QRS Complex Detection Using Zero Frequency Filtering**
Kanjit Ray, C. M. Vikram and S. R. Nirmala

Session	[WE5B.SS26] SS26: Recent Advances in Intelligent Video Surveillance Systems
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4211
Organizer(s) / Chair(s)	Maheshkumar Hanmant Kolekar; Vinay Kumar Mittal

791 **COLT: Extending CONCOLIC Testing to Measure LCSAJ Coverage**
Arpita Dutta, Sangharatna Godboley and Durga Prasad Mohapatra

794 **Simultaneous Aerial Vehicle Localization and Human Tracking**
Kiran Kumar Lekkala and Vinay Kumar Mittal

1271 **Post-disaster Rescue Facility: Human Detection and Geolocation Using Aerial Drones**
A. J. A. Rivera, A. D. C. Villalobos, J. C. N. Monje, J. A. G. Mariñas and C. M. Oppus

1391 **A Novel Krawtchouk Moment Zonal Feature Descriptor For User-independent Static Hand Gesture Recognition**
Subhamoy Chatterjee, Piyush Bhandari and MaheshKumar H. Kolekar

1505 **Hidden Markov Model Based Human Activity Recognition using Shape and Optical Flow Based Features**
Maheshkumar H. Kolekar and Deba Prasad Dash

1531 **Detection of Fence Climbing Using Activity Recognition by Support Vector Machine Classifer**
Maheshkumar H Kolekar, Nishant Bharti and Priti N Patil

Session	[WE6B.SS30] SS30: Recent Challenges in Biomedical Applications
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4212
Organizer(s) / Chair(s)	Celia Shahnaz; S. A. Fattah

835 **Multi-Satellite Task Allocation Algorithm for Earth Observation**
Pratik Kumar Sinha and Animesh Dutta

1157 **An Algorithm to Decode Movement and Laterality From Deep Brain Local Field Potentials Utilizing Time and Frequency Domain Features**
Abu Shafin Mohammad Mahdee Jameel and Khondaker Abdullah Al Mamun

1296 **Autism Express-A cloud based framework for autism screening, confirmation and intervention**
Sharmistha Bardhan, Anwar Ullah, Helal Uddin Ahmed, Mohammod Golam Rabbani and Khondaker Abdullah Al Mamun

1334 **An Approach for Automatic Sleep Apnea Detection Based on Entropy of Multi-Band EEG Signal**
Suvasish Saha, Arnab Bhattacharjee, Md. Abu Aeioub Ansary and Shaikh Anowarul Fattah

1345 **Emotion Recognition Based on Wavelet Analysis of Empirical Mode Decomposed EEG Signals Responsive to Music Videos**
Celia Shahnaz, Shoaib-Bin-Masud and S. M. Shafiul Hasan

1360 **Test Case Generation For Concurrent Systems Using UML Activity Diagram**
Prateeva Mahali, Saswat Arabinda, Arup Abhinna Acharya and Durga Prasad Mohapatra

Session	[WE7B.SS10] SS10: Smart Distribution Systems: Technologies and Management
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4311
Organizer(s) / Chair(s)	Sivanand Kumar; Dipti Srinivasan; Thillainathan Logenthiran; Abhisek Ukil

533 **Compute Intensive Code Offloading in Mobile Device Cloud**
Sajeeb Saha, Ahsan Habib and Abdur Razzaque

1499 **Analysis of Ambient Temperature Effects and Airflow Rate for Energy Efficient HVAC in Buildings**
Zhang Hanwen and Abhisek Ukil

1534 **Secured Real-Time Impact Monitoring System for Integrating Solar PV in Distribution Network**
Congmiao Li, Dipti Srinivasan and Thomas Reindl

1535 **Forecasting of Wind Energy Generation using Self-Organizing Maps and Extreme Learning Machines**
Kianhwee Tan, Thillainathan Logenthiran and W. L. Woo

1536 **Forecasting of Photovoltaic Power using Regularized Ensemble Extreme Learning Machine (RE-ELM)**
Tiong Teck Teo, Thillainathan Logenthiran, Wai Lok Woo and Khalid Abidi

Session	[WE8B.CT2] CT: Network and Cyber Security
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Tohari Ahmad; Rajesh C. Panicker

495 **A Novel Approach for Evaluating Trust of Resources in Cloud Environment**
Usha Divakarla and K. Chandrasekaran

546 **Annulus: A Novel Image-based CAPTCHA Scheme**
Haichang Gao, Fang Cao and Ping Zhang

552 **Elliptic Curve Cryptography Implementation on FPGA using Montgomery Multiplication for Equal Key and Data Size Over GF(2^m) for Wireless Sensor Networks**
G. Leelavathi, K. Shaila and K. R. Venugopal

620 **Web Proxy Log Classification for Burst Behavior**
Nattapol Kiatkumjounwong, Sudsanguan Ngamsuriyaroj and Anon Plangprasopchok

1150 **Overlapped Scheme for Neighboring Similarity Method in Video-based Data Hiding**
Diksy Media Firmansyah and Tohari Ahmad

1151 **Modelling of UDP Throughput**
Sneha Thombre

1188 **Energy Efficient Grid Clustering Based Data Aggregation in Wireless Sensor Networks**
N. Rajathi and L. S. Jayashree

Session	[WE.OIF1] Oral Interactive Forum
Date / Time	23 November 2016, Wednesday / 12.30 pm – 2.30 pm
Venue	Orchid Main Ballroom 4201AB – 4306
Chair(s)	Sree Sharmila T.; Arokiaswami Alphones; Sahoo S. K

22 **Adaptive Sparse Range-spread Target Detection in Homogeneous Generalized Pareto Clutter**
Shuwen Xu, Penglang Shui, Xueying Yan and Jia Pu

104 **GuiTones-I: An Audio-Visual Database of Monophonic Guitar Tones**
Arpit Aggarwal, Rajeev Kumar, Tanvi Sahay and Mahesh Chandra

170 **Fault Location Estimation for VSC-HVDC System Using Artificial Neural Network**
Somasundaram Vasanth, Yew Ming Yeap and Abhisek Ukil

Session	[WE.OIF2] Oral Interactive Forum
Date / Time	23 November 2016, Wednesday / 3.00 pm – 5.00 pm
Venue	Orchid Main Ballroom 4201AB – 4306
Chair(s)	Sree Sharmila T.; Arokiaswami Alphones; Sahoo S. K

211 **Coil Design Guidelines for High Efficiency of Wireless Power Transfer (WPT)**
J. P. K. Sampath, A. Alphones and Hitoshi Shimasaki

281 **Improved Micro-Doppler Features Extraction Using Smoothed-Pseudo Wigner-Ville Distribution**
Roger Tan, Lim Hock Siong, Adriaan. B. Smits, Ronny. I. A. Harmanny and Lorenzo Cifola

442 **Automatic Generation Control in Competitive Market Conditions with Moth-flame Optimization based Cascade Controller**
More Raju, Lalit Chandra Saikia and Debdeep Saha

453 **Evaluation of Superconducting Coil for Microwave Power Transmission**
Hiromasa Kondo, Satoko Iida, Kosei Tanii and Takanobu Ohno

458 **Active Contour Energy Used in Object Recognition Method**
Zhiheng Zhou, Kaiyi Liu and Xiaowen Ou

471 **Joint Cyber and Physical Attacks Against Topology of Electric Grids**
Ying Sun, Wen-Tai Li, Wentu Song and Chau Yuen

507 **Robots for the Bottom of the Pyramid: Mobile Robot Racing Over the Internet**
Harini Venkatachalam Subramani, Dharani Marimuthu, Kamal P. Balaji and Shunmugham R. Pandian

589 **Current-fed Full-Bridge and Half-Bridge Topologies with CCL Transmitter and LC Receiver Tanks for Wireless Inductive Power Transfer Application**
Suvendu Samanta, Akshay Kumar Rathore and Sanjib Kumar Sahoo

595 **Reduced Network based Voltage Stability Monitoring by using PMU Measurements**
Ch. V. V. S. Bhaskara Reddy, Saikat Chakrabarti and S. C. Srivastava

640 **System Voltage and Frequency Control using DFIG based Wind Energy Conversion System**
Arup Kumar Goswami, Dwip Jyoti Goswami, Chinmaya Behera, Galiveeti Hemakumar Reddy and Pranju Chakrapaani

645 **Impedance Source Converter for Grid-connected Photovoltaic Applications**
Tan Hui Ying Felicia, R. T. Naayagi and Thillainathan Logenthiran

682 **DC Equipment Identification using K-means Clustering and kNN Classification Techniques**
Y. T. Quek, W. L. Woo and T. Logenthiran

684 **Adjacent and Functional LBP Based Background Model Learning for Video Object Detection**
Subhabrata Acharya, Pragyan Snigdha Priyadarsini and Pradipta Kumar Nanda

733 **Symmetrical DC-link Capacitor Voltage for Cascaded H-Bridge Inverter Supported from Solar PV Array**
Rahul Sharma and Rajesh Gupta

923 **Implementation and Power-Loss Characteristics of 400-V, 10-kW, 20-kHz Three-way Isolated DC/DC Converter as A Power Routing Unit for Constructing Microgrid Systems**
Ryosuke Kasashima, Shota Nakagawa, Koya Nishimoto, Yuichi Kado and Keiji Wada

24 November 2016, Thursday

Session	[TH1A.BE1] BE: Biomedical Imaging
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Melati Junior Ballroom 4D
Chair(s)	Worapan Kusakunniran, *Mahidol University, Thailand* Rajib Kar, *NIT Durgapur, India*

24 **Automatic Quality Assessment and Segmentation of Diabetic Retinopathy Images**
Worapan Kusakunniran, Jirat Rattanachoosin, Krittanat Sutassananon and Phuthimeth Anekkitphanich

209 **Assessment of Speckle Denoising in Ultrasound Carotid Images using Least Square Bayesian Estimation Approach**
Y. Nagaraj, C. S. Asha and A. V. Narasimhadhan

243 **A New Way of Applying Spatial Filters and Wavelets to Reduce Noise in Medical Images**
Alberto Palacios Pawlovsky and Makoto Hozaki

252 **Optimal Design of Full Subtractor using Particle Swarm Optimization with Aging Leader and Challenger Algorithm**
S. Kumar, P. K. Prasad, R. Das, A. Kumar, R. Kar, D. Mandal and S. P. Ghoshal

331 **Modeling Bipedal LocomotionTrajectories Using Hybrid Automata**
Gora Chand Nandi, Vijay Bhaskar Semwal, Manish Raj and Akanksha. Jindal

434 **A Study of Data Fusion for Alzheimers Disease Based on Diffusion Magnetic Resonance Imaging**
Changle Zhang, Shuai Mao, Chun Sing Wong, Edward S Hui, Chenfei Ye, Hengtong Li, Jingbo Ma and Ting Ma

437 **Automatic Classification of Leukocytes using Morphological Features and Naive Bayes Classifier**
Anjali Gautam, Priyanka Singh, Balasubramanian Raman and Harvendra Bhadauria

Session	[TH2A.IoT] ET: Internet of Things
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Lotus Junior Ballroom 4E
Chair(s)	N. Sathish Kumar, *Sri Ramakrishna Engineering College, India* Josyl Mariela B. Rocamora, *University of Santo Tomas, Philippines*

524 **IOT Based Smart Garbage Alert System using Arduino UNO**
N. Sathish Kumar, B. Vijayalakshmi, R. Jenifer Prarthana and A. Shankar

743 **Analysis of Traffic Information Dissemination using Vehicular Ad Hoc Network Simulations**
Neil Calvin C. Roque, Angelica Mari D. Guico, Elladine Faye C. Mondia, Arianne Louise P. Garing, Josyl Mariela B. Rocamora and Edison A. Roxas

823 **FogR: A Highly Reliable and Intelligent Computation Offloading on the Internet of Things**
Md. Tanzim Saqib and Md. Abdul Hamid

901 **Stimulation Methods for Students Studies using Wearable Technology**
Toshiki Ueda and Yoshikazu Ikeda

933 **Smart Attendance Management using Bluetooth Low Energy and Android**
Raghav Apoorv and Puja Mathur

1024 **Performance Analysis of Intermittently Connected Sensor Networks**
Masahiro Fukuoka, Tomotaka Kimura, Kouji Hirata and Masahiro Muraguchi

1339 **Fuzzy Logic Based Algorithm for Context Awareness in IoT for Smart Home Environment**
Arpit Patel and Tushar A. Champaneria

Session	[TH3A.CS1.1] CS: Antennas, Propagation and Computational EM
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Melati Junior Ballroom 4011
Chair(s)	X. Zhao, *National University of Singapore* Nasimuddin, *Institute for Infocomm Research, Singapore*

260 **Polarization Reconfigurable Square Slot Ring Antenna with CPW-to-Slotline Transition**
Bharathi Anantha, Lakshminarayana Merugu and P.V.D. Somasekhar Rao

269 **A Wideband Circularly Polarized Antenna for Low Mutual Coupling Ka-band Phased Arrays**
Nasimuddin, Xianming Qing and Zhi Ning Chen

428 **Design and Equivalent Circuit Modeling of Textile Antenna for WBAN Applications**
Abhaikumar Sakthi, Roshni S. Nair, Arokiaswami Alphones and S. Raju

633 **Design of Wideband Planar Loop Antenna with Two Perpendicular Modes for Mobile Platforms**
X. Zhao, B. N. Tian, S. P. Yeo and L. C. Ong

657 **A Circularly Polarized Beam--Steering Antenna System for GNSS Applications**
Xinyi Tang, Nasimuddin, Xianming Qing and Zhi Ning Chen

705 **Triple Bands MIMO Antenna for WLAN Applications**
Guiping Jin, Yong Huang, Chuhong Deng and Guangde Zeng

722 **Composite Right/Left Handed (CRLH) Based Frequency Selective Surfaces (FSS) for Enhancement in Performance of Microstrip Antennas**
Karthik Thothathri Chandrasekaran, Muhammad Faeyz Karim, Nasimuddin, Arokiaswami Alphones, Leong Siew Weng and Michael Ong Ling Chuen

Session	[TH4A.CS2.1] CS: Wireless Communications and Networks
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Melati Junior Ballroom 4111
Chair(s)	Md. Ahsan Habib, *University of Dhaka, Bangladesh* Padmalaya Nayak, *GRIET, India*

49 **Intelligent Cross-Layer Protocol with Traffic-Differentiation-Based QoS for Wireless Sensor Networks**
Jawad Ahmad Haqbeen, Takayuki Ito, Mohammad Arifuzzaman and Takanobu Otsuka

70 **Starfish Routing for Wireless Sensor Networks with a Mobile Sink**
Ahsan Habib, Sajeeb Saha, Fernaz Narin Nur and Abdur Razzaque

80 **Collaborative Neighbor Discovery in Directional Wireless Sensor Networks**

Fernaz Narin Nur, Selina Sharmin, Ahsan Habib, Abdur Razzaque and Shariful Islam

95 **Peak-to-Average Power Ratio Reduction in OFDM System Using Amplitude Clipping**
Pramesh Gautam, Prawal Lohani and Brajesh Mishra

193 **An Efficient Compressive Spectrum Sensing Technique for Cognitive Radio System**
Hao Chen and Chan Hua Vun

233 **A Fuzzy Logic based Dynamic Channel Allocation Scheme for Wireless Cellular Networks to optimize the Frequency Reuse**
Padmalaya Nayak, Bhavani Vathasavai and M. Shanthi

253 **Performance Evaluation of Caching Policies in NDN-An ICN Architecture**
Samar Shailendra, Senthilmurugan Sengottuvelan, Hemant Kumar Rath, Bighnaraj Panigrahi and Anantha Simha

1402 **Analysis of Spectrum Handoff under Secondary User Mobility in Cognitive Radio Networks**
Shanidul Hoque, Mohd Azmal and Wasim Arif

Session	[TH5A.SIP1.1] SIP: Image Processing
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4211
Chair(s)	Sharmil Randhawa, *Flinders University, Adelaide, Australia* Debby D. Wang, *Caritas Institute of Higher Education, Hong Kong*

94 **Biclustering-based Iterative Segmentation of Human Face Images for Facial Feature Extraction**
Debby D. Wang, Haoran Xie, Fu Lee Wang, Ran Wang, Xuefei Zhe and Hong Yan

164 **Opto-mechanical Tilt Sensor using Moire Effect for Slope Movement Remote Sensing**
Pei Ying Tan, Mani Maran Ratnam, Yen Kin Sam and Fauziah Ahmad

224 **Lost Label Prediction Algorithm for Three Description Lattice Vector Quantization System**
Hui Ting Teo and Mohd Fadzli Mohd Salleh

277 **Enhancement of Depth Map Using Texture and Depth Consistency**
Ting-An Chang and Jar-Ferr Yang

291 **Edge Preserving CFA Demosaicking based on Nonlinear Weighted Color Differences**
Ngai Li, Jim S. Jimmy Li, Sharmil Randhawa and Donald G. Bailey

432 **Image Annotation Using Multi-view Non-negative Matrix Factorization and Semantic Co-occurrence**
Fuping Zhong and Lihong Ma

439 **Diffusion and Interpolation Method for Gradient Vector Flow**
Ruzheng Zhao, Zhiheng Zhou and Huiqiang Zhong

Session	[TH6A.SIP2.1] SIP: Signal Processing
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4212
Chair(s)	Shinichi Koike, *Consultant, Japan* Aditya K. Jagannatham, *Indian Institute of Technology Kanpur, India*

60 **Phase-Compensator Design Using Two-Step Mathematical Programming**
Tian-Bo Deng

86 **Subspace Based Multi-User Spectrum Sensing in Frequency Selective Cognitive Radio Systems**
Mohit Rajput, Saumya Dwivedi, Adarsh Patel and Aditya K. Jagannatham

141 **Adaptive Step-Size Q-Normalized Least Mean Modulus-Newton Algorithm**
Shin'ichi Koike

179 **Effect of Minimum Phase Whitening Filter in Adaptive Beamforming Structure on Fluctuating Acoustic Signal**
Jinsoo Jeong

206 **A Digital Signal Processing Algorithm on Read Out Circuit for Electrical Capacitance Tomography**
Arba'i Yusuf, Dodi Sudiana, Agus Santoso Tamsir and Harry Sudibyo S

265 **Accurate Design of Digital Fractional Order Differentiators using Improved Particle Swarm Optimization**
Shibendu Mahata, Rajib Kar, Durbadal Mandal and Suman Kumar Saha

266 **Efficient design of IIR Fractional Order Digital Integrators using Craziness based Particle Swarm Optimization**
Shibendu Mahata, Rajib Kar, Durbadal Mandal and Suman Kumar Saha

1504 **Mathematical Modeling of Predictive Grinding for Ball Mill**
Sonali Sen, Arup Kumar Bhaumik and Jaya Sil

Session	[TH7A.POW1.1] PEPE: Micro Grids and Distributed Generation
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4311
Chair(s)	Farhad Shahnia, *Murdoch University, Australia* Thillainathan Logenthiran, *Newcastle University, Singapore*

102 **Smart Home Demonstration on LabVolt Home Energy Production Training System**
K. R. Tan, Thillainathan Logenthiran, W. L. Woo and R. T. Naayagi

121 **Connecting an Embedded Generator to an Existing Facility in Singapore Power Grid**
Tan Xiao Xuan, Thillainathan Logenthiran, K. Yathunanthan and P. Amirthan

151 **Total Optimization of Smart Community by Differential Evolution Considering Reduction of Search Space**
Mayuko Sato and Yoshikazu Fukuyama

220 **Study in the Impact of Distributed Generator (DG) Placement and Sizing on a Ring Distribution Network**
Amir Alipour, Christian Alexander C. Asis, Jefferson Joseph P. Avanzado and Michael C. Pacis

309 **Dependability Evaluation of Parallel Differential Evolutionary Particle Swarm Optimization for On-line Optimal Operational Planning of Energy Plants**
Norihiro Nishimura, Yoshikazu Fukuyama and Tetsuro Matsui

311 **Optimal Allocation of FACTS Device to Improve Voltage Profile and Power Loss using Evolutionary Programming Technique**
Nur Ashida Binti Salim and Josepely Maika

494 **Defining the Suitable Adjacent Microgrids to From a Temporary System of Coupled Microgrids**
Farhad Shahnia and Ali Arefi

505 **Stability of a Sustainable Remote Area Microgrid**
Farhad Shahnia

Session	[TH8A.SS5] SS05: Magnetics and Spintronics
Date / Time	24 November 2016, Thursday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4010AB
Organizer(s) / Chair(s)	S. N. Piramanayagam

181 **Investigation of Artificial Magnetic Lattices [Invited]**
Hironaga Uchida

1508 **Process Controlled Magnetic Properties in thin Film Ferrite Systems [Invited]**
Venkataramani Narayanan

1512 **Stress Induced Magnetization Rotation in Nanoscale Magnetic Elements and its Applications for Electrical Power Generation [Invited]**
Liu Xiaoxi

482 **Performance Analysis of Media-based Cache via Analytical and Simulation Model**
Mingzhou Xie, Jun Xu and Li Xia

1511 **Holographonics**
Ranjbar Mojtaba

Session	[TH1B.BE2] BE: Biomedical Imaging
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Rajgopal Kasi, *Indian Institute of Science, Bengaluru* Zaid Omar, *Universiti Teknologi Malaysia, Malaysia*

527 **Optimization of Declarative Graphics by Parallel Programming**
Aishwarya Rajan, Kriti Nagori, Meenakshy Balachandran, Shashidhar G Koolagudi and Fathima Afroz

568 **Machine Learning Algorithm for Retinal Image Analysis**
R. Santhakumar, E. R. Rajkumar, Megha Tandur, K. S. Geetha, Kumar Thirunellai Rajamani and Girish Haritz

588 **Automated Edge Detection of Breast Masses on Mammograms**
Sarmistha Chakraborty, Mrinal Kanti Bhowmik, Anjan Kumar Ghosh and Tannistha Pal

606 **A Multi Clue Heuristic Based Algorithm For Table Detection**
G V S S K R Naganjaneyulu, N Veerendra Sathwik and A. V. Narasimhadhan

613 **A Novel Method for Pitch Detection via Instantaneous Frequency Estimation using Polynomial Chirplet transform**
G V S S K R Naganjaneyulu, M Venkata Ramana and A. V. Narasimhadhan

621 **Artificial Bee Colony (ABC) Based Variable Density Sampling Scheme for CS-MRI**
Akshay Kumar Jagadish, Soumya Goswami, Pramit Saha, Satrajit Chakrabarty and Rajgopal Kasi

769 **Noisy Brain MR and CT Image Registration using MRF Model**
Sunita Samant, Pradipta Kumar Nanda and Asish Ghosh

869 **Wavelet-based Medical Image Fusion via a Non-linear Operator**
Zaid Omar, Saif S. Ahmed, Musa Mokji, Marsyita Hanafi and Vikrant Bhateja

Session	[TH2B.SS9.1] SS09: Renewable Energy-based Microgrids and Sustainable Development
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Lotus Junior Ballroom 4E
Organizer(s) / Chair(s)	Dr. Taha Selim Ustun; Sarat Kumar Sahoo

5 **Feasibility of Microgrid Optimization and Grid Extension for Rural Electrification**
Andrew Harrison Hubble and Taha Selim Ustun

21 **Overview of Grand Challenges and SmartGrid Research Framework for a Smooth Transition in Qatars Electrical Sector**
Taha Selim Ustun

52 **Wireless Power Grid: Leapfrogging in Power Infrastructure of Developing Countries**
Ashok Tak and Taha Selim Ustun

486 **Generation of Electricity using Concentrated Solar Power and Thermo-electric Module**
Tahmid Tisad Prantor, Mehedi Hasan and Chowdhury Akram Hossain

843 **Voltage Control and Power Balance in a Standalone Microgrid Supported from Solar PV System**
Vivek Kumar and Rajesh Gupta

955 **Micro-grid Operation and Control of Photo-Voltaic Power with Canal Based Small Hydro Power Plant**
Dushyant Sharma, Sukumar Mishra and Janardan Nanda

1107 **Feasibility Study of Solar Power System in Fishing Trawlers in Chittagong Region of the Bay of Bengal**
Sajib Chakraborty, S.M. Safayet Ullah, Mohammed Mahedi Hasan and M. Abdur Razzak

Session	[TH3B.CS1.2] CS: Antennas, Propagation and Computational EM
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Melati Junior Ballroom 4011
Chair(s)	Deeplaxmi V. Niture , *College of Engineering, India* Rahul Singhal, *BITS, Pilani-Campus, India*

787 **Monopole Antenna with Double Rectangular Slot and Truncated Corners Ground for Ultra-Wideband Application**
Ria Aprilliyani, Fariz Azhar Abdillah, Rian Gilang Prabowo, Teguh Samudra Firdaus and Fitri Yuli Zulkifli

827 **Frequency and Polarization Reconfigurable Square Ring Antenna for Wireless Application**
Deeplaxmi V. Niture, Padwal Ashish Govind and S. P. Mahajan

830 **Performance Comparison of Probe-fed Polygonal Patch Antennas for L-Band Applications**
Abhishek Joshi and Rahul Singhal

832 **Probe-Fed Regular Hexagonal Narrow-Slot Antenna with Reduced Ground Plane for WLAN Applications**
Abhishek Joshi and Rahul Singhal

1039 **Model Comparison for Estimating Cloud Liquid Water Content and Attenuation in Tropical Region**
Feng Yuan, Shilpa Manandhar, Yee Hui Lee and Yu Song Meng

1040 **Weather Radar to Detect Cloud Occurence Level**
Shilpa Manandhar, Feng Yuan, Soumyabrata Dev, Yee Hui Lee and Yu Song Meng

Session	[TH4B.CS2.2] CS: Wireless Communications and Networks
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Melati Junior Ballroom 4111
Chair(s)	Soumitra Bhowmick, *Indian Institute of Technology, Kanpur, India*

319 **Energy Harvesting Aware Protocol for 802.11-based Internet of Things Network**
Lukman Rosyidi and Riri Fitri Sari

343 **A Proposal on Void Zone Aware Greedy Forwarding Method over Manet**
Yuto Terao, Phonepadith Phoummavong, Keisuke Utsu and Hiroshi Ishii

372 **Study of Expected Delay of Multi-hop Desynchronization for Wireless Sensor Networks**
Dujdow Buranapanichkit

441 **Bit Error Rate of Spatial Modulation Systems for Nakagami-*m* Fading**
Nodar Ugrelidze, Mariam Sordia and Sergo Shavgulidze

478 **Method of Determining the Relationship between Audio/Video QoE and Route Availability in a MANET**
Tamotsu Yashima and Kazumasa Takami

479 **Method of Detecting a Stray Diver Using Underwater Ultrasonic-Band Multicast Communication**
Shinya Kaido and Kazumasa Takami

795 **Effect of Probabilistic Sensing Models in a Deterministically Deployed Wireless Sensor Network**
Nitika Rai and Rohin D Daruwala

936 **Development and Analysis of 3D-Copula Model for Statistical Dependencies in Wireless Sensor Networks**
Sunayana Jadhav and Rohin Daruwala

Session	[TH5B.SIP1.2] SIP: Image Processing
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4211
Chair(s)	Wen Chen, *The Hong Kong Polytechnic University, China* Stefan Winkler, *Advanced Digital Sciences Center (ADSC), Singapore*

492 **Video Inpainting Detection and Localization Using Inconsistencies In Optical Flow**
Shobhita Saxena, Venkata Subramanyam and Hareesh Ravi

637 **MSCM-LiFe: Multi-Scale Cross Modal Linear Feature for Horizon Detection in Maritime Images**
Dilip K. Prasad, Deepu Rajan, C. Krishna Prasath, Lily Rachmawati, Eshan Rajabally and Chai Quek

659 **Automatic Detection of Defective Welding Electrode Tips Using Color Segmentation and Hough Circle Detection**
Chisung Kim, Dong Seog Han, Jin Kyoung Kim and Byoung Ik Kim

674 **Optical Decoded-Image Correlation using Simultaneous Compression of Input Image and the Phase in the Recording Plane**
Wen Chen

719 **Comparison of Human and Machine Performance for Copy-Move Image Forgery Detection Involving Similar but Genuine Objects**
Ye Zhu, Ramanathan Subramanian, Tian-Tsong Ng, Stefan Winkler and Rama Ratnam

729 **Biometric Association using Transfer Subspace Learning**
Rupali Sandip Kute and Vibha Vyas

860 **Detail and Contrast Enhancement for Images Using Dithering Based on Complex Wavelets**
Sunpreet Sharma, Ju Jia Zou and Gu Fang

Session	[TH6B.SIP2.2] SIP: Signal Processing
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4212
Chair(s)	Fuxi Wen, *Singapore University of Technology and Design, Singapore* Lay Teen Ong, *National University of Singapore, Singapore*

284 **Vehicle Black Box with 24GHz FMCW Radar**
Jung-Hwan Kim, Sun-Kyu Kim, Sang-Hyuk Lee, Tae-Min Lee and Joonhong Lim

359 **Exploring Acoustic Factor Analysis for Limited Test Data Speaker Verification**
Salil Mamodiya, Lav Kumar, Rohan Kumar Das and S. R. Mahadeva Prasanna

362 **Speaker Verification using Acoustic Factor Analysis with Phonetic Content Compensation in Limited and Degraded Test Conditions**
Akhil Babu Manam, Tummala Sai Revanth, Rohan Kumar Das and S. R. Mahadeva Prasanna

370 **A Generalized l_p-l_q Norm Minimization Approach for Distributed Estimation in Sensor Networks**
Fuxi Wen and Zhongmin Wang

376 **Experimental Study on Spatial Smoothing Direction of Arrival Estimation for Coherent Signals**
Lay Teen Ong

394 **Self-Training-Based No-Reference SSIM Estimation for Single Video Frame**
Zhenyu Wu and Hong Hu

411 **Design of Non-uniform Modified DFT Filter Banks**
V. Sakthivel and Elizabeth Elias

1207 **Acoustic Segmentation of Speech using Time Reversal: Single Frequency Filtering Analysis of Hypothesized Boundaries**
Raghu Ram Nevali, Sudarsana Reddy Kadiri, Bhanu Teja Nellore, Sri Harsha Dumpala and Suryakanth V Gangashetty

Session	[TH7B.POW1.2] PEPE: Micro Grids and Distributed Generation
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4311
Chair(s)	Gayadhar Panda, *NIT Meghalaya, India* Byungmoon Han, *Myongji Univ., South Korea*

598 **Modelling and Hardware-in-Loop Validation of a Modified Controller for Intermittent Operation of a Standalone Low Voltage DC Fuel Cell System**
Bonu Ramesh Naidu, Gayadhar Panda and R Ganesh

632 **Strategical Studies on Frequency and Voltage Control of an Islanded Microgrid**
N. J. L. Lim, Thillainathan Logenthiran, R. T. Naayagi and V. T. Phan

693 **Investigation on FPGA based Passive Anti-Islanding Protection Schemes for Grid Interfaced Distributed Generation System**
Satabdy Jena, Gayadhar Panda and Rangababu Peesapati

782 **Battery SoC-based DC Output Voltage Control of BESS in Stand-alone DC Microgrid**
Byungmoon Han

1329 **Optimal Design Combined with Power Management for Stand-Alone Microgrid**
Dzung Phan Quoc, Viet Nguyen Chan, Tuyen Nguyen Dinh, Tien Nguyen and Hiep Le Chi

1400 **Performance Analysis of Static Versus Rotary DC/AC Power Converters for Hybrid Renewable Energy Based Microgrid Applications**
Y. V. Pavan Kumar and Ravikumar Bhimasingu

Session	[TH8B.POW2.1] PEPE: Power Generation, Transmission and Distribution
Date / Time	24 November 2016, Thursday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Masahiro Furukakoi, *University of the Ryukyus, Japan* Hiroki Hayashi, *Kyushu University, Japan*

227 **Profit Maximization with Integration of Wind Farm in Contingency Constraint Deregulated Power Market using Moth Flame Optimization Algorithm**
Subhojit Dawn, Sadhan Gope, Arup Kumar Goswami and Prashant Kumar Tiwari

408 **Hybridization of Genetic Algorithm and Priority List to Solve Economic Dispatch Problems**
B. M. S Muhammad Ramadan, Thillainathan Logenthiran, R. T. Naayagi and Charles Su

436 **Optimal Operation for Transmission Systems with Uncertainty of Demand Forecasting and Voltage Stability**
Masahiro Furukakoi, Ahamad Samim Noorzad, Mohammad Masih Sediqi and Tomonobu Senjyu

440 **Load Frequency Control of a Multi-area, Multi-source System Using Firefly Algorithm Optimized F2DOFIDD Controller**
Upasana Sarma, L. C. Saikia, Arindita Saha and Puja Dash

450 **An Active Power Spot Price based Approach for Congestion Management by Optimal Allocation of TCSC in Competitive Power Market**
Subhojit Dawn, Prashant Kumar Tiwari, Sadhan Gope, Arup Kumar Goswami and Prakash Kumar

464 **Detection of Acetylene Dissolved in Insulation Oil Using Pt-decorated ZnO Gas Sensor**
Hiroki Hayashi, Michihiko Nakano and Junya Suehiro

481 **Neutral Grounding Reactors for Shunt Compensated EHV Transmission Lines**
K. S. Meera and Puneeth Bhurat

504 **Short-term Forecasting of Ports Power Load Based on Similarity of Wind Conditions**
Chuncheng Ling, Gang Yao, Yongjian Sun and Fushen Xue

Session	[TH1C.BE3] BE: Biomedical Signal Processing and Instrumentation
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Niyan Marchon, *Goa University, India* Roy Francis Navea, *De La Salle University, Philippines*

48 **Development of Wear-Free Health Monitoring System for Independent Aged People-Biological Signal Monitoring Using Piezoelectric-film Sensor**
Hitoshi Ueno

182 **Classification of Wavelet-denoised Musical Tone Stimulated EEG Signals using Artificial Neural Networks**
Roy Francis Navea and Elmer Dadios

366 **Acquisition and Analysis of Electrocardiogram Waveforms with Diagnosis Transmission through Short Message Service Communication System**
Bernice Mae Yu Jeco, Renz Vergil Doma, Michael Anthony Morales, Elisha Grace Tarroza, Ma. Fatima Villaflores, Angelo dela Cruz, Emmanuel Guevara, Ryan Rhay Vicerra and Ma. Luisa Asilo

391 **Improving the Performance of Multi-parameter Patient Monitors using Feature Mapping and Decision Fusion**
J. Rajevenceltha, C. Santhosh Kumar and A. Anand Kumar

404 **Detection of Fetal Heart Rate using ANFIS Displayed on a Smartphone**
Niyan Marchon and Gourish Naik

435 **Spectral Analysis of Heart Rate Variability and Its Coherence with Pulse Transit Time Variability in Prehypertension**
Ye Zhu, Yang Chen, Liangkun Qi and Heather T. Ma

Session	[TH2C.SS22.1] SS22: Engineering in Medicine and Biology
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.30 pm
Venue	Lotus Junior Ballroom 4E
Organizer(s) / Chair(s)	Chee-Kong Chui; Damon Wong

575 **Eye Movement Correction for 3D Optical Coherence Tomography Volume by using Saliency and Center Bias Constraint [Invited]**
Huazhu Fu, Yanwu Xu, Damon Wing Kee Wong and Jiang Liu

160 **High Performance Differential Capacitive MEMS Sensor Readout with Relaxation Oscillator Front-End and Phase Locked Loop Time-To-Digital Converter Back-End**
Kevin T. C. Chai, Chao Wang, Jifang Tao, Jinghui Xu, Liang Zhong and Ru S. Tan

280 **Multiscale Modeling of Liver Bio-impedance and Frequency Control for Radiofrequency Ablation**
Bin Duan and Chee-Kong Chui

652 **AQUIR-A System to Generate Quantitative and Customized Vision Measurement Template**
Ying Quan, Beng-Hai Lee, Ai Ping Yow, Zhuo Zhang, Damon Wing Kee Wong and Jiang Liu

759 **Automatic Image Classification in Intravascular Optical Coherence Tomography Images**
Mengdi Xu, Jun Cheng, Damon Wing Kee Wong, Akira Taruya, Atsushi Tanaka, Jiang Liu, Nicolas Foin and Philip Wong

Session	[TH3C.CS1.3] CS: Antennas, Propagation and Computational EM
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.00 pm
Venue	Melati Junior Ballroom 4011
Chair(s)	Abhay N. Gaikwad, *Babasaheb Naik College of Engineering Pusad, India* Venkateswaran N., *SSN College of Engineering, India*

1052 **An Empirical Propagation Model for UHF Frequency Bands in Varied Types of Tree Lines**
Vanpiti Jungpanich and Supachai Phaiboon

1085 **Ultra-wideband Rectangular Slot Antenna With U-Shaped Tuning Stub**
A. Bharathi

1153 **Square Fractal Ring Loaded CPW-Fed Circular Polarized Antenna**
Satyadeep Das and Sudhakar Sahu

1180 **Design of Microstrip TV Antenna for In-Campus Digital Broadcast System at 479 MHz**
Jennifer C. Dela Cruz , Alejandro H. Ballado Jr., Flordeliza L. Valiente, Mark Luis M. Lubrin , Kirk Nicole D. Matoza, Joshua C. Pineda and Aaron M. Polancos

1185 **Experimental Study and Analysis of Stepped-Frequency Continuous Wave Based Radar for Through the Wall Detection of Life Signs**
Abhay N. Gaikwad, Utkarsh S. Verulkar and Kalpesh S. Dongre

1310 **DOA Estimation of Near-Field Sources Using Support Vector Regression**
N. Venkateswaran and Ashok C.

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Session	[TH4C.CS2.3] CS: Wireless Communications and Networks
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.00 pm
Venue	Melati Junior Ballroom 4111
Chair(s)	Yuhong Wang, *Institute for Infocomm Research, Singapore* S. M Sameer, *National Institute of Technology Calicut, India*

360 **A New Integer Frequency Offset Estimation Method for OFDM Signals**
Soumitra Bhowmick and Kasturi Vasudevan

540 **Enhancement of PRoPHET Routing in Delay Tolerant Networks from an Energy Prospective**
Bhed Bahadur Bista and Danda B. Rawat

561 **SSIM based Resource Optimization for Multiuser Downlink OFDM Video Transmission Systems**
Finto Raphel and S. M. Sameer

562 **Analytical Computation of Frequency Metric for a Synchronous Ethernet Network**
Satheesh Kumar S

587 **Performance Analysis of HWMP Protocol for Wireless Mesh Networks Using NS3**
A. B. Nataraju, H. D. Maheshappa and Amar Devkatte

600 **Analysis of the Half-Duplex Decode-and-Forward Relay-Assisted Asymmetric Interference Channel**
Rajendra Prasad Sirigina and AS Madhukumar

631 **High Sensitivity ZigBee Baseband Receiver Design**
Yuhong Wang, Zhongding Lei and Ho Huat Peh

Session	[TH5C.SIP1.3] SIP: Image Processing
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4211
Chair(s)	Balasubramanian Raman, *Indian Institute of Technology Roorkee, India* Xiangrong Zhang, *Xidian University, China*

866 **Human Shadow Detection for Real-time Applications**
Mosin Russell, Ju Jia Zou and Gu Fang

976 **Image Segmentation Using K-Means Color Quantization and Density-Based Spatial Clustering of Applications with Noise (DBSCAN) for Hotspot Detection in Photovoltaic Modules**
Genevieve C. Ngo and Erees Queen B. Macabebe

1022 **A New Approach for Jawi Sub-word Segmentation using Histogram Projection**
Khairun Saddami, Khairul Munadi and Fitri Arnia

1033 **Medical Image Denoising Based on Improving K-SVD and Block-Matching 3D filtering**
Jing Bai, Yanchao Sun, Ting Fan, Shu Song and Xiangrong Zhang

1034 **A Reversible Robust Watermarking Scheme Based on Two out of Two Visual Cryptography Approach**
Priyanka Singh, Balasubramanian Raman and Manoj Misra

1038 **Information Security Display System on Android Device**
Yuanchun Chen, Ning Liu, Guangtao Zhai, Zhongpai Gao and Ke Gu

Session	[TH6C.SIP2.3] SIP: Signal Processing
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4212
Chair(s)	S. R. M. Prasanna, *IIT Guwahati, India* Kailash Chandra Ray, *Indian Institute of Technology Patna, India*

426 **CORDIC-based Parallel Architecture for One Dimensional Discrete Mellin Transform**
Kailash Chandra Ray and Anindya Sundar Dhar

454 **Study of Prosodic Feature Extraction for Multidialectal Odia Speech Emotion Recognition**
Monorama Swain, Aurobinda Routray, P. Kabisatpathy and Jogendra N. Kundu

537 **Detection of Similarity in Music Files using Signal Level Analysis**
Mathew Thomas, Mintu Jothish, Navin Thomas, Shashidhar G. Koolagudi and Y. V. Srinivasa Murthy

610 **Shouted/Normal Speech Classification using Speech-Specific Features**
Shikha Baghel, Banriskhem K. Khonglah, S. R. M. Prasanna and Prithwijit Guha

636 **Implementation of Pipelined Radix-2 FFT using SDC and SDF Architecture**
Deepika Hiremath and B. Rajeshwari

891 **Pattern Recognition Using Fragmentation and Concatenation**
Irwan Ramli and Cesar Ortega-Sanchez

Session	[TH7C.POW1.3] PEPE: Renewable Energy Sources and Technology
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4311
Chair(s)	Gudey Venkata Eswara Satish Kumar, *Gayatri Vidya Parishad College of Engineering, India*

175 **Energy Contraption Design Using Playground Seesaw for Lighting Load Applications**
John Ray B. Abad, Merryll D. Capucao, Lynette Dane C. Legaspi, Jesus Martinez Jr. and Michael C. Pacis

191 **Multi-AOA Optimization of Variable-Speed Wind Turbine Airfoils**
Yang Zhiqiang, Yin Minghui, Chen Xiaoyang, Chen Zaiyu and Zou Yun

194 **Control of Single Phase Power Inverter using Model Predictive Controller for Grid Integrated Renewable Energy Systems**
Aditi Chatterjee and K. B. Mohanty

202 **Capture Chamber Modelling and Validation in OWC on-shore Devices**
Aitor Garrido, Izaskun Garrido, Erlantz Otaola, Jon Lekube, Fares M'Zoughi, Khaoula Ghefiri, Diclobin G. Mundackamattam and Iñigo Oleagordia

328 **Islanding Operation of Small Vertical Axis Wind Turbine Under a Wide Wind Speed Area**
Hidehito Matayoshi, Atsushi Kina, Tomonobu Senjyu, Nobuaki Hiranaka and Abdul Motin Howlader

461 **A Comparative Study of Different MPPT Techniques Using Different DC-DC Converters in a Standalone PV System**
Bikram Sah and Gudey Venkata Eswara Satish Kumar

Session	[TH8C.POW2.2] PEPE: Power Generation, Transmission and Distribution
Date / Time	24 November 2016, Thursday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	S. Prabhakar Karthikeyan, *VIT University, India* Zhen Shu, *Energy R&D, DNV GL, Singapore}*

514 **Hydrothermal Scheduling using Modified Flower Pollination Algorithm: A Parallel Approach**
Suman Sutradhar, N. B. Dev Choudhury and N. Sinha

543 **Sensitivity Assessment on Locational Marginal Price under Deregulated Electricity Market**
Ashok Thomas Aby, S. Prabhakar Karthikeyan, Polly Thomas, and Emil Ninan Skariah

625 **Modeling Method of Controllable Loads with Decentralized and PID+DD Control Systems for use in Electric Power Transmission Systems**
Michael Palmer, Takahiro Uehara, Ryuto Shigenobu, Tomonobu Senjyu and Atsushi Yona

664 **Analysis of Singapore Electricity Market Clearing Model with Transmission Network Consideration**
Zhen Shu, Shengfeng Zhou, Kelvin Tan Kian Hock and Gooi Hoay Beng

696 **Interruptible Load Scheme: Demand Response Management for Buildings**
B. Sivaneasan, K. Thachinamoorthi and K. P. Goh

781 **Realization of Effect of Relative Humidity on Domestic Tariff for Low Tension Customers in India**
M. Yunus Ali Khan, Syed Yusuf Ahmed and S. Prabhakar Karthikeyan

786 **Modeling Diesel Generators for Weak and Strong Grid Conditions: Emphasis on LVRT Compliance**
Sruti Keerti, VSK Murthy Balijepalli, Abhisek Ukil, Yang Shicong, N. Karthikeyan and Amit K. Gupta

Session	[TH1D.BE4] BE: Biomedical Signal Processing and Instrumentation
Date / Time	24 November 2016, Thursday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Yap Roderick, *De La Salle University, Philippines* Saman S. Abeysekera, *Nanyang Technological University, Singapore*

583 ***K*-Nearest Neighbor: Detection of NS1 from SERS Spectra of Adulterated Saliva**
Nur Hainani Othman, Lee Yoot Khuan, Afaf Rozan Mohd Radzol, Wahidah Mansor and Ummu Rakinah Mohd Rashid

673 **Photoplethysmographic Signal Analysis via Beat-to-beat Periodicity Estimation**
Saman S. Abeysekera

689 **Bernstein Polynomial and Rational Bezier Curve for Blood Pressure Simulation**
I. Kanjanasurat, V. Chutchavong, C. Benjangkaprasert, V. Pirajnanchai and K. Janchitrapongvej

694 **A wireless Blood Sugar Monitoring System Using Ion-Sensitive Field Effect Transistor**
Jason M. Dy Perez, Windel B. Misa, Patrick Alvin C. Tan, Roderick Yap and Julita Robles

710 **Spectral Analysis on Vibroarthrographic Signal of Total Knee Arthroplasty**
Tanut Aranchayanont, Jitkomut Songsiri and Kakanand Srungboonmee

749 **On a New Model for Ebola disease**
Manuel De la Sen, Santiago Alonso-Quesada, Raúl Nistal and Asier Ibeas

Session	[TH2D.SS22.2] SS22: Engineering in Medicine and Biology
Date / Time	23 November 2016, Wednesday / 4.00 pm – 5.30 pm
Venue	Lotus Junior Ballroom 4E
Organizer(s) / Chair(s)	Chee-Kong Chui; Damon Wong

1401 **Development of Flexible Electronics in Biomedicine [Invited]**
Lee Chengkuo

1527 **Research of Beam Hardening in CBCT imaging [Invited]**
Jing Zhang, Yongliang Tian, Qi Liu, Ling He, Kai Liu

876 **Modeling and Simulation of a Remote Center of Motion Mechanism**
Chin-Boon Chng, Bin Duan and Chee-Kong Chui

1299 **Development of a Sign Language Translator Using Simplified Tilt, Flex and Contact Sensor Modules**
Katrina Nicole M. Ramos and Carlos Emmanuel A. Quiapo

1303 **A Modular Sensorized Handle for the Training of Functional Tasks with Planar Neurorehabilitation Setups**
Ming Jeat Foo, Simone Kager, Mohammad Esmaeili, Asif Hussain and Domenico Campolo

Session	[TH3D.CS1.4] CS: RF/Millimeter-wave Circuits and Systems
Date / Time	24 November 2016, Thursday / 4.00 pm – 5.30 pm
Venue	Melati Junior Ballroom 4011
Chair(s)	L. Snehalatha, *Indian Institute of Technology, India* Kouzani Abbas, *Deakin University, Australia*

188 **A Study on Tunable Bulk Acoustic Wave Macro Resonators**
Hock Lim, Abbas Z. Kouzani and Akif Kaynak

221 **Concurrent Dual-frequency Oscillator Using a Dual-band Filter**
L. Snehalatha, Nagendra P. Pathak and S. K. Manhas

452 **Validation of Damping Terminations for Signal Integrity Management in Digital Switching**
Wei-Juet Wong and Antonio Cantoni

456 **The Simplest Rectifier Topology Tolerant of Load Resistance Variation and Circuit Analysis by Square-Wave Approximation**
Kyohei Yamada, Yoichiro Miyazaki, Shinji Abe, Naoki Sakai and Takashi Ohira

605 **Analytical Drain Current Model to Study the Impact of Negative Capacitance Phenomenon in Symmetric Double Gate Junctionless Transistor**
Hema Mehta and Harsupreet Kaur

669 **Magnetic Circuit for a Sheet Electron Beam Ka-band Microfabricated Traveling Wave Tube**
Shaomeng Wang and Sheel Aditya

Session	[TH4D.CS2.4] CS: Wireless Communications and Networks
Date / Time	24 November 2016, Thursday / 4.00 pm – 5.30 pm
Venue	Melati Junior Ballroom 4111
Chair(s)	Sanjay K. Bose, *Indian Institute of Technology Guwahati, India* David Tung Chong Wong, *Institute for Infocomm Research A*STAR, Singapore*

634 **Multicasting in Wireless Networks with Correlated Links**
Prateek Rathore, Kalpana Dhaka and Sanjay K. Bose

662 **On the Complementary Nature of the Signature Matrices with Orthogonal Subsets for Overloaded CDMA**
Amiya Singh and Poonam Singh

665 **Two-hop AF MIMO Relay Systems with Direct Link - Transceiver Design Based on New Protocol**
Jinnian Zhang, Wanning Liu, Zhiqiang He and Yue Rong

685 **Training Design and Two Stage Channel Estimation for Correlated Two-way MIMO Relay Systems Under Colored Disturbance**
Huiming Chen and Wong-Hing Lam

703 **Performance Analysis of a Slotted Aloha with Decollision Algorithm (SADA) MAC Protocol for Satellite Uplink Access**
David Tung Chong Wong

724 **A Low Delay Cross-Layer Contention Based Synchronous MAC Protocol for a Multi-hop WSN**
Ripudaman Singh, Brijesh K. Rai and Sanjay K. Bose

Session	[TH5D.ROB1] OT: Robotics, Control, Instrumentation and Automation
Date / Time	24 November 2016, Thursday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4211
Chair(s)	Scott Adams, *Deakin University, Australia*

83 **A Redundant Flight Recovery System Implementation During an Octocopter Failure**
Elmer R. Magsino, Karl Obias, John Paul Samarista, Marc Francis Say and John Amos Tan

84 **A Rapid Screening Algorithm Using a Quadrotor for Crack Detection on Bridges**
Elmer R. Magsino, John Robert B. Chua, Lawrence S. Chua, Carlo M. de Guzman and Jan Vincent L. Gepaya

776 **Design of a Compact and Economical Remotely Operated Vehicle for Aquatic Monitoring**
Giridharan Kumaravelu, Chetan Soni and Shunmugham R. Pandian

962 **Mathematical Modeling and DLQR Based Controller Design for a Non-Minimum Phase Electro Hydraulic Servo System (EHS)**
Mazid Ishtique Ahmed and A. K. M. Azad

1002 **Wireless Tool Holder Sensor Design for Cutting Force Measurement Applied to Chatter Detection**
D. A. Reyes Uquillas and T. Hsiao

1131 **Development of a Single Axis Tilting Quadcopter**
Russell Oliver, Sui Yang Khoo, Michael Norton, Scott Adams and Abbas Kouzani

Session	[TH6D.ITS] TT: Intelligent Transport Systems
Date / Time	24 November 2016, Thursday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4212
Chair(s)	Maode Ma, *Nanyang Technological University, Singapore*

78 **Specularity Removal for Robust Road Detection**
Falak Shah, Pratik Shah and Rahul Dubey

275 **Travel-Time Prediction With Deep Learning**
Chaiyaphum Siripanpornchana, Sooksan Panichpapiboon and Pimwadee Chaovalit

345 **Routing in Taxi and Public Transport Based Heterogeneous Vehicular Networks**
Gen Li, Maode Ma, Chunfeng Liu and Yantai Shu

348 **Cooperative Multi-channel Dissemination of Safety Messages in VANETs**
Odongo Steven Eyobu, Jhihoon Joo and Dong Seog Han

738 **Intelligent System Architecture for a Vision-Based Contactless Apprehension of Traffic Violations**
Robert Kerwin C. Billones, Argel A. Bandala, Edwin Sybingco, Laurence A. Gan Lim and Elmer P. Dadios

848 **Passenger Demand Forecast Using Optical Flow Passenger Counting System for Bus Dispatch Scheduling**
Cyrill O. Escolano, Robert Kerwin C. Billones, Edwin Sybingco, Alexis D. Fillone and Elmer P. Dadios

Session	[TH7D.POW1.4] PEPE: Renewable Energy Sources and Technology
Date / Time	24 November 2016, Thursday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4311
Chair(s)	Abhisek Ukil, *Nanyang Technological University, Singapore*

466 **Modelling and Implementation of Single Phase Dual Stage Grid-Tied Solar Power Inverter**
Jeanette Lam Min Yi, R. T. Naayagi and Thillainathan Logenthiran

485 **Parameter Extraction of Solar Photovoltaic System Using Lambert-W Function for Different Environmental Condition**
Prashant Upadhyay, Madhav Sharma, Subrahmanyam Pulipaka and Rajneesh Kumar

513 **Evaluation Method of Photovoltaic Power Prediction System Based on Order Relation Analysis Method and Entropy Method**
Fushen Xue, Wenhai Yang, Fan Zhang, Yajing Gao, Chunlai Li and Libin Yang

564 **A Method to Reduce DC-link Overvoltage of PMSG Based WECS During LVRT**
Papan Dey, Manoj Datta, Nuwantha Fernando and Tomonobu Senjyu

677 **Single-Phase Grid-Tied Photovoltaic Inverter to Control Active and Reactive Power with Battery Energy Storage Device**
Maheswar Prasad Behera, Pravat Kumar Ray and Gooi Hoay Beng

1501 **Modeling and Performance Assessment of Pontoon Roller Wave Energy Converter in Singapore**
Manni Xiong, Abhisek Ukil, Jiyun Zhao, Michael Lochinver and Narasimalu Srikanth

Session	[TH8D.SS25] SS25: Evolutionary Optimization Methods Applied to Smart Grid
Date / Time	24 November 2016, Thursday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4010AB
Organizer(s) / Chair(s)	Dipti Srinivasan; Anupam Trivedi; Rohit Bhakar

628 **A Multi-objective Shuffled Bat Algorithm for Optimal Placement and Sizing of DGs with Load Variations**
Chandrasekhar Yammani

1330 **Swarm and Bacterial Foraging Based Optimal Power System Stabilizer for Stability Improvement**
Prakash K. Ray, Shiba R. Paital, Asit Mohanty, T. K. Panigrahi, Manish Kumar and Harishchandra Dubey

1530 **Maximizing DG Penetration using Optimal Placement of Shunt Devices in Distribution Systems**
Dhivya Sampath Kumar, Dipti Srinivasan and Thomas Reindl

1537 **Multi-objective V2G Energy Storage System for Grid Support with Cost and Emission Reduction**
Samar Ahmad and S. Sivasubramani

2100 **Optimized Support Vector Regression Models for Short Term Solar Radiation Forecasting in Smart Environment**
Sreenu Sreekumar, Kailash Chand Sharma and Rohit Bhakar

Session	[THU.OIF1] Oral Interactive Forum
Date / Time	24 November 2016, Thursday / 9.00 am – 11.00 am
Venue	Orchid Main Ballroom 4201AB – 4306
Chair(s)	Michael Ong; T. Sree Sharmila; Sahoo S. K.

3 **Re-jagged AR4JA LDPC Coded Outdoor Optical Wireless Communication System**
Madhusmita Mishra, Sarat Kumar Patra, Ashok Kumar Turuk and Pabitra Mohan Khilar

110 **A Diversity Order Design of Linearly Precoded MU-MIMO Downlink System**
Nobuaki Shimakawa and Yasunori Iwanami

111 **Coherent GFSK Receiver on MIMO Frequency Selective Channels**
Kazuki Yoshida and Yasunori Iwanami

242 **Air Pollution Analysis Using Enhanced K-Means Clustering Algorithm for Real Time Sensor Data**
R. Kingsy Grace, R. Manimegalai, M. S. Geetha Devasena, S. Rajathi, K. Usha and N. Raabiathul Baseria

249 **Detecting Irregular Fuzzy Coherent Rules in a Predefined Taxonomy**
R. Anuradha, N. Rajkumar and S. Praveenkumar

299 **Receiver Angle Control in an Infrastructure-to-Car Visible Light Communication Link**
Jiseong Jeong, Chung Ghiu Lee, Inkyu Moon, Moonsoo Kang, Seokjoo Shin and So Eun Kim

316 **Design and Simulation of X Band Microstrip Circulator**
Vishwa Kelaiya and Mehul R. Naik

392 **Event Log-Based Fraud Rating Using Interval Type-2 Fuzzy Sets in Fuzzy AHP**
Evi Septiana Pane, Adhi Dharma Wibawa and Mauridhi Hery Purnomo

559 **Visible Light Communication System for Wearable Patient Monitoring Device**
Trio Adiono, Radhian Ferel Armansyah, Swizya Satira Nolika, Fadhli Dzil Ikram, Rachmad Vidya Wicaksana Putra and Amy Hamidah Salman

580 **AES in Partially Reconfigurable CGRAs**
Chinmaya Dash, Kolin Paul and D Roy Chowdhury

601 **An Area-Efficient Implementation of a Message Authentication Code (MAC) Algorithm for Cryptographic Systems**
Jingjing Lan, Jun Zhou and Xin Liu

618 **Millimeterwave Eight-way Waveguide Combiner for High Power Combining**
Shi Bo, Luo Bin, Leong Siew Weng and Wang Wenjiang

Session	[THU.OIF2] Oral Interactive Forum
Date / Time	24 November 2016, Thursday / 11.30 am – 1.30 pm
Venue	Orchid Main Ballroom 4201AB – 4306
Chair(s)	Michael Ong; T. Sree Sharmila; Sahoo S. K.

114 **Datawarehouser: A Data Warehouse Artist Who Have Ability to Understand Data Warehouse Schema Pictures**
Harco Leslie Hendric Spits Warnars and Richard Randriatoamanana

228 **Design and Evaluation of an IoT Enabled Secure Multi-service Ambulance Tracking System**
Sarbpreet, Somanath Tripathy and Jimson Mathew

255 **Prosodic Features of Marathi News Reading Style**
Sanket Barhate, Shruti Kshirsagar, Niramay Sanghvi, Kamini Sabu, Preeti Rao and Nandini Bondale

274 **Reference Table Based Cache Design using LRU Replacement Algorithm for Last Level Cache**
T. Reishi Kumaar, Anamika Sharma and M. Bhaskar

293 **RnSIR:A New Model of Information Spread in Online Social Networks**
N. Sumith, B. Annappa and Swapan Bhattacharya

320 **Ultrasonic Sensing System for Detecting Water Adulteration in Milk**
Aditya Dave, Dishant Banwari, Sumit Mansinghani, Satyam Srivastava and Shashikant Sadistap

322 **Algorithm Development for Power System Contingency Screening and Ranking using Voltage-Reactive Power Performance Index**
Ernest F. Dela Cruz, Alex N. Mabalot, Raymond C. Marzo, Michael C. Pacis and John Heinrich S. Tolentino

374 **Empowering Consumers in Selected Public Markets in Metro Manila: A Framework for the Development of AgriWatchPH**
Glenor L. Novio, John Austin M. Cruz, John Carl Neil S. Deinla, Marphy James T. Rollan and Bernie S. Fabito

385 **T-@npi: A Twitter-Based Safety Confirmation System**
Keisuke Utsu, Ayami Manaka, Rie Abe, Akio Ogata, Yoshiro Yamamoto, Hiroshi Ishii and Osamu Uchida

386 **T-c@re: A Twitter-Based Status Monitoring System**
Keisuke Utsu, Rie Abe, Ayami Manaka, Mana Tsutsumi, Ayaha Suzaki, Hiroshi Ishii and Osamu Uchida

388 **Collection of Disaster-related Information by Focusing on Twitter Posts Immediately after Retweeting Announcement Posts**
Ayami Manaka, Shiori Kodama, Akio Ogata, Osamu Uchida, Yoshiro Yamamoto, Hiroshi Ishii and Keisuke Utsu

416 **Development of the System and Method for Delivery using Radio Frequency Identification (I-BOX)**
Mark Angelo C. Purio, Michael Joshua P.L. Sacopon, John Jason O. Salvador and Ferdinand Alerick B. Velasco

25 November 2016, Friday

Session	[FR1A.BE5] BE: Biomedical Signal Processing and Instrumentation
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Melati Junior Ballroom 4D
Chair(s)	M. Sabarimalai Manikandan, *Indian Institute of Technology Bhubaneswar, India*

760 **Towards in-vivo ATP Sensing**
Scott Adams, Abbas Z. Kouzani, Kevin Bennet and Susannah J. Tye

789 **Discriminant Feature Vectors for Characterizing Ailment Cough vs Simulated Cough**
Ravi Shekhar Jha, Vishwanath Pratap Singh and Viany Kumar Mittal

813 **Statistical Feature Analysis for EEG Baseline Classification : Eyes Open vs Eyes Closed**
K. Gopika Gopan, Neelam Sinha and J. Dinesh Babu

887 **A Robust Sparse Signal Decomposition Framework for Baseline Wander Removal from ECG Signal**
Udit Satija, Barathram Ramkumar and M. Sabarimalai Manikandan

897 **Fourier Decomposition Method Based Descriptor of EEG Signals to Identify Dementia**
Ekta Kapoor, Vinith Johnson, Soumya Pati and Vijay Kumar Chakka

954 **An Intelligent Technique for Posture and Fall Detection using Multiscale Entropy Analysis and Fuzzy Logic**
Alok Verma, Reshma A. Merchant, Santhosh Seetharaman and Haoyong Yu

1059 **ThinICA-CSP Algorithm for Discrimination of Multiclass Motor Imagery Movements**
Deepa Beeta Thiyam, Sergio Cruces and E. R. Rajkumar

Session	[FR2A.CT3] CT: Network and Cyber Security
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Lotus Junior Ballroom 4E
Chair(s)	Geoff Skinner, *The University of Newcastle, Australia* Sye Loong Keoh, *University of Glasgow, United Kingdom*

173 **Cyber Security for Younger Demographics-A Graphic Based Authentication and Authorisation Framework**
Geoff Skinner

326 **A Secure Accountability Protocol Based on Public Key Encryption**
Chian Techapanupreeda and Supakorn Kungpisdan

339 **Design of a Two-factor Authentication Ticketing System for Transit Applications**
N. Edna Elizabeth and S. Nivetha

1342 **Accountability for Electronic-Health Systems**
Chian Techapanupreeda and Chokngamwong Roongroj

1354 **Secure Message Transmission Algorithm for Vehicle to Vehicle (V2V) Communication**
Trupil Limbasiya and Debasis Das

1393 **A Cloud Authentication Protocol using One-Time Pad**
Lexus Jun Hong Sim, Shu Qin Ren, Sye Loong Keoh and Khin Mi Mi Aung

Session	[FR3A.CS1.5] CS: RF/Millimeter-wave Circuits and Systems
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Melati Junior Ballroom 4011
Chair(s)	Chaitali Koley, *NIT Mizoram, India* Bo Shi, *Institute for Infocomm Research, A*STAR, Singapore*

768 **Mixer Linearization Using Dynamic Bias Circuit with an Integrated Diode Linearizer**
Bo Shi

819 **High-efficiency OFDM Power Amplifier System Using a New Polar Modulation Technique**
Ryota Ishioka, Tomotaka Kimura and Masahiro Muraguchi

821 **15-GHz-Band Low-Power and Low Phase-Noise LC VCO IC with a Second Harmonic Filter in 130-nm SiGe BiCMOS**
Xu Xiao, Xinyi Wang and Toshihiko Yoshimasu

853 **Fully Integrated 24 GHz CMOS Injection-Locked VCO With Folded Marchand Balun**
Boon-Eu Seow, Wei-Cheng Lai, Tzuen-Hsi Huang and Huey-Ru Chuang

1021 **Studies on the performance of a Gunn Oscillator based Demodulator System in presence of Chaos modulated signal**
Chaitali Koley, Arun Kanti Guin and Bishnu Charan Sarkar

1359 **FPGA Design and Implementation of ANC-EPWM Transmitter**
Takashi Funabashi and Yasushi Yamao

Session	[FR4A.CS2.5] CS: Wireless Communications and Networks
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Melati Junior Ballroom 4111
Chair(s)	Maode Ma, *Nanyang Technological University, Singapore*

667 **Compressed Sensing Based Channel Estimation and Impulsive Noise Cancelation in Underwater Acoustic OFDM Systems**
Peng Chen, Yue Rong, Sven Nordholm, Alec J. Duncan and Zhiqiang He

721 **Training Sequence Optimization for Estimating the Channel in the Presence of Colored Interference for MIMO-OFDM Systems**
E. Sharma, Himanshu B. Mishra and K. Vasudevan

802 **Dynamic Interference Estimation in Secure Gate System using Intra-body Communication**
Yuki Wada, Keisuke Furuya, Ryota Kato and Mitsuru Shinagawa

807 **Interference Problem of Fixed Transmitter during Intra-body Communication**
Keisuke Furuya, Yuki Wada, Ryota Kato, Mitsuru Shinagawa, Ken Seo, Daisuke Saito, Kyoji Oohashi and Yuichi Kado

863 **Implementation of an LDPC Decoder on a Heterogeneous FPGA-CPU Platform using SDSoC**
Si-Dong Roh, Keol Cho and Ki-Seok Chung

870 **Proposal of a New OFDM Scheme for a Doubling of Spectral Efficiency**
Misaki Hirabayashi, Kazutaka Yamai, Takenao Yokomori, Tomotaka Kimura and Masahiro Muraguchi

Session	[FR5A.SIP1.4] SIP: Image Processing
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4211
Chair(s)	Stefan Winkler, *ADSC, Singapore*

1057 **Short-Term Prediction of Localized Cloud Motion Using Ground-Based Sky Imagers**
Soumyabrata Dev, Florian M. Savoy, Yee Hui Lee and Stefan Winkler

1061 **Mass Characterization in Mammograms using an Optimal Ensemble Classifier**
Dhadma Balachandran and R. Lavanya

1100 **Weighted Median Filter with Minimum Spanning Tree-based Adaptive Window**
Takanori Koga, Saki Asamoto and Noriaki Suetake

1183 **Crack Detection using Spectral Clustering Based on Crack Features**
Takumi Matsuoka and Kousuke Matsushima

1199 **Hybrid LASSO and Neural Network Estimator for Gaze Estimation**
S. Deepthi Iyer and Hariharan Ramasangu

1201 **Visibility Enhancement Techniques for Fog Degraded images: A Comparative Analysis with Performance Evaluation**
Tannistha Pal, Mrinal Kanti Bhowmik, Debotosh Bhattacharjee and Anjan Kumar Ghosh

1227 **A High Throughput Fully Parallel-Pipelined FPGA Accelerator for Dense Cloud Motion Analysis**
Bibin Johnson and J. Sheeba Rani

Session	[FR6A.SIP2.4] SIP: Signal Processing
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4212
Chair(s)	Priyankoo Sarmah, *Indian Institute of Technology Guwahati, India* P. Palanisamy, *National Institute of Technology, Tiruchirappalli, India*

650 **Low Frequency Region of Vocal Tract Information for Speech / Music Classification**
Banriskhem K. Khonglah and S. R. Mahadeva Prasanna

670 **Accurate Parameter Estimation from a Complex Sinusoid-Pair: An Application in Power Systems**
Saman S. Abeysekera

740 **A Strict Bound for Dimension of Measurement Matrix for CS Beamformer MUSIC Algorithm**
Abhishek Aich and P. Palanisamy

779 **A Design Method for Low-Delay Band-Pass Maximally Flat FIR Digital Differentiators with Stopband based on L_p Norm Criterion**
Ryosuke Kunii, Takashi Yoshida and Naoyuki Aikawa

812 **Dysarthric Speech Corpus in Tamil for Rehabilitation Research**
T. A. Mariya Celin, T. Nagarajan and P. Vijayalakshmi

952 **Text to Speech Synthesis System in Indian English**
Deepshikha Mahanta, Bidisha Sharma, Priyankoo Sarmah and S. R. Mahadeva Prasanna

971 **2D Sparsity for Joint DOA and Frequency Estimation of Harmonic Acoustic Signals**
Lu Wang, Lifan Zhao, Qiang Wang, Xiangyang Zeng and Guoan Bi

Session	[FR7A.POW1.5] PEPE: Renewable Energy Sources and Technology
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4311
Chair(s)	Supachai Phaiboon, *Mahidol University, Thailand*

686 **Offshore Wind Energy - Potential for India**
Col. Madan Singh

690 **Fault Ridethrough and Power Quality Improvement of Doubly-Fed Induction Generator based Wind Turbine System During Grid Fault with Novel Active Crowbar Protection Design**
Snehaprava Swain and Pravat Kumar Ray

850 **The Generation Characteristics of the Improved Configuration of the Stator and the Mover in the Linear Generator Using Vibration Energy**
Kiko Ishida, Jyunki Muranishi, Tomoya Aoki and Shunsuke Ohashi

959 **Design and Performance Analysis of a ZVS Parallel Quasi Resonant Converter for a Solar Based Induction Cooking System**
Saila Ishrat Annie, Khosru M Salim, Zaima Tasneem and Mohammad Rejwan Uddin

1095 **Numerical Analysis of I-V Characteristics and Diode Currents of a PV Module Reflected by Partial Shadow**
Cheikh Ibra Wade, Yu Fukamachi, Noriyuki Hayashi, Ryo Torihara and Tatsuya Sakoda

1140 **Fuzzy Model for Predicting Electric Generation from Sea Wave Energy in Thailand**
Supachai Phaiboon and Khunchai Tanukitwattana

Session	[FR8A.POW2.3] PEPE: Power Generation, Transmission and Distribution
Date / Time	25 November 2016, Friday / 8.30 am – 10.15 am
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Atthapol Ngaopitakkul, *Faculty of Engineering, King Mongkuts Institute of Technology Ladkrabang, Thailand* Pradeep Kumar Yemula, *IIT Hyderabad, India*

868 **Selection of Proper Input Pattern in Fuzzy Logic Algorithm for Classifying the Fault Type in Underground Distribution System**
Jittiphong Klomjit and Atthapol Ngaopitakkul

1071 **New Optimization Method Considering Combinatorial and Multi-Objective Optimization Problem for Distribution Systems**
Ryuto Shigenobu, Masahiro Furukakoi, Atsushi Yona and Tomonobu Senjyu

1082 **Parallel Discrete EPSO for Distribution Network Reconfigurations**
Hiroyuki Mori and Hiromitsu Ikegami

1217 **Short-Term Power Market Services on Cloud**
K. Jagan Mohan, M. Siddharth Rao, R. K. Senthil Kumar and G. L. Ganga Prasad

1236 **Voltage Stability Improvement by Optimal Active Power and Reactive Power Output Control of Storage Battery System**
Mitsuki Sagara, Mohammad Masih Sediqi, Tomonobu Senjyu, Mir Sayed Shah Danish and Toshihisa Funabashi

1287 **Distribution Utility Survey on Electricity Prepaid Metering**
Jordan Rel Orillazaa, Angelico Angeles, Arnulfo Barra Jr. and Louella Orillaza

1372 **Reduction in Loss of Life of Transformer with Demand Response**
S. Charan Teja and Pradeep Kumar Yemula

Session	[FR1B.BE6] BE: Biomedical Signal Processing and Instrumentation
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	M. Sabarimalai Manikandan, *IIT Bhubaneswar, India* T. S. Bindya, *National Institute of Technology Calicut, India*

1076 **Reconfigurable Low Complexity Hearing Aid System using Adjustable Filter Bank**
A. Amir, Rakesh Inani, T. S. Bindiya and Elizabeth Elias

1104 **Brain-Computer Interface and Voice-Controlled 3D Printed Prosthetic Hand**
Carlos M. Oppus , Jesus Roselito R. Prado, Jocel C. Escobar, Juan Antonio G. Mariñas and Rosula S. J. Reyes

1203 **An Efficient Rate Allocation Algorithm For Transmission And Storage of Compressed Biomedical Signals In Wireless Health Monitoring Systems**
J. F. Wu, S. C. Chan, A. L. Liu and H. C. Wu

1237 **Application Specific Integrated Circuit (ASIC) for Ion Sensitive Field Effect Transistor (ISFET) L-Asparagine Biosensor**
Febus Reidj G. Cruz, Clarissa M. Magsipoc, Francez Eunika B. Alinea, Marvin Edrian P. Baronia, Mohammad M. Jumahadi, Ramon G. Garcia and Wen-Yaw Chung

1259 **Discernibility Matrix Based Dimensionality Reduction for EEG Signal**
Rajdeep Chatterjee, Dibyajyoti Guha, Debarshi Kumar Sanyal and Sachi Nandan Mohanty

1352 **Removal of Power Line Interference in EEG Signals with Spike Noise Based on Robust Adaptive Filter**
Jianqiang Lin, Xu Sun, Jiafei Wu, Shing-Chow Chan and Weichao Xu

1463 **Effective Systolic Peak Detection Algorithm Using VariationalMode Decomposition and Center of Gravity**
Simhadri Vadrevu and M. Sabarimalai Manikandan

Session	[FR2B.OT] OT: Other Topics
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Lotus Junior Ballroom 4E
Chair(s)	Mohammad Faisal, *BUET, Bangladesh* Rajendra K. Pandey, *IIT (BHU), India*

12 **Optimizing Path for Kinematically Redundant Robotic Inspection System using Obstacle Based Probabilistic Roadmap and Genetic Algorithm**
Prashin Sharma, Iacopo Gentilini and Kenji Shimada

139 **Ultrahigh Birefringent Index Guiding Photonic Crystal Fibers**
Md. Nafiz Amin, Mohammad Faisal and Md. Mostafizur Rahman

234 **Design and Implementation of a Web-Based Thesis Coordinator System (TCS)**
Geanne Ross L. Franco and Carlo Ysmael C. De Guzman

389 **ATC Enhancement with SSSC-Knowledge Inference based Intelligent Controller Tuning**
Rajendra K. Pandey and Deepak Kumar Gupta

1152 **Algorithm for Finding Influential User: Based on Users Information Diffusion Region**
Amrita Namtirtha, Shaswat Gupta, Animesh Dutta, Biswanath Dutta and Frans Coenen

1308 **A Smartcard-Based Framework for Delegation Management in Healthcare Access Control Systems**
M. Fahim Ferdous Khan and Ken Sakamura

1475 **Source Location Privacy Using Data Mules in Wireless Sensor Networks**
Jyoti Prakash Singh, Pradeep Kumar Roy, Sunil Kumar Singh and Prabhat Kumar

Session	[FR3B.NAN] DMP: Nano-electronics
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Melati Junior Ballroom 4011
Chair(s)	Muhammad Faeyz Karim

332 **Temperature Dependent Modeling and Performance Analysis of Single - Walled Carbon nanotube(SWCNT) Bundle Interconnects.**
Saurabh Lavaniya, Satbir Singh and Mayank Kumar Rai

592 **InxGa1-xAs/GaAs-based Intermediate Band Solar Cell: Effects of Quantum Dots**
Sayeda Anika Amin, Md. Tanvir Hasan and Muhammad Shaffatul Islam

614 **Fast Response time Photodetector based on Annealed TiO_2 Nanowires deposited by GLAD**
Biraj Shougaijam, Chitralekha Ngangbam and Trupti Ranjan Lenka

748 **Comparative Study of Quantum Mechanical Capacitance Voltage Characteristics and Threshold Voltage of Two Different Structures of Junction Less Nanowire Transistor**
Nujhat Tasneem, Mohsinur Rahman Adnan, Samzid Bin Hafiz and Quazi D. M. Khosru

774 **Electrochemical Modeling of Carbon Nanotube Based Dual Gated Junctionless Enzyme Field Effect Transistor**
Sharma Purnima Kumari and Dutta Jiten Chandra

865 **Chirality Dependence of Single Wall Carbon Nanotube Based Gas Sensor**
G. R. Ahmed Jamal, M. Rezanur Islam, M. Adnan Rahman, J. Ferdous Meem and R. Akter Sathi

1147 **A Molecular Dynamics Study on Thermal Conductivity of Armchair Graphene Nanoribbon**
Asir Intisar Khan,Ishtiaque Ahmed Navid, Fahim Ferdous Hossain, Maliha Noshin and Samia Subrina

Session	[FR4B.CS2.6] CS: Wireless Communications and Networks
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Melati Junior Ballroom 4111
Chair(s)	Pushpendu Kar, *Energy Research Institute, Nanyang Technological University, Singapore* Noritaka Shigei, *Kagoshima University, Japan*

871 **Three-Phase Overlay D2D Communications in Traffic-Aware Two-Way Cellular Systems**
Devendra S. Gurjar and Prabhat K. Upadhyay

872 **Joint Link-Channel Selection and Rate Allocation Heuristic for Cognitive Radio Mesh Networks**
Maheen Islam, Abdur Razzaque and Mamun-Or-Rashid

888 **A Strategy for AP Selection with Mutual Concessions in Sustainable Heterogeneous Wireless Networks**
Hideo Kobayashi, Eiichi Kameda, Yoshiaki Terashima and Norihiko Shinomiya

893 **SDH: Self Detection and Healing Mechanism for Dumb Nodes in Wireless Sensor Network**
Subhransu Das, Pushpendu Kar and Dipak Kumar Jana

895 **Multiple-Sink Approach for Prolonging Network Lifetime of Wireless Sensor Network**
Noritaka Shigei, Jo Kawasaki and Hiromi Miyajima

904 **Design of Automobile Intelligence Control Platform Based on Bluetooth Low Energy**
Kun Xia, Haibo Wang, Nan Wang, Wei Yu and Tong Zhou

Session	[FR5B.SIP1.5] SIP: Image Processing
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4211
Chair(s)	Amit M. Joshi, *Malaviya National Institute of Technology, India* Venkateswaran N., *SSN College of Engineering, India*

1231 **A Reduced Region of Interest Based Approach for Facial Expression Recognition from Static Images**
Kashyap Chitta and Neeraj N. Sajjan

1275 **Gastric Lymph Nodes Detection Based on Visual Saliency and Dictionary Learning**
Nuo Tong, Shuiping Gou, Yao Yao, Chenjiao Wang and Jing Bai

1280 **Accuracy of Personal Identification Based on Joint Motions Extracted from 2D Positions of a Reduced Set of Joints**
Risako Aoki and Ryusuke Miyamoto

1288 **Fingerprint Based Biometric Watermarking Architecture using Integer DCT**
Ayush Vashistha and Amit M. Joshi

1297 **Philippine Vehicle Plate Localization using Image Thresholding And Genetic Algorithm**
Rhen Anjerome Bedruz, Ana Riza Quiros, Aaron Christian Uy, Argel Bandala and Elmer Dadios

1333 **Visible and Thermal Image Fusion using Curvelet Transform and Brain Storm Optimization**
K. Madheswari, N. Venkateswaran and V. Sowmiya

1340 **Semi-Supervised Sparse Dimensionality Reduction For Hyperspectral Image Classification**
Xiangrong Zhang, Ning Huyan, Nan Zhou and Jinliang An

Session	[FR6B.SIP2.5] SIP: Signal Processing
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4212
Chair(s)	Elizabeth Elias, *National Institute of Technology Calicut, India*

1019 **Improved Multimodal Sentiment Detection Using Stressed Regions of Audio**
Harika Abburi, Manish Shrivastava and Suryakanth V. Gangashetty

1048 **An Efficient Transformation for Two Dimensional Circularly Symmetric Wideband FIR Filters**
T. Bindima, Manju Manuel and Elizabeth Elias

1144 **AMRITATCS-IITGUWAHATI Combined System for the Speakers in the Wild (SITW) Speaker Recognition Challenge**
Kuruvachan K. George, Rohan Kumar Das, Sarfaraz Jelil, K. Arun Das, C. Santhosh Kumar, S. R. Mahadeva Prasanna and Ashish Panda

1186 **Analysis of Source and System Features for Speaker Recognition in Emotional Conditions**
K. N. R. K. Raju Alluri, V. V. Vidyadhara Raju, Suryakanth V. Gangashetty and Anil Kumar Vuppala

1221 **Performance of Zero Forcing Precoder for Vectored DSL**
Rajani Katiyar and K. V. Padmaja

1238 **A Rainfall Estimation Method based on RBFNN**
Jing Feng, Dinglian Yuan and Aixia Zhou

1403 **Speckle Noise Reduction in Images using Wiener Filtering and Adaptive Wavelet Thresholding**
R. Rajesh Mohan, S. Mridula and P. Mohanan

Session	[FR7B.POW1.6] PEPE: Switching Circuits and Power Converters
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4311
Chair(s)	Yong Liu, *Nanyang Technological University, Singapore* Watcharin Srirattanawichaikul, *Chiang Mai University, Thailand*

161 **Modified Single-carrier-based Modulation Technique for Grid-connected Three-level NPC Converters**
Watcharin Srirattanawichaikul and Suttichai Premrudeepreechacharn

371 **Analysis of High Frequency Gate Driver Using Push-Pull LC Self-Excitation Oscillator**
Naoyuki Ishibashi, Kazuki Eshita, Masahiko Hirokawa and Akihiko Katsuki

484 **A Study on Voltage Equilibration Circuit of EDLC Using Self-Oscillation Circuit**
Sho Sukegawa, Hiroshi Ohsawa and Yosuke Asano

500 **Universal R-Dump Converter for Switched Reluctance Motor-Realisation Using Bidirectional Switches**
C. M. Vijayaragavan, B. Umamaheswari and P. Kavitha

626 **Analysis and Design of Coupled Inductor and Output Harmonic Filter for Interleaved Three Phase VSCs**
Yong Liu, Kye Yak See, Lim Ziyou, Rejeki Simanjorang, Shan Yin, Chin Foong Tong, Hui Chen Yang, Arie Nawawi, A. Sakanova,King Jet Tseng, Jih-Sheng Lai and Amit K. Gupta

753 **Demonstration of a 50 kW and 100 kHz SiC High Power Density Converter for Aerospace Application**
Shan Yin, K. J. Tseng, Yong Liu, Rejeki Simanjorang, C. F. Tong and Amit K. Gupta

889 **Sub-Period Interleaved Fibonacci Switched Capacitor Converter**
Vivekanandan Subburaj and Debashisha Jena

Session	[FR8B.POW2.4] PEPE: Power Quality
Date / Time	25 November 2016, Friday / 10.45 am – 12.30 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Ray Pravat Kumar, *Nanyang Technological University, Singapore* A. K. Kapoor, *IIT(BHU), Varanasi, India*

149 **A Partial Feedback Linearization based Approach to Shunt Active Power Filter Design**
Soumya Ranjan Mohapatra, Pravat Kumar Ray and Gooi Hoay Beng

162 **Static Series-Connected Compensator with Load-Side Connected Shunt Converter based on Single-Phase VSI for Voltage Sag Mitigation**
Watcharin Srirattanawichaikul and Yuttana Kumsuwan

246 **Energy Conservation with TCSC Controller of Electric Arc Furnace for Harmonic Analysis in Power Quality Disturbance Using Continuous Wavelet Transform**
Chamni Jaipradidtham

247 **Adaptive DC-Link Voltage Regulation for DSTATCOM under Load Variations**
Hareesh Myneni, G. Siva Kumar and D. Sreenivasarao

512 **Power Quality Evaluation of valuation of Photovoltaic Generation Based on AHP-CRITIC and Improved TOPSIS**
Fushen Xue, Wenhai Yang, Yanping Sun, Yajing Gao, Chunlai Li and Libin Yang

624 **Suppression of Voltage and Frequency Fluctuations by PID+DD and Decentralized Control in Transmission Systems**
Michael Palmer and Ryuto Shigenobu

815 **Power Quality Analysis in a Grid Connected PV System Employing a Hybird Technique Based on Fractional Wavelet Transform**
Smitha Joyce Pinto and Gayadhar Panda

1404 **A Dynamic Voltage Restorer Based on Voltage Balanced Back-to-Back Stacked Multicell Converter with Equal Voltage Sources**
Gaurav Sharma and A. K. Kapoor

Session	[FR1C.BE7] BE: Wearable Sensors for Healthcare monitoring
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Deepthi P. P., *NIT Calicut, India* Fazel Naghdy, *University of Wollongong, Australia*

399 **Objective Clinical Functional Assessment of Breast Cancer Patients Using Inertial Motion Capture**
Sina Ameli, Fazel Naghdy, David Stirling, Golshah Naghdy and Morteza Aghmesheh

692 **Smartphone-based Continuous Blood Pressure Monitoring Application-Robust Security and Privacy Framework**
Hamid GholamHosseini, Mirza Mansoor Baig, Farhaan Mirza and Dehan Luo

851 **Machine Learning-based Clinical Decision Support System for Early Diagnosis from Real-time Physiological Data**
Mirza Mansoor Baig, Hamid GholamHosseini and Maria Lindén

875 **Highly Sensitive TiO_2 Thin Film Matrix Biosensor for Glucose Detection in Blood**
B. Gopal Krishna, M. Jagannadha Rao, B. Nalinikant, D. K. Golhani and Sanjay Tiwari

879 **GeO_2/SiO_2 Matrix Biosensor for Detection of Probiotic Bacteria L. Plantarum**
B. Gopal Krishna, M. Jagannadha Rao, B. Nalinikant, D. K. Golhani and S. A. H. Zaidi

1159 **Secure Sensor Node Design for ECG in Body Area Network**
Teena P. Jose and P. P. Deepthi

Session	[FR2C.CI.3] CI: Neural Networks
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Lotus Junior Ballroom 4E
Chair(s)	Lipo Wang; Suganthan

287 **Application Of Hybrid Artificial Neural Network Algorithms For The Prediction Of Standardized Precipitation Index**
Kavina S Dayal, Ravinesh C Deo and Armando A Apan

405 **An Adaptive Learning Method of Deep Belief Network by Layer Generation Algorithm**
Shin Kamada and Takumi Ichimura

511 **An Online BPN Gain Adapter for PID Through PLC on a Conical Tank System**
M. Balaji and K. Porkumaran

638 **Typhoon Forecasting in the Philippines Using an Optimal Multilayer Feedforward Artificial Neural Network Model Trained in Resilient Propagation Algorithm**
Karla Louissa Marie D. Sobrevilla, Efraim O. Reyes, Christina A.C. Hendrickx and Sidney S. Yao

702 **Daily Weather Forecast in Tiwi, Albay, Philippines using Artificial Neural Network with Missing Values Imputation**
Karla Louissa Marie D. Sobrevilla, Archie G. Quiñones, Kharl Vincent S. Lopez and Virna T. Azaña

1087 **Traffic Flow prediction with Long Short-Term Memory Networks (LSTMs)**
Hongxin Shao and Boon-Hee Soong

Session	[FR3C.SS6] SS06: Monitoring and Prognostics
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Melati Junior Ballroom 4011
Organizer(s) / Chair(s)	Ittipong Khemapech, *University of the Thai Chamber of Commerce, Thailand*

289 **Inter-Turn Fault and Condition Identification in Induction Machines using Multiple Indicator Approach**
Danwei Wang , Jeevanand Seshadrinath, VietHung Nguyen, Abhisek Ukil, Viswanathan Vaiyapuri and Sivakumar Nadarajan

491 **Effect of Fog on the BER Performance of an Optical CDMA FSO Link with SIK Receiver**
S. P. Majumder and A. K. M. Islam

671 **Development of Microcontroller-based Landslide Early Warning System**
Armin Jude Tiongson, Crissa Fernandez, Kirstin Mendoza and Melannie Mendoza

771 **Condition Monitoring of Induction Motor using Statistical Processing**
S. Sridhar, K. Uma Rao, Raksha Umesh and K. S. Harish

1416 **A Real-time Health Monitoring and Warning System for Bridge Structures**
Ittipong Khemapech, Watsawee Sansrimahachai and Manachai Toahchoodee

1472 **Experiments on Children's Speech Recognition under Acoustically Mismatched Conditions**
Hemant Kumar Kathania, S. Shahnawazuddin, Gayadhar Pradhan and A. B. Samaddar

Session	[FR4C.CS2.7] CS: Wireless Communications and Networks
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Melati Junior Ballroom 4111
Chair(s)	S. M. Sameer, *National institute of Technology, Calicut, India* King Sun Chan, *Curtin University, Australia*

942 **Precision Agriculture Monitoring System using Wireless Sensor Network and Raspberry Pi Local Server**
Kristoffer O. Flores, Isidro M. Butaslac, Jon Enric M. Gonzales, Samuel Matthew G. Dumlao and Rosula S. J. Reyes

977 **A Novel Node Localization Algorithm for Anisotropic Wireless Sensor Networks with Holes Based on MDS-MAP and EKF**
Shi Zhang, Baihai Zhang, Meng Joo Er and Zixiao Guan

980 **Estimating the Network Throughput of Two Channels MAC for Multi-hop Wireless Networks**
Prihadi Murdiyat, Kah Seng Chung and King Sun Chan

1018 **Network Lifetime Aware Coverage Quality Maximizing for Heterogeneous Targets in DSNs**
Selina Sharmin, Fernaz Narin Nur, Abdur Razzaque and Mustafizur Rahman

1027 **Two-level Precoding Based Interference Reduction in Uplink for MIMO Femtocell Networks**
Megha M. Gandha, Najlah C. P and S. M. Sameer

Session	[FR5C.EDM1] DMP: Electronic Devices and Materials Processing
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4211
Chair(s)	V. Rukkumani, *Sri Ramakrishna Engineering College, Coimbatore* Vineeta Agarwal, *MNNIT Allahabad, India*

106 **Area Efficient Design and Analysis of an Amplifier using Submicron VLSI**
V. Rukkumani and N. Devarajan

340 **Breakup of Carbon Nanotube Aggregates under High Electric Field and its Application to Nanocomposite Film**
Yoshihiko Obana, Michihiko Nakano and Junya Suehiro

421 **Design and Analysis of Improved Logic Halo LDD NMOSFETs Robust to HCI Stress, Using TCAD Numerical Models**
Yon-Sup Pang, Sung-Bum Park, Leeyeun Hwang and Taejong Lee

463 **Dielectrophoretic Modification of Carbon Nanotube with ZnO Nanoparticles for NO_2 Gas Sensing**
Shota Inoue, Yushi Nanba, Michihiko Nakano and Junya Suehiro

496 **Design and Analysis of Sram Cells for Power Reduction Using Low Power Techniques**
V. Rukkumani, M. Saravanakumar and K. Srinivasan

Session	[FR6C.SIP2.6] SIP: Video Processing
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4212
Chair(s)	V. R. Satpute, *Visvesvaraya National Institute of Technology Nagpur, India* Lalit K. Jiwani, *National Institute of Technology Goa, India*

91 **Adaptive Inter-Layer Prediction Algorithm for Scalable Extensions of High Efficiency Video Coding**
Chan-Seob Park, Tae-Jung Kim, Jong-Hyeok Lee and Byung-Gyu Kim

172 **Adaptive Energy Weighted Direction Method for Intra-Prediction Video Compression**
Lalit K. Jiwani, A. Siva Krishna and Mohammed Owais

262 **3-D Redundant DCT Restoration Method for MPEG-Compressed Video**
Takashi Komatsu, Sougo Kondou and Takahiro Saito

393 **Reconstruction-based No-Reference Video Quality Assessment**
Zhenyu Wu and Hong Hu

469 **Early Depth Determination Algorithm for Enhancement Layer Intra Coding of SHVC**
Takafumi Katayama, Wen Shi, Tian Song and Takashi Shimamoto

820 **Compressed Domain Video Watermarking using EZW and Chaos**
V. R. Satpute, Sneha Kadu and Ch. Naveen

Session	[FR7C.POW1.7] PEPE: Motors and Drives
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4311
Chair(s)	M Venu Gopala Rao, *PVP Siddhartha Institute of Technology, Vijayawada, India* Viet Phuong Bui, *A*STAR Institute of High Performance Computing, Singapore*

230 **A Sensorless Speed Estimation for Indirect Vector Control of Three-Phase Induction Motor Using Extended Kalman Filter**
JongKwang Kim, YongKeun Lee and JangHyeon Lee

271 **A Rapid and Reliable Approach for Optimal Design of an Electromagnetic Nanopositioning Actuator**
Viet Phuong Bui and Tat Joo Teo

373 **Experimental Investigation of Multiphase Transformer Fed Induction Motor**
B. Jyothi, M. Venu Gopala Rao and S. Prabhakhar Karthikeyan

445 **Levitation Characteristics of the Primary Coil Configuration in the Magnetically Levitated Conveyance System Using the Linear Stepper Motor**
Reoto Tamaki, Masaki Fukuda and Shunsuke Ohashi

455 **Improvement of Velocity Control in the Permanent Magnet-HTS Hybrid Magnetically Levitated Conveyance System**
Yuta Takaki, Takuro Sumida and Shunsuke Ohashi

Session	[FR8C.POW2.5] PEPE: Power System Monitoring, Control and Protection
Date / Time	25 November 2016, Friday / 2.00 pm – 3.00 pm
Venue	Orchid Junior Ballroom 4010AB
Chair(s)	Suchin Arunsawatwong, *Chulalongkorn University, Thailand* Daejin Park, *Kyungpook National University, South Korea*

222 **Optimal Coordination of Directional Overcurrent Relays (DOCR) in a Ring Distribution Network with Distributed Generation (DG) using Genetic Algorithm**
Amir Alipour and Michael Pacis

226 **Design of Load Frequency Control for Power Systems with BESS and Generation Rate Constraint Subject to Persistent Load Disturbances**
Suchin Arunsawatwong and Patipan Kalvibool

270 **Modeling, Analysis and Measurement of Characteristics of Printed Coils for Current Monitoring Applications**
Jun Song Koh and Neelakantam Venkatarayalu

304 **Transient Stability Multi-Swing Step-out Prediction with Online Anomaly Detection**
Takuya Omi,Hiroto Kakisaka, Tomomi Sadakawa and Shinichi Iwamoto

305 **A Power System Operations Planning Method Considering Generator Outputs and System Voltages under Large-scale PV Penetration**
Toshiko Suzuki, Ayano Ishikawa, Tomoyuki Gomi, Shinichi Iwamoto, Shingo Sakaeda and Yukihiro Onoue

Session	[FR1D.SS8] SS08: Computing Architectures and Systems
Date / Time	25 November 2016, Friday / 4.00 pm – 5.30 pm
Venue	Orchid Junior Ballroom 4010AB
Organizer(s) / Chair(s)	Zhang Lei; Bharat Singh

4 **Accelerating Computer Vision on Mobile Embedded Platforms**
Rahul Singh and Lakmal Ranasinghe

158 **Thermal Vision Human Classification and Localization using Bag of Visual Word**
Sourabh Malpani, C. S. Asha and A. V. Narasimhadhan

337 **Domain Regularized Transfer Component Analysis**
Lei Zhang and Yan Liu

383 **High-Dimensional Face Data Separation for Recognition via Low-Rank Constraints**
Tan Guo and Xiaoheng Tan

409 **A Scalable Hybrid Ensemble Model for Text Classification**
Bharat Singh, Nidhi Kushwaha and O. P. Vyas

982 **Pedestrian Crowd Level Estimation by Head Detection using Bio-inspired Retina Model**
Arun Kumar Chandran and Wai-Choong Wong

Session	[FR2D.CI.4] CI: Swarm and Evolutionary Computation
Date / Time	25 November 2016, Friday / 4.00 pm – 5.30 pm
Venue	Lotus Junior Ballroom 4E
Chair(s)	Yangyang Li, *Key Laboratory of Intelligent Perception and Image Understanding of Ministry of Education, China* Yuan Yuan, *Nanyang Technological University, Singapore*

68 **Evolutionary Multitasking in Permutation-Based Combinatorial Optimization Problems: Realization with TSP, QAP, LOP, and JSP**
Yuan Yuan, Yew-Soon Ong, Abhishek Gupta, Puay Siew Tan and Hua Xu

297 **MOQPSO: A New Quantum-Behaved Particle Swarm Optimization for Nearest Neighborhood Classification**
Yangyang Li, Yang Wang and Licheng Jiao

427 **Evolutionary Algorithm Using Converted Problems**
Yangyang Li, Zhenghan Chen, Yang Wang and Licheng Jiao

713 **Performance Evaluation of Floating Point Differential Evolution Hardware Accelerator on FPGA**
Rangababu Peesapati, Kiran Kumar Anumandla and Samrat L. Sabat

717 **Effective Shepherding Behaviours Using Multi-Agent Systems**
Kaoru Fujioka and Sakiko Hayashi

1298 **A Fuzzy MLP Approach for Fault Diagnosis in Wireless Sensor Networks**
Rakesh Ranjan Swain and Pabitra Mohan Khilar

Session	[FR3D.SS9.2] SS09: Enhancing Power Quality, Reliability and Economic Performance of Microgrids
Date / Time	25 November 2016, Friday / 4.00 pm – 5.30 pm
Venue	Melati Junior Ballroom 4011
Organizer(s) / Chair(s)	Dr. Taha Selim Ustun; Chandrasekhar Yammani

627 **Fuel Cost Minimization with Reserve Capacity and Inter-Area Flow Limit for Reliable and Cost Effective Operation of Multi Microgrids**
Chandrasekhar Yammani and Vamsi Krishna Macha

1274 **An Adaptive Fuzzy Sliding Mode Controller for Reactive Power & Transient Stability Management**
Asit Mohanty and Meera Viswavandya and Prakash Kumar Ray

1292 **Fuzzy Linear Programming Model for the Optimal Design of a Trigeneration Plant with Product Price Variability**
Andres Philip Mayol, Alvin B. Culaba, Kathleen B. Aviso, Denny K. S. Ng, Raymond R. Tan and Aristotle T. Ubando

1294 **Design of Hybrid Renewable Energy Systems Considering Optimal Real-time Pricing**
Shota Tobaru, Cirio Celestino Muarapaz, Foday Conteh, Tomonobu Senjyu, Abdul Motin Howlader and Mir Sayed Shah Danish

1509 **A Self Sustained Microgrid Realized Using Coordinated Control Mechanism**
E. Sheeba Percis, S. Manivannan, A. Nalini and Sarat Kumar Sahoo

Session	[FR4D.CS2.8] CS: Wireless Communications and Networks
Date / Time	25 November 2016, Friday / 4.00 pm – 5.30 pm
Venue	Melati Junior Ballroom 4111
Chair(s)	Tomotaka Kimura, *Tokyo University of Science, Japan*

1062 **Investigating Received Signal Characteristics Upon On-Axis Rotation of an Embedded Antenna in a Mobile Device**
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Effect of Mobility Degradation on the Device Performance of Organic thin-film transistor's

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***Abstract*— The quest for alternative materials to Silicon has lead the technological industry to introduce a new class of materials i.e. 'organics'. The semiconducting properties of organic materials has made possible the realization of organic thin-film transistor (OTFT) which provides a major area of research in the device design technology. It is a well-known fact that OTFT's exhibit the Poole-Frenkel mobility mechanism wherein the material mobility increases with the increase in gate voltage. In this paper, an attempt is made to investigate the mobility behaviour of pentacene (intrinsic) based OTFT in bottom-contact configuration. The device characteristics are studied based on two-dimensional numerical simulation and analysis. Due to the grain structure of pentacene and interface charges, the material mobility degrades due to surface roughness and scattering phenomenon. These mobility degradation effects have been incorporated into the numerical analysis and it has been found that the device characteristics show a significant deviation from the linear trend at high gate voltages. The influence of mobility degradation on device performance parameter metrics i.e. V_{TH}, G_M and I_{ON}/I_{OFF} has been studied and it has been found that there is substantial change in these parameters.**

Keywords—chargecarriers; I_{ON}/I_{OFF}; mobility degradation; OTFT; pentacene; surface scattering; transconductance

I. INTRODUCTION

Organic thin-film transistor's (OTFT's) have gained attention as an area of research as they provide low-cost alternative to silicon for low-end applications. Research on organic devices has been limited to the fabrication part and the device parameters are only tuned to produce accurate simulation results. It is a well-known fact that the mobility modeling of organic semiconductors is so far governed by the Poole-Frenkel mobility model wherein the mobility is a function of gate voltage and has an exponential gate voltage dependence [1]. The two-dimensional numerical simulation of organic thin-film transistors has been carried out using the MOS models in accumulation and the Poole-Frenkel mobility model. Due to the grain structure and interface charges in pentacene, the material mobility may degrade due to surface roughness and scattering phenomenon. The effects of surface roughness and surface scattering in organic semiconductors result in significant deviation from the Poole-Frenkel behaviour and the mobility does not increase linearly with the vertical electric field [2]. These mobility degradation effects in OTFT's have not been simulated till now and it was assumed that the transfer characteristics always show a linear trend. It has been reported experimentally that OTFT's also exhibit mobility degradation at high vertical fields [2]. The purpose of this paper is to investigate the device performance of OTFT's taking into account the mobility degradation model in addition to the Poole-Frenkel mobility model. The device schematic of the simulated structure has been shown in section II and the material parameters for organic semiconductor i.e. pentacene have been discussed. Section III elaborates the results obtained and section IV draws the conclusion.

II. DEVICE SIMULATION AND PARAMETERS

The simulations were carried out in 2D device simulator Atlas. Figure 1 shows the schematic of the simulated device with symmetric source and drain contacts. The structural details of the simulated device are listed in table 1 [1] [3]. Table 2 lists the material properties of undoped pentacene semiconductor.

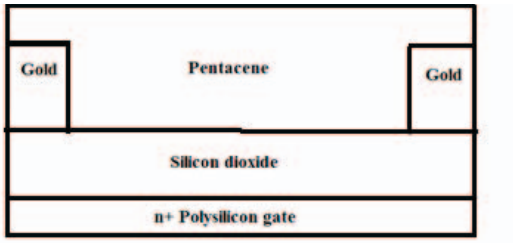

Fig. 1: Simulated structure of OTFT in bottom-gate bottom-contact configuration

TABLE I. STRUCTURAL PARAMETERS

Semiconductor thickness	200 nm
SiO_2 dielectric thickness	100 nm
n+ Polysilicon gate thickness	100 nm
Gold source/drain contact	10 nm
Channel length	Variable (5-0.7) µm

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TABLE II. Simulated material parameters for intrinsic pentacene

Density of conduction band	2E21cm^{-3} (Default: 2.8E21 cm^{-3})
Density of valence band	2E21cm^{-3} (Default: 1.04E19 cm^{-3})
Band gap	1.8 eV (Default)
Electron Affinity	2.9 eV (Default)
Dielectric constant	4.0
Acceptor trap tail density, N_{TA}	1E18 cm^{-3}eV^{-1}
Acceptor trap midgap density, N_{GA}	6.3E16 cm^{-3}eV^{-1}
Interface charge density, N_{it}	8E11cm^{-2}

In order to correctly model the device behaviour, the density of traps in both shallow and bulk states has been simulated. The shallow states have been modelled by an exponential distribution of traps (N_{TA}) and bulk states by a Gaussian distribution (N_{GA}) [4]. The shallow trap states are closely spaced near band edges whereas the bulk states are spaced in the band gap. The shallow traps play a major role in limiting the number of charge carriers contributing to drain current. Due to presence of moisture, oxygen or mobile charges in the dielectric, a positive interface charge density has also been included in the simulated structure [1].

It is evident that the grain like structure of pentacene may not only act as trapping centres but may also lead to surface roughness. In order to obtain a better mobility analysis of OTFT's, we investigated the influence of various mobility degradation models due to perpendicular electric field provided in the device simulator. The reason for not considering the effect of lateral electric fields on mobility modeling is that with OTFT's, the channel lengths are quite long and so the lateral field effects are negligible. The mobility degradation effect is activated by perpendicular field mobility model specified by PRPMOB and surface mobility model specified by SURFMOB in ATLAS.

III. RESULTS AND DISCUSSION

The transfer characteristics of the device have been simulated using PRPMOB model and SURFMOB model. The hole mobility in PRPMOB model is described by equation 1:

$$\mu_p \propto \frac{1}{\sqrt{E_\perp}} \tag{1}$$

where $E_\perp$ is the electric field perpendicular to the flow of current. The device transfer characteristics did not show any observable deviation from the linear behaviour using the PRPMOB model as shown in figure 2. The effective mobility described in SURFMOB model is given by equations 2 and 3:

$$\frac{1}{\mu_{eff,p}} \propto \left(\frac{1}{E_{eff,p}}\right)^{-0.29} + \left(\frac{1}{E_{eff,p}}\right)^{-1.62} + \left(\frac{1}{N_B}\right)^{-1} \tag{2}$$

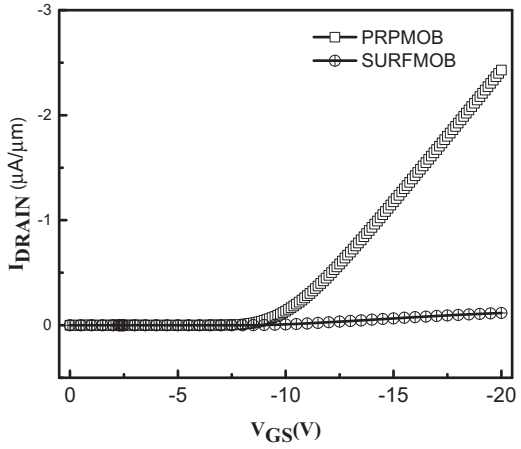

Fig. 2: Transfer characteristics of simulated device with PRPMOB and SURFMOB mobility degradation.

$$E_{eff,p} = E_\perp + ETAP.WATT(E_0 - E_\perp) \tag{3}$$

where $E_{eff,p}$ is the effective electric field given by equation 3 and N_B is the surface trapped charge density [5]. Equation 2 gives the effective hole mobility in terms of three scattering mechanism, where the first term corresponds to phonon scattering, the second term corresponds to surface roughness and third term corresponds to charged impurity scattering. The first two terms take into account the electric field effects and are important for modeling mobility behaviour in organic semiconductors. These two terms correspond to universal field-mobility relation. The third term however is not important in our simulation because it is assumed that the charge impurity scattering is inversely proportional to doping density. The pentacene has been taken as intrinsic without external doping, so third term doesn't influence mobility modeling in our simulations. ETAP.WATT in equation 3 is a fitting parameter of value 0.33 and E_0 is the field perpendicular at insulator-semiconductor interface.

As shown in figure 2, the transfer characteristics simulated with SURFMOB model showed a significant deviation from the linear trend. Also the drain current reduced by an order of magnitude when using surface mobility model. This indicates that the surface roughness due to grain like structure of organic semiconductors and phonon scattering are primary factors for mobility degradation [6] [7]. These factors are taken into account in SURFMOB model and not in PRPMOB model. Thus the mobility behaviour at high values of gate voltage can be predicted accurately from two-dimensional numerical simulations by proper selection of mobility models.

The I_D-V_{GS} graphs obtained in figure 2 using PRPMOB and SURFMOB models reveals that the reduction in drain current occurs due to change in mobility. In order to find the reduction in mobility of charge carriers i.e. holes with respect to vertical electric field, a plot of channel mobility versus gate-source voltage is plotted in figure 3. Figure 3 shows that the channel mobility increases to a typical optimum value for some value of

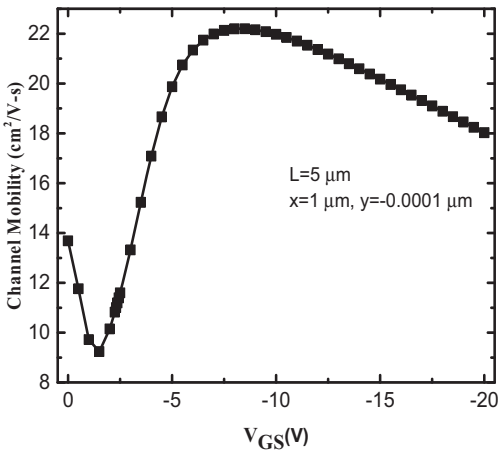

Fig. 3: Channel mobility versus gate-source voltage

V_{GS} and then decreases. The increase in channel mobility corresponds to an increase in drain current with gate voltage above threshold voltage (V_{TH}). But the channel mobility does not continue to increase indefinitely, rather it goes through a peak and then again decreases. The percentage decrease in the carrier mobility was found to be 18.8% of its highest value at the peak. This result leads to defining mobility in terms of equation 4:

$$\mu = \frac{\mu_0}{1+\theta(V_G - V_T)} \quad (4)$$

μ_0 corresponds to zero-field mobility, (V_G-V_T) is the gate overdrive and θ is the mobility degradation factor. This equation has already been used to describe the mobility behaviour of MOSFET's [4] [5]. The result suggests that the charge carriers in OTFT's do exhibit mobility degradation at high values of vertical electric field and thus it is necessary to incorporate these effects into mobility models used for the analysis of OTFT's.

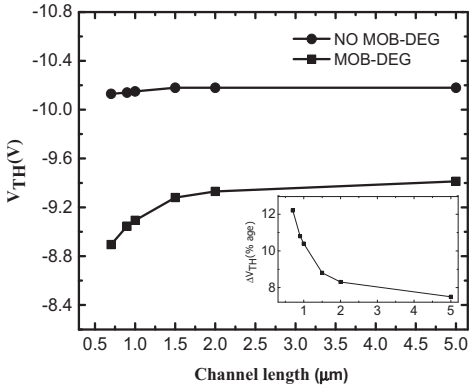

Fig. 4: Comparison of threshold voltage (V_{TH}) variation with channel lengths with and without mobility degradation model. Inset graph shows percentage change in V_{TH}.

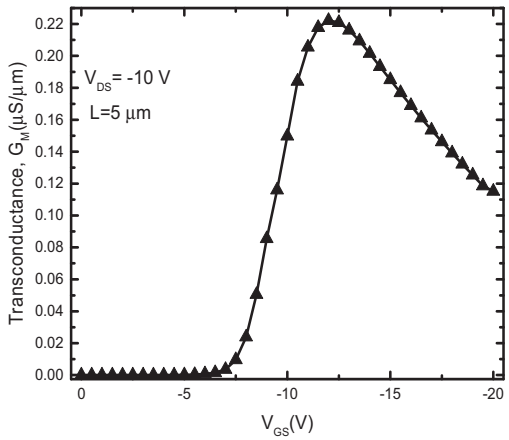

Fig. 5: Transconductance curves for different channel lengths incorporating SURFMOB model.

To further investigate the effect of mobility degradation on the device performance, the threshold voltage (V_{TH}) of the device was plotted for different channel lengths ranging from 5 µm to 0.7 µm as shown in figure 4.

The graph in figure 4 shows two curves for V_{TH} versus channel length of the device. One curve corresponding to the value of V_{TH} when carrier mobility degradation is not incorporated and the other corresponding to value of V_{TH} when mobility degradation model is used. It is observed that for the same channel length, the threshold voltage of the device is reduced when mobility degradation model is incorporated. The surface scattering due to grain boundaries reduces the effective number of charge carriers and thus the value of threshold voltage obtained from the x-intercept method reduces. The comparison of two curves in figure 4 reveals that the threshold voltage roll-off versus channel length is more when mobility degradation model is used. The inset figure in figure 4 shows that the percentage decrease in threshold voltage using surface mobility model (ΔV_{TH}) varies from 7.5% at L=5 µm to 12.2 % at L=0.7 µm. This decrease is thus more pronounced at short-channel lengths.

The transconductance is an important performance parameter as it defines the drain current modulation of the device [8] [9]. The transconductance (G_m) obtained from the derivative of I_D-V_{GS} curve in figure 2 is shown in figure 5. Results suggest that the transconductance curve exhibits a well-defined peak. G_m shows an increase with V_{GS} corresponding to the increase in drain current. At some particular value of V_{GS}, G_m exhibits a peak value and then decreases. This peak corresponds to the highest value of charge carrier mobility obtained in figure 3. At high values of gate voltage, the transconductance decreases sharply due to decrease in carrier mobility caused by phonon scattering and surface roughness scattering. The transconductance characteristics of the OTFT's may exhibit flat curves if mobility degradation effect is not included. But the device simulations show significant effect of mobility degradation on the transconductance parameter as well.

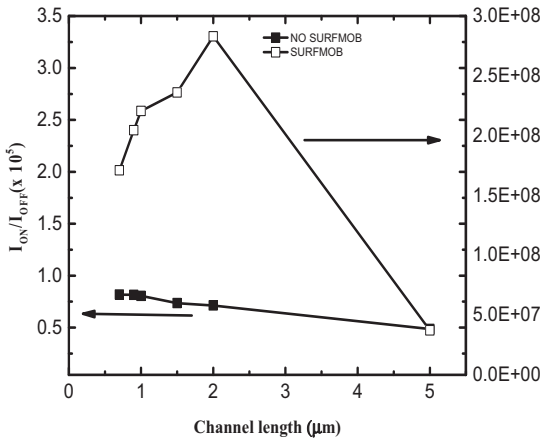

Fig. 6: I_{ON}/I_{OFF} ratio versus channel length (SURFMOB model included).

The results suggest that for accurate simulation of device characteristics, the incorporation of mobility degradation models in device simulations is important. The reduction in transconductance due to change in carrier mobility at high fields reveals that the device dc gain may also be effected.

Figure 6 shows the ratio of on-current (I_{ON}) to off-current (I_{OFF}) versus different channel lengths. I_{ON}/I_{OFF} ratio is an important device design parameter as it describes the transistor switching behavior. I_{ON} of device was measured at V_{DS}= -10 V and (V_{GS}-V_{TH}) =-10 V. I_{OFF} was measured at V_{GS}=0 V and V_{DS} = -10 V. The graph shows that I_{ON}/I_{OFF} ratio is of the order of 1E13 when mobility degradation model is considered whereas it has been found that the I_{ON}/I_{OFF} ratio is of the order of 1E5 when only Poole-Frenkel mobility model is considered. The reason for a high value of I_{ON}/I_{OFF} ratio is that with mobility degradation, both I_{ON} and I_{OFF} currents decrease, but the decrease in I_{OFF} is much more pronounced than the decrease in I_{ON}. This is because at V_{GS}= 0 V for I_{OFF}, the carriers are left with their own thermal energy to contribute to current in presence of surface scattering agents. For calculating I_{ON}, surface scattering agents are still present but the magnitude of electric field is large enough to drive significant number of charge carriers from source to drain and contribute to current. This field in the ON state of the device allows carriers to overcome the energy barrier in presence of mobility degradation factors resulting in less reduction in current.

IV. CONCLUSION

In this paper, the charge carrier mobility behavior at high electric field was studied using two-dimensional numerical device simulation. The mobility analysis had been carried in presence of charge scattering mechanisms. It has been found that at high values of V_{GS}, the mobility modeling cannot be predicted alone by Poole-Frenkel mobility model but mobility is also affected by scattering mechanisms. The surface scattering and phonon scattering mechanisms affect OTFT performance parameter metrics especially at short-channel lengths. It has thus been found that the device simulations can also predict the device behavior through proper selection of device models. This is of great help to researchers who investigate the device performance using modeling and simulations. The evaluation of different performance parameters shows that mobility modeling has a significant role as far as device performance is concerned. It has been observed from the results that even though a high value of I_{ON}/I_{OFF} ratio is obtained but V_{TH} decreases on addition of mobility degradation which is undesirable. The decrease in V_{TH} at short channel lengths may be adjusted by other methods such as channel doping, oxide thickness etc. The device design and interface issues must be improved in order to achieve large drive currents and device gain. Thus there is a need for in-depth investigation of mobility models for OTFT's for research and development.

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***Abstract*—Collaborations and sharing of knowledge has been one of the primary activities of academics and researchers. The purpose of any research and development activity is to transfer ideas into products. Any such activity is useless if its benefits do not percolate down to the society. IITs have been established in India on the model of MIT, USA and are supposed to produce high quality technocrats, produce path breaking research and provide solutions to common problem & societal issues. In this context they ought to have a strong industry linkage as they cannot convert ideas into product at their own. In this paper we explore the linkage between the faculty of these institutes and industry through joint publications i.e. co-authorships. Co-authorship is one of the most tangible and well documented forms of research activity and is capable of providing intrinsic details about all aspects of research credentials of individuals, institutes, communities, organizations, etc. This study reveals that these institutes have not been up to expectations and need to strengthen their industry linkage if they want to transfer the knowledge from their confines to industry and fulfill their mandate.**

Keywords—Industry-academia linkage; joint publications; co-authorship; hybrid similarity; IIT

I. INTRODUCTION

The origin of Indian Institutes of Technology (IITs) can be traced to colonial era in the recommendations of Sarkar Committee but surprisingly these institutes were established on the lines of Massachusetts Institute of Technology (MIT), USA and not on the lines of a British Institute or University. This choice was not accidental but an outcome of well thought out strategy. MIT model attracted the then policy makers for certain obvious reasons including, academia-industry linkage, course structure, learning by doing and commitment towards local/regional social & economic development. In fact academia-industry linkage or cooperation with industry of MIT has been the most compelling factor for the policy makers of IITs to follow that model.

IITs have been dominating the technical education in India since the establishment of first Indian Institute of Technology at Kharagpur in West Bengal in the year 1950. A number of such institutes have been established since then at different places throughout the entire length and breadth of the country. The academic, research and social expectations from these institutes have been clearly spelt out in the IIT charter[1]. It may be argued that IITs were established to impart education so as to produce engineers and technocrats of highest quality but things have changed over a period of time. Research and innovation now figure high on agenda of the IITs. This becomes amply clear from the vision statement of one of the top ranked IITs, IIT Bombay, which states "to be a fountain head of new ideas and of innovators in technology and science".

Academic research institutions (ARIs) like IITs are important actors in the creation and dissemination of knowledge in the National Innovation System [1]. In this new era of knowledge based economies, the linear model of innovation has become outdated as such institutions like IITs have to reorient themselves for a better industry linkage and to foster transfer of knowledge to the industry on one hand and for betterment of the society on the other1. Though there may be a number of reasons to argue that academia and industry have different research and development goals and as such linkage between them may not be of any use but it has been observed time and again that industry and society turn to academics for solution of problem being faced by them [2, 3] and there is a need for better linkages between these two entities [4]. In this consumer driven market it becomes imperative for the industries to upgrade their products and services at a much greater pace than ever before. But they don't have enough manpower and time to perform conceptual research. ARIs on the other hand are very good at performing conceptual research which can be transformed into end products with certain modifications [3].

In this backdrop such a study that tries to analyse empirically the industry linkage of these institutes assumes great significance. This study uses the publications data of Computer Science Engineering departments of four IITs at Kanpur, Delhi, Kharagpur and Madras over a five year period 2011-2015 for extraction and analysis of social networks formed between these institutes and various industries. The choice of these institutes was quite natural as all four were established in the initial lot of five IITs established between 1951 and 1961. IIT Bombay was left out as it lagged behind all these four in research productivity [1]. Joint publications which are also referred to as co-authorships is one of the most

[1] Source: lIT Review Committee Report, 2004

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tangible and well documented form of research publications [2] and there are a number of sources like DBLP, ACM Digital Library, Microsoft Academic Search, etc. that maintain their record.

II. Background and Related Work

Some studies have tried to analyze various aspects of academia-industry linkages in the Western and European setup but there are limited numbers of studies that focus on the Asian countries [5]. Majority of these studies have been published in terms of working papers. Basant and Chandra [6] study the academia-industry linkages in two cosmopolitan cities viz. Bangalore and Pune located in two different regions of India. In this study it has been observed that there are a variety of such linkages depending upon the capabilities of academic institutions and the demand of the industry. According to [6] these linkages can be classified into four major categories. These are: (i) labour market related linkages, (ii) demand & supply of goods and services based linkages, (iii) linkages for creation of new enterprises and (iv) linkages for creation, acquisition and dissemination of knowledge.

Linkages of the type (iv) can take a variety of forms including, student projects, consulting, joint research and development projects, guest lectures, specialized training programs, internships, etc, [6]. Of all the forms of knowledge based linkages joint research has the highest potential of improving the fragile link between any two entities in the two domains [5] as academics are always ready to share their results without any financial considerations [7]. From the available literature it can be observed that studies on academia-industry linkages have focused on the role of creation of new industries and enterprises, product patenting, technical manpower produced, etc. [6]. However to the best of our knowledge, academia-industry linkages in terms of joint publications by people working in Indian institutions and the industry has not been addressed by any other study. In fact this aspect has also remained unexplored in international setup as the studies conducted previously have often taken into consideration academia-industry linkages on the basis of patenting, licensing and academic entrepreneurship [7].

The type of possible linkage depends upon certain factors but the nature of the academic institution and the local industrial setup is the most important one [6]. The trend in knowledge based linkage is changing as more and more small scale industries are coming up and they don't have the expertise or qualified manpower to do in-house research and development [8]. Thus they have to look for potential research partners in the local academic setup to meet this requirement. This interaction is beneficial for both the parties. For academics, it serves as an opportunity to put to use their fundamental research and further it, whereas for industries it is like getting their problem solved with minimal resources [7] and a research partner for their future knowledge requirements.

The potential and intensity of the knowledge transfer linkage depends upon the trust areas of research in a particular institution as some domains, particularly those dealing with science & technology have more potential than the others [9, 10]. Thus there is greater potential in city-industrial clusters where there are a good number of diversified institutions coexisting with equally diversified industrial setup [6]. This has to do a lot with the policy making as it is possible neither for the academia to setup industries at their own nor for the industries to setup academic and research institutions to meet their knowledge demands. The level of collaboration between academia and industry is low [4] and there are certain ways and means which can be used to improve it [11, 12].

Some studies [12, 13] list some important factors which hamper the knowledge sharing linkage between academia and the industry. Academics want recognition of their work which they can achieve through publication of that piece of knowledge whereas industry wants to keep secret their research findings. In addition to that the goal of research is different for both, academics prefer to do fundamental research, have potential to deal with dodgy concepts [14] which can have long term effects whereas the aim to research in industry is to improve end products that can lead to profit maximization and thus has short shelf life. The most important difference the two entities is the attitude towards work, academics prefer to work with their own ease without any deadline in mind whereas industry works with tight deadlines and a clear understanding of what they want to achieve.

III. Data Collection

Publications data of the full time faculty working with Computer Science Engineering departments of four IITs was collected from their respective homepages for a five year period from 2011 to 2015. After normalization and bringing the data to a common format for all the four IITs under consideration this data was augmented with affiliation information of each of the authors. For the purpose of uniformity we removed the departmental information from affiliations of the authors and took into consideration the institutional information only. In addition to industry specific linkages we have also obtained the inter-institutional linkages. Table-1 shows the statistics of the data obtained for the present study [15].

TABLE I. Statistics of the Dataset

IIT	Faculty	Number of Publications in					Total
		2011	2012	2013	2104	2015	
Kanpur	25	17	42	27	14	3	103
Delhi	27	62	71	72	69	14	288
Kharagpur	32	40	69	70	20	1	200
Madras	27	113	116	126	108	28	491
Total	111	232	298	295	211	46	1082

IV. Experiments, Results & Discussions

Instead of following the traditional means of data collection, like surveys, questionnaires, personal interviews, for the study of the linkages we used web mining to extract the desired publications data from the homepages of these four IITs. This data was then normalized and brought in a common format for all the IITs which was then populated with the affiliation information of each of the authors from the Web.

The affiliation information was truncated in such as fashion that it contains the name of the institutions only leaving aside the name of department or section, etc. Figure-2 shows an overview of the major steps involved in the process.

After extraction of the publications data from the web it is stored in a database. Affiliation information for each of the authors of a publication is obtained from the web by posing a query containing the title of the publication to a search engine. The affiliation information obtained from the web is incorporated in the database. Algorithm-1 presented in Figure-1 summarizes the steps involved in the conversion of raw publication data into institutional linkage information.

Algorithm 1: Institutional Linkage Extraction

Input: List of Publications

Output: List of Institutional Collaborations

1. Extract list of authors A from each publication p_i in the database.
2. Repeat step-3 $\forall\ p_i$
3. Search and populate the database: Search Google with title of p_i and extract affiliation aff_i of each a_i and store the affiliation information of each author in the database.
4. Repeat step-5 $\forall\ p_i$
5. Find and replace duplicates affiliations:
   if CosSim(aff_i, aff_j) > *threshold*
   and JaroWinklerSim(aff_i, aff_j) > *threshold*, ***then***
   aff_i and aff_j refrer to same affiliation string, remove either aff_i or aff_j
6. Repeat Step 7 $\forall\ a_i$ and $\forall\ p_i$
7. Extract the collaboration information between any two co-authors with different affiliations.

Figure 1: Algorithm for extraction of linkages.

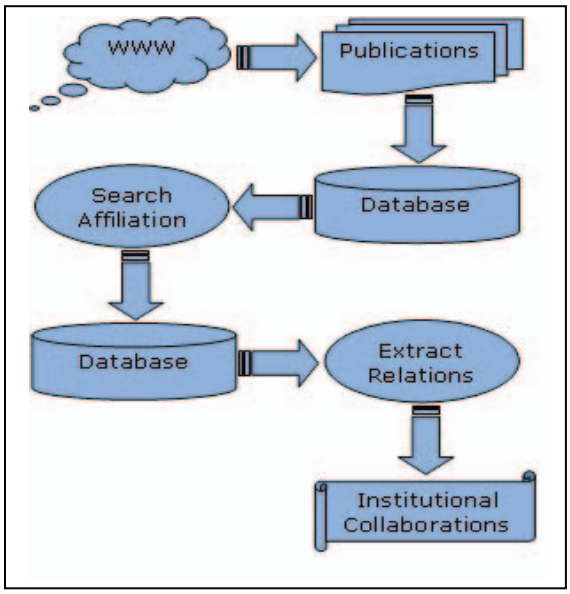

Figure-2: System Architecture

We disambiguated affiliation by comparing them on the basis of their similarity using a hybrid similarity score. The affiliations were first compared on the basis of Cosine Similarity between them, if this similarity is above a threshold Jaro-Winkler Similarity between them was calculated. If the value of Jaro-Winkler Similarity is also above a defined threshold the two affiliation strings are treated as different representations of the same affiliation string and one of them gets removed. In this fashion all the duplicate strings for all the publications were removed and replaced with a standard version from amongst the available affiliation strings.

The Jaro similarity between any two strings ***s*** and ***t*** as defined in [16] is expressed in (1).

$$Jaro\ (s,t) = \frac{1}{3}\cdot\left(\frac{|s'|}{s} + \frac{|t'|}{t} + \frac{|s'| - T_{s',t'}}{2|s'|}\right) \quad (1)$$

Where, ***s'*** is the number of characters in ***s*** common with characters in ***t*** in the same order as they appear in ***s***, ***t'*** is the number of characters in ***t*** common with characters in ***s*** in the same order as they appear in ***t***, and $T_{s',t'}$ is half the number of transpositions for ***s'*** and ***t'***.

Winkler modification assigns higher weightage to matches in the beginning characters in the two strings. It is defined as in (2).

$$Jaro - Winkler(s,t) = Jaro(s,t) + \left(lp\left(1 - Jaro(s,t)\right)\right) \quad (2)$$

l specifies the length of the longest common prefix of ***s*** and ***t***, and ***p*** is a scaling factor (constant). In Winkler's implementation ***l=4*** and ***p=0.1***.

The cosine similarity between any two strings ***s*** and ***t*** can be expressed as shown in (3).

$$CosineSimilarity\,(s,t) = \cos(\theta) = \frac{s\cdot t}{\|s\|\ \|t\|} = \frac{\sum_{i=1}^{n} s_i \times t_i}{\sqrt{\sum_{i=1}^{n}(s_i)^2} \times \sqrt{\sum_{i=1}^{n}(t_i)^2}} \quad (3)$$

Industrial collaborations of these four IITs for the period under investigations are shown in the following tables. In each of these tables strength specifies the number of times that collaborator has been a co-author of a joint publication with an author of the IIT listed in that table.

TABLE II. INDUSTRY LINKAGES OF IIT-KANPUR

Collaborator	Strength	Collaborator	Strength
Microsoft Corporation, Redmond, WA, USA	13	Amazon Development Limited, Hyderabad, India	1
Intel Technology India Pvt. Ltd	2	IBM Research Laboratory, New Delhi, India	5
Microsoft Research, Bangalore, India	4	Intel Architecture Group, Bangalore India	2
Tata Research, Development & Design Centre, Pune, India	1		

TABLE III. INDUSTRY LINKAGES OF IIT-DELHI

Collaborator	Strength	Collaborator	Strength
Boston Consulting Group, Delhi, India	3	Google, Mountain View, CA, USA	6
IBM Research, India New Delhi, India	13	Google, London, UK	1
Mentor Graphics Pvt. Ltd. Noida, U.P., India	1	Goldman Sachs, India	1
Tower Research Capital LLC, Gurgaon, India	3	IBM T.J. Watson Research Center, USA	8
Amazon Development Centre, Bangalore, India	1	Gram Vaani, New Delhi, India	10
Bharat Heavy Electr. Ltd., Hyderabad	1	Microsoft Research	10
IBM Research US, Yorktown Heights, US	4	Decide, Inc, Seattle, WA, USA	1
CSR Technologies India Pvt. Ltd. Noida, India	1	Cisco Systems Inc	1
Cosmic Circuits Pvt. Ltd.	1	EMC Software India Pvt. Ltd	2
IBM Haifa Research Lab Haifa, Israel	3	NVIDIA Inc, Pune, India	1
Netapp India Pvt. Ltd, Bangalore, India	1	Score Foundation, India	1
Adobe Systems India, Adobe Towers, Noida, U.P, India	1	IBM Research, Bangalore, India	4
Google, Bangalore, India	1	IBM Research China, Beijing, China	3
IKP Center for Technologies in Public Health, Thanjavur, Tamil Nadu, India	2		

TABLE IV. INDUSTRY LINKAGES OF IIT-KHARAGPUR

Collaborator	Strength	Collaborator	Strength
Samsung India Software Operations Pvt. Ltd., Bangalore, India	1	Advanced Computing and Microelectronics Unit, Indian Statistical Institute	12
General Motors India Science Lab	4	GM India Science Lab, Bangalore, India	4
Bhabha Atomic Research Centre, Mumbai, India	1	National Semiconductor Corp. CA, USA	2
India Science Lab, General Motors Global Research & Development, Bangalore, India	4	Avenue de Belle Fontaine, Cesson Sevigne Codex France	1
Synopsys India Pvt Ltd, Bangalore, India	3	IBM India Pvt. Ltd., Bangalore, India	1
Oracle India pvt Limited	2	Microsoft Research India, Bengaluru, India	2
Freescale Semiconductor	3	Eastern Telecom Project, BSNL, Kolkata, India	3
Synopsys, Inc., Mountain View, CA, USA	3	Motorola Inc., Austin, TX, USA	3
INRIA-Rocquencourt, Le Chesnay, France	2	Infosys Labs Infosys Limited, Bangalore, India	1
Alcatel-Lucent India Ltd, Bangalore, India	3	Cadence Design Systems (I) Pvt. Ltd., Noida India	1
Vestek R&D, Istanbul, Turkey	1		

These four tables (Table 2, 3, 4 and 5) present a view of the industry linkage of the specific IITs. From these tables it can be summarized that the state of affairs in the current context is not very good. IIT Kanpur only 33 collaborators out of which only 7 are from the industry. The strength of collaboration is 32 only. The scenario improves in case of IIT Delhi with 217 publications having authors from outside. The number of unique collaborators in this case is 94 with 27 industrial collaborators. The total appearances of industrial co-authors is 85. In case of IIT Kharagpur, the number of external collaborators is 157 with 55 times an author from industry figuring in the publications as co-authors. The number of distinct industrial collaborators in this case being 23. This situation is good in case of IIT Madras if we compare it with rest of the four IITs. In this case the number of external collaborators is 141 with almost each publication having a co-author from outside this institution. The number of co-authors from industry is 28, the most in the current study and the strength of collaboration equal to 129.

TABLE V. INDUSTRY LINKAGES OF IIT-MADRAS

Collaborator	Strength	Collaborator	Strength
India UK Advanced Center of Excellence in Next Generation Networks, Systems and Services, India	7	Indira Gandhi Centre for Atomic Research, Kalpakkam, Tamil Nadu	6
Centre of Excellence in Wireless Technology, Chennai, India	2	Tata Research Development and Design Centre, Pune, India	2
Centre for Development of Advance Computing, Kolkata	6	Centre for Development of Advance Computing, Mumbai, India	1
Centre of Excellence in Wireless Technology, Chennai	2	HCL Technologies Ltd, Chennai, India	2
Microsoft Research India, Bangalore, India	10	Midas Communication Technology, India	1
IBM Research, India	39	Big Data Labs, American Express, India	2
Adobe Research, Bangalore, India	8	Tata Institute of Fundamental Research, Mumbai, India	4
CCA&R, New Delhi, India	1	Yahoo! Labs, Bangalore, India	3
Google, India	2	Microsoft Research, USA	1
Intel Labs, Santa Clara, CA	2	IBM T. J. Watson Research Center, USA	3
HP Labs, Bangalore, India	2	Bloomberg, L.P., London, UK	1
Centre for AI and Robotics Bangalore, India	2	iNoCs, Lausanne, Switzerland	2
Oracle India Private Limited, Bangalore, India	1	Infosys Limited, Bangalore, India	3
Secure Cyber Space, Melbourne, VIC, Australia	3	CAIR (DRDO), Bangalore, India	1

The statistics related to co-authorship based academia-industry linkage presented in this study reveal a distant relationship between the two entities. In fact the two entities which should complement each other in their pursuit for knowledge creation, dissemination and usage have preferred to stay away from each other as per this study. This is something which can have long term implications if the trend is not reversed. The institutions have to encourage their faculty to engage with the industry whereas on the other hand the industry has to reach out the academia for solutions to

fundamental problems. The managers on both the sides have to sit together to remove impediments that hamper the smooth flow of collaboration, find ways and means to improve it and work out incentives that can be provided for carrying joint research.

V. Conclusions

This study brings to light the poor state of affairs in academia-industry linkages in four top ranked IITs. The statistics reveals that IIT-Madras stands above the rest of the institutions under study which can be attributed to different polices and approach towards industrial collaborations. In all the cases it was observed that there is no clear indication of any link being influenced by city cluster model as the people working with these institutions have collaborations primarily with people geographically apart from each other. Although one may argue that co-authorship is just one form of collaboration and it may not be fair to draw conclusions on its basis, it can be deduced that these links are the most tangible one and thus can be treated as a true representative of the academia-industry collaborations.

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Social Media Listening and Monitoring for Business Applications

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IGI Global

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ABSTRACT

Social media is perhaps responsible for largest share of traffic on the Internet. It is one of the largest online activities with people from all over the globe making its use for some sort of activity. The behaviour of these networks, important actors and groups and the way individual actors influence an idea or activity on these networks, etc. can be measured using social network analysis metrics. These metrics can be as simple as number of likes on Facebook or number of views on YouTube or as complex as clustering co-efficient which determines future collaborations on the basis of present status of the network. This chapter explores and discusses various social network metrics which can be used to analyse and explain important questions related to different types of networks. It also tries to explain the basic mathematics behind the working of these metrics. The use of these metrics for analysis of collaboration networks in an academic setup has been explored and results presented. A new metric called "Average Degree of Collaboration" has been defined to quantify collaborations within institutions.

INTRODUCTION

Man's desire to quantify things is as old as the mankind itself. We derive great pleasure when we are able to represent something in terms of numbers particularly if the measurement at hand is of qualitative nature. Social networks have been around since time immemorial but they attracted attention of the sociologists only in the 1930's (Cooley et al., 1997). Before the advent of computers analysis and understanding of large scale complex networks was almost impossible. The computational power of computers and their ability to store large amounts of data has provided the much needed impetus to the analysis and understanding of large scale complex social networks. These networks have attracted huge attention from the researchers and policy makers because they are being used for a variety of purposes.

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In the recent past, online social networks have been used for political opinion making, discussing the pros and cons of a product or service, discussing events, etc. It has been observed that these networks have a great deal of impact on the strategy of political figures, political parties, organizations, industries, etc. because they have to adopt to the mood and requirements of the target audience as opinions are formed and revised collectively not individually.

In this contemporary world networks can be found in abundance and everyone talks about them (Katzmair, 2014). A social network is constituted by a number of units (nodes, actors, etc.) that are connected to each other by a defined relationship e.g. "*alice* cites *bob*", "*alice* sends 5 email messages a week to *bob*", "*alice* and *bob* use the same product", "*alice* and *bob* belong to same organization", etc. There are a few wrinkles-the units may be persons, organizations, cities, journal articles, or other types of entities; the relationships may be uni-directional or bi-directional; and the linking relationships may represent categorical relationships or intensity relationships. "*alice* cites *bob*" is a uni-directional relationship; "*alice* cites *bob* very often" is a uni-directional relationship recording intensity; "*alice* and *bob* are friends" is a bi-directional relationship; "*alice* and *bob* are close friends" is a bi-directional relationship recording intensity.

In simple terms a network is an organized collection of nodes or actors and their interconnections or relationships (Jin et al., 2006). Networks can be as simple as blood relations between two individuals or as complex as the World Wide Web. Such networks, where the relationships between actors have some sort of social bearing, are called as social networks. Examples of social networks include e-mail communication networks, economic or business networks, cooperative networks, academic networks. Though the type of link or relationship between actors in any of these networks may be completely different from those in others, they can still be analyzed using a multidisciplinary science called as Social Network Analysis (SNA).

Orgnet.com [1] defines SNA as a tool for analysing relationships and flows between various entities like people, groups, organizations, computers, URLs, etc. In social networks, nodes represents entities like people, groups, organizations, etc. whereas, the edges represents the relationships or flows between the nodes. Using SNA techniques one can have both a visual and a mathematical analysis of relationships in social networks. As a branch of sociology, SNA has emerged as a formal discipline that has borrowed a lot from mathematical notions of graph theory (Mika, 2007). The developments in SNA that we see today are an outcome of contributions from a multitude of disciplines like sociology, social psychology, anthropology, mathematics and computer science (Mika, 2007).

Study of the patterns of interaction and communication in collaborations between various actors has already attracted significant interest from scholars (Wagner & Leydesdorff, 2005a; Wagner & Leydesdorff, 2005b; Wagner & Leydesdorff, 2008; Luo & Hsu, 2009). Advances in data mining and recent developments in social network visualization software have facilitated the study and analysis of intensity and dynamics of these relationships in a visual or graphical manner (Luo & Hsu, 2009). Representation of interactions between entities in terms of nodes and edges i.e. graphs, where nodes represents entities and edges represents interactions, allows one to apply graph theory for the analysis and understanding of underlying collaborations (Luo & Hsu, 2009). Such a study is capable of finding and describing the interactions at micro, macro and universal level.

SNA defines actors and their interactions in quantifiable terms using a set of metrics commonly referred to as social network analysis metrics. Since the use of SNA is not limited to a particular field or type of network the choice of metrics is dependent upon the particular type of network. For example, in an online social network some of metrics are different from those used to model an academic social

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Silence Revealed: Articulating the Inarticulate in *Where Did I Leave My Purdah?*

Shachi Sood

Recently, much has been written by many writers about the nature of violence during and after the Partition which constitutes the thematic corpus of Partition Literature. The exceptionally thought-provoking work *Where Did I Leave My Purdah?* (2012) by Mahesh Dattani deals with the theme of partition in a ground-breaking manner. The violence that was unleashed during partition was massive and the worst sufferers were the women and children especially women of all communities were at the receiving end. Dattani perceives that the males of both the communities took revenge by committing violence on the womenfolk of the opposite community. Rather than portraying women as feeble and pitiable creatures the dramatist highlights his women protagonist as potent, vocal and ingenious.

Partition as an event of shattering corollary, retains its pre-eminence even today, despite two wars on the borders and wave after wave of communal violence. At partition, women became sites of contestation for the men of different religious communities and women's bodies bore the brunt of violence and sexual assaults. However, the physical markings and memories carried by thousands of women allow them to fulfill a more subversive role.

Dhananjaya Pratap Singh
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Microbial Inoculants in Sustainable Agricultural Productivity

Vol. 2: Functional Applications

Springer

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Contents

Understanding the Role of Nanomaterials in Agriculture

17

Sourabh Dwivedi, Quaiser Saquib,
Abdulaziz A. Al-Khedhairy, and Javed Musarrat

Abstract

Nanotechnology offers immense opportunities for improvement in the quality of life through applications in agriculture and the food systems. Development of nanotechnology-based novel agro-products, viz., nanosensors, nano-fertilizers, nano-pesticides and nanoformulations of biocontrol agents, is currently a subject of intense investigation. A variety of nanomaterials has been recommended for use in agriculture, in order to help reduce the consumption of agrochemicals by use of smart delivery systems, minimize the nutrient losses and increase the yield through optimized water and nutrients management. Nanotechnology-derived devices have also been explored in the areas of plant breeding and genetics. Additionally, the agricultural products and/or by-products can be utilized as a source for developing bio-nanocomposites. Nevertheless, the potential advantages of nanotechnology applications in the agricultural sector are still marginal, and have not been commercialized to a significant extent, as compared to other industrial sectors. Researches in the area of agricultural nanotechnology are being extensively pursued in quest for the solutions to the agricultural and environmental challenges, such as sustainability, increased productivity, disease management and crop protection through innovative techniques for monitoring, assessing and controlling the agricultural practices. This chapter provides a basic knowledge about the role of nanotechnology in developing sustainable agriculture and environment, and eventually in the welfare of human society, at large, in the near future.

Keywords

Nanoparticles • Nano farming • Green synthesis • Nano-pesticides

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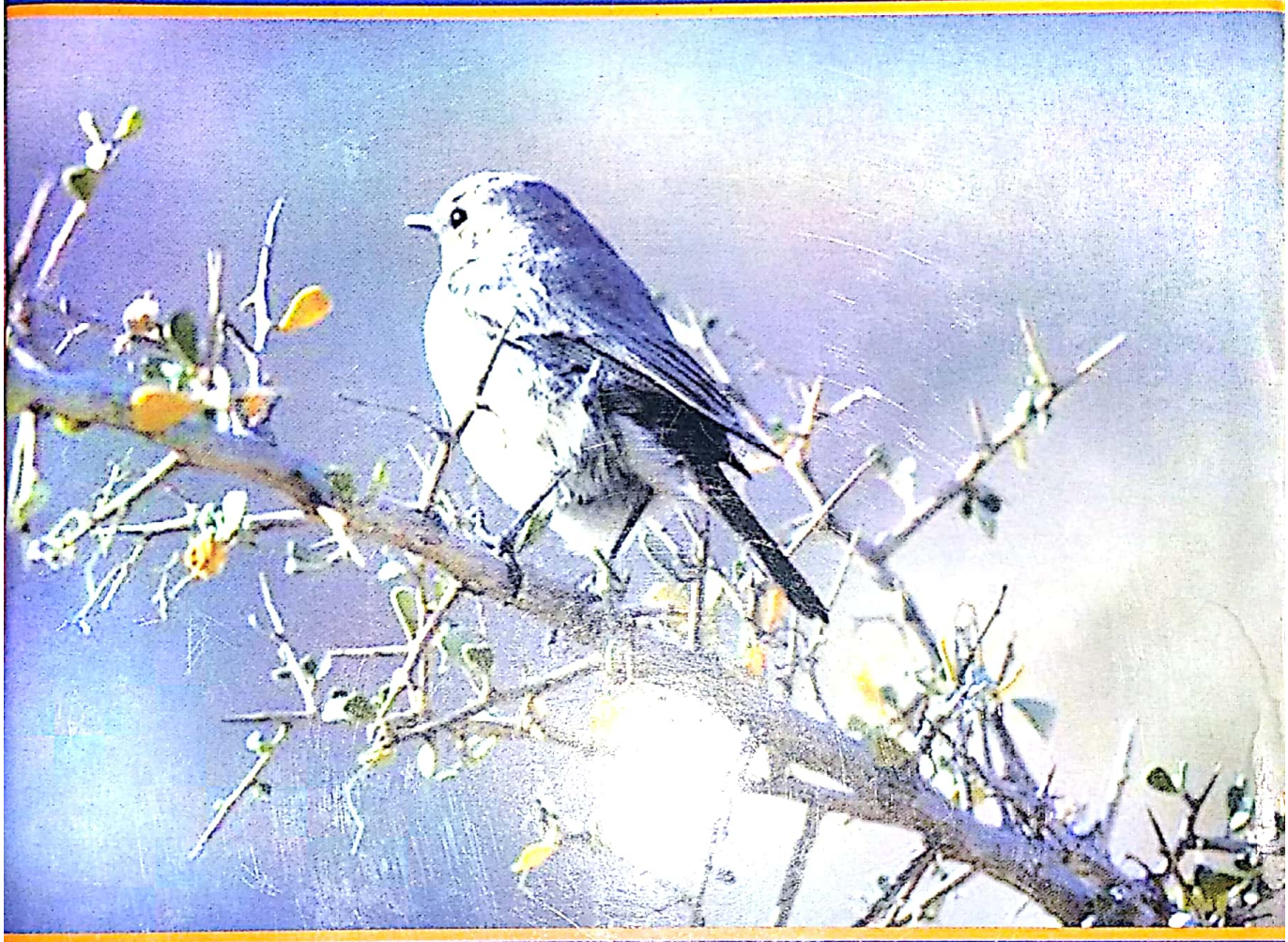

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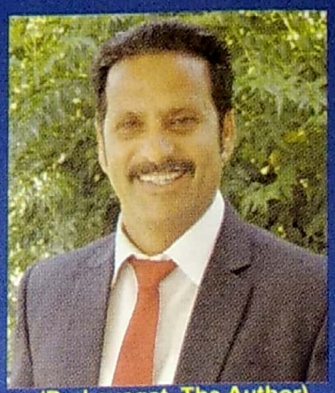
(Dr. Layaqat, The Author)

ریاست جموں وکشمیر کے ضلع پونچھ نے کئی ہستیوں کو جنم دیا ہے اور علمی وفکری جادے روشن کیے ہیں۔ اس دھرتی نے زندگی کے ہر شعبہ میں اپنے بہترین نمائندوں سے رہنمائی فراہم کی ہے۔ برادر عزیز ڈاکٹر لیاقت نیر نے شاعری کے توسط سے اس دھرتی کے چند اہل فکر واہل قلم شعراء کا ذکر اپنی کتاب 'کانٹوں پہ زبان رکھ دی' میں مختصراً کیا ہے جو سمندر کو کوزہ میں بند کرنے کے مترادف ہے۔ شاعری بقول علامہ اقبالؔ ''شیوۂ پیغمبری'' ہے اور اس میں حقیقی شاعر خونِ جگر سے کام لیتا ہے، جو مشہور یونانی فلسفی ارسطوء کا بھی نظریۂ شعر ہے۔ ویسے تو شاعروں کی بھی بہت سی قسمیں ہیں مگر فلسفی شاعر ہمیشہ حق گو، بے باک، خدا ترس اور بندہ نواز ہوتا ہے اور اسی حقیقت گوئی، خودداری اور بلند فکری کی وجہ سے وہ 'کانٹوں پہ زبان رکھ' دیتا ہے۔ لیاقت صاحب نے بھی کافی حد تک اپنی شاعرانہ قدرت کا جرائت مندانہ اظہار کیا ہے۔ اگر قارئین، ذاکرین، ناظرین، دیسی شعراء اور قریبی رفقاء اپنے متعصبانہ انداز کو نظر انداز کریں تو اس حلیم شاعر کی خوبیاں بآسانی ان کی شاعری میں تلاش کر سکتے ہیں۔ میں ذاتی طور سے ڈاکٹر لیاقت کو اس خوبصورت اور باہمت علمی کاوش کے لیے مُبارکباد پیش کرتا ہوں اور دُعا کرتا ہوں کہ یہ سلسلہ جاری اور ساری رہے۔ کیونکہ مستند اور معتبر علمی جگر کاوی دورِ حاضر میں معدوم ہوتی جارہی ہے اور جگہ جگہ نام نہاد ادارہ جات علم فروشی کے کاروبار میں سرگرم ہیں۔ درحقیقت ایک مفکر ادیب کا موثر ہتھیار اس کا قلم ہوتا ہے اور عشق سے سرشار شاعری ہمیشہ روحانی، اخلاقی، انسانی، تہذیبی اور جمالیاتی اقدار کی پرورش اور تبلیغ میں مصروف رہتی ہے۔ اور دُنیا کی کوئی رکاوٹ ایسی شاعری کی ترویج میں حائل نہیں ہوسکتی۔ اس ضمن میں اپنے مرحوم استادِ محترم پروفیسر سید وحید اختر صاحب کا یہ شعر کافی حد تک [illegible]

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الرواية العربية المصرية

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تأليف

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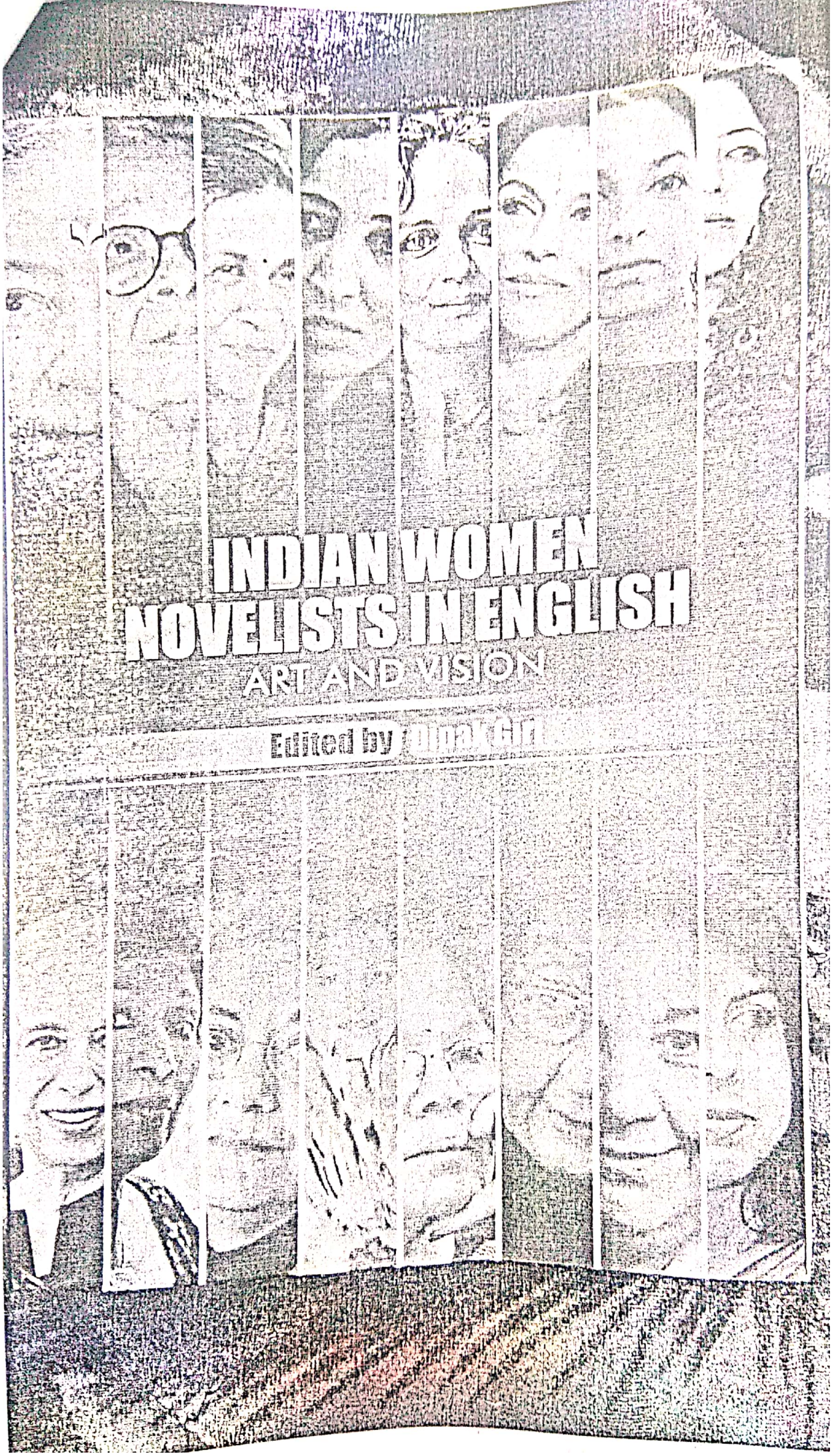

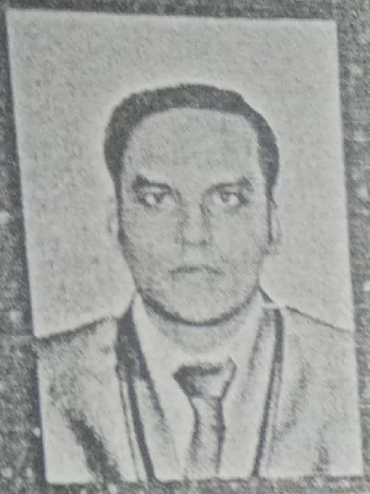

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The book "Indian Women Novelists in English: Art and Vision" is a volume of twenty five research articles on contemporary Indian women novelists and their works ranging from Anita Desai, Shashi Deshpande, Manju Kapur, Shobhaa De, Meena Alexander, Githa Hariharan, Arundhati Roy to the younger generation of novelists Anita Nair, Kiran Desai and Jhumpa Lahiri along with two less explored novelists Rita Garg and Nayeema Mahjoor. Three regional writers- Sarah Joseph, Qurratulain Hyder and Mahasweta Devi are also part of this volume, though their write-ups are in regional languages, yet their translated works in English have earned wide popularity. The volume with its diversity of topics will instill knowledge into the critical minds and open many unopened doors from where many unexplored regions of knowledge will be revisited.

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Representing Gender Identity and Patriarchy in Anita Desai's Novel *Fasting, Feasting*

Dr. Shachi Sood & Yasmeena Jan

Anita Desai is one of the most prominent Indian women novelists writing in English and a pioneer of psychological novelists in Indian English literature. She has portrayed in her novels, the predicaments, the emotional traumas of woman as an individual. In her novel Fasting, Feasting women are shown as inferior and there is discrimination between the son and the daughter in a family. More attention is paid towards the education of boys than girls. Anita Desai portrays the story of an Indian traditional family, who follow different norms for the daughters and son. The comparison of discrimination and inequalities between the father and the mother, between a son and a daughter is realistically portrayed in the novel. Here patriarchy and gender discrimination is the main theme that Anita Desai highlighted in a very good manner. The main character in the novel is deprived of

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Contents

Bibliographic Data Extraction from the Web Using Fuzzy-Based Techniques

Tasleem Arif and Rashid Ali

1 Introduction

The exponential growth of the Web in addition to making the availability of diversified data ubiquitous [18], has made the job of information search very tough [26]. In order to find relevant information from the sea of data (the Web), the information scientists need to devise efficient techniques to extract the required data. These search techniques have to be supplemented with effective data processing techniques that can use the acquired data in an intelligent way that eventually can help address user queries satisfactorily. Thus, it can be assumed that the efficiency and efficacy of extraction, processing, and usage of data depends largely upon the methodology used by the end user/application to search for the desired results.

Though the use of search engines for finding relevant information on the Web is on the rise [22], technically, they are primarily limited to a simple relevance-ranking mechanism [11]. With the exponential growth of the Web and abundance of keywords repetition across documents the results returned by a search engine are vast and mostly beyond the limit of comprehension of a human being. Whereas, with the increasing role of named entities on the Web [6] it is expected that the search results should be *highly expressive*, e.g., if one searches for Prime Minister of a country, he should get a list of all the Prime Ministers of that country along with all other relevant details. Besides, the search results should present data

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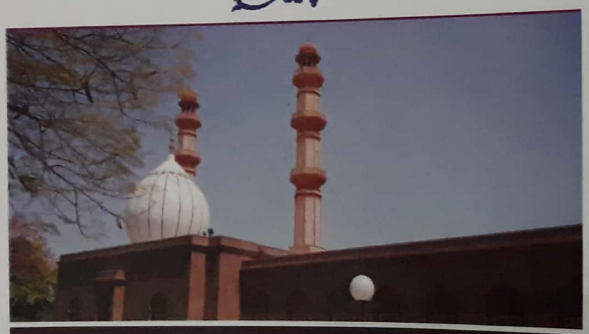

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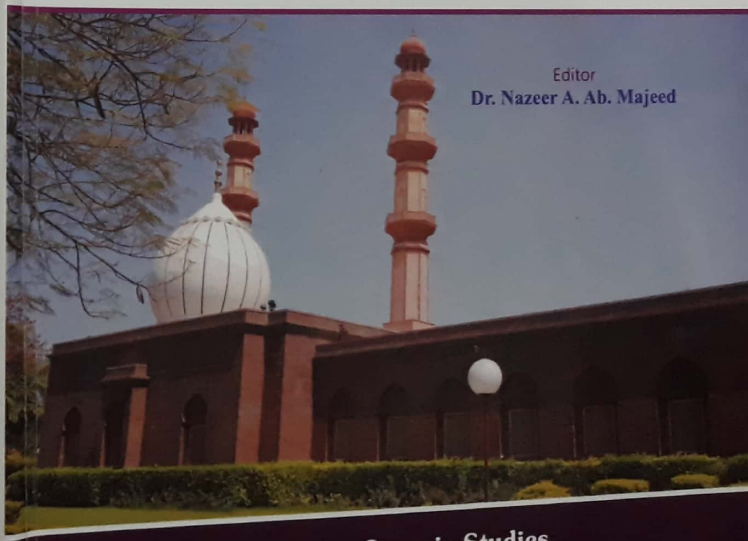

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3

Family Rights in the Quran and their Contemporary Relevance

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Abstract

The Quran invites man to enter wholly into the fold of Islam and gives integrated view of life and reality. The teachings of Islam cover all fields of human activities spiritual and material, individual as well as social. They cater for the aspirations of the soul as well as for the demands of the law and social institutions. Islam's uniqueness lies in spiritualising the whole matrix of life, every activity, whether related to the things like prayer and fasting or to economic transactions, family relationships, diplomatic dealings or scientific experimentations; it all is religious, if the intension is to please Allah.

The Shari'ah (Islamic code of life) guides life in its eternity, example of Muhammad ﷺ is the model which a Muslim tries to follow and in his example one can seek guidance in all aspects of human life, from the highly personal to the purely social as a man, a son, a husband, a father, a preacher, a teacher, a trader, a statesmen, a commander, a peace negotiator, a judge, or a head of the state. Islam is a complete way and has a distinct outlook on life, it aims at producing a unique personality in the individual and a distinct culture for the community based for the Islamic ideals and values. This paper is a humble effort to present the Quranic view of family relations and its effect on contemporary society.

INTRODUCTION

Islam is the religion which came forth through revelation by God to Prophet Muhammad ﷺ. Religion is faith and laws; a faith governing spiritual relations with God and laws administering the affairs of life in the name of life in the name of God. In both cases, we are seeking the same God, we worship one God. Family is the first cradle of man. It is here that the primary character-traits of man are set. As such it is not only the cradle of man but also the cradle of civilisation. Family is a divinely inspired and ordained institution. It was not evolved through human experimentation involving a process of trial and error spread over time. It was an institution and not the other way round. Family is the primary unit of the community the initial cell at the institutional level. Family unit is an environment of cooperation between men and women and the domain of child's earliest upbringing. Family is the Islamic scheme of life provides for moral, social and emotional security. It represents an educational environment both for spiritual sublimation and intellectual development. The family in Islam is built upon a holy bond and a mutual contract of tranquillity, love and kindness between the hearts. Faith constitutes the bedrock of the family. Family life is basic unit of social order, hence it should be stable, orderly

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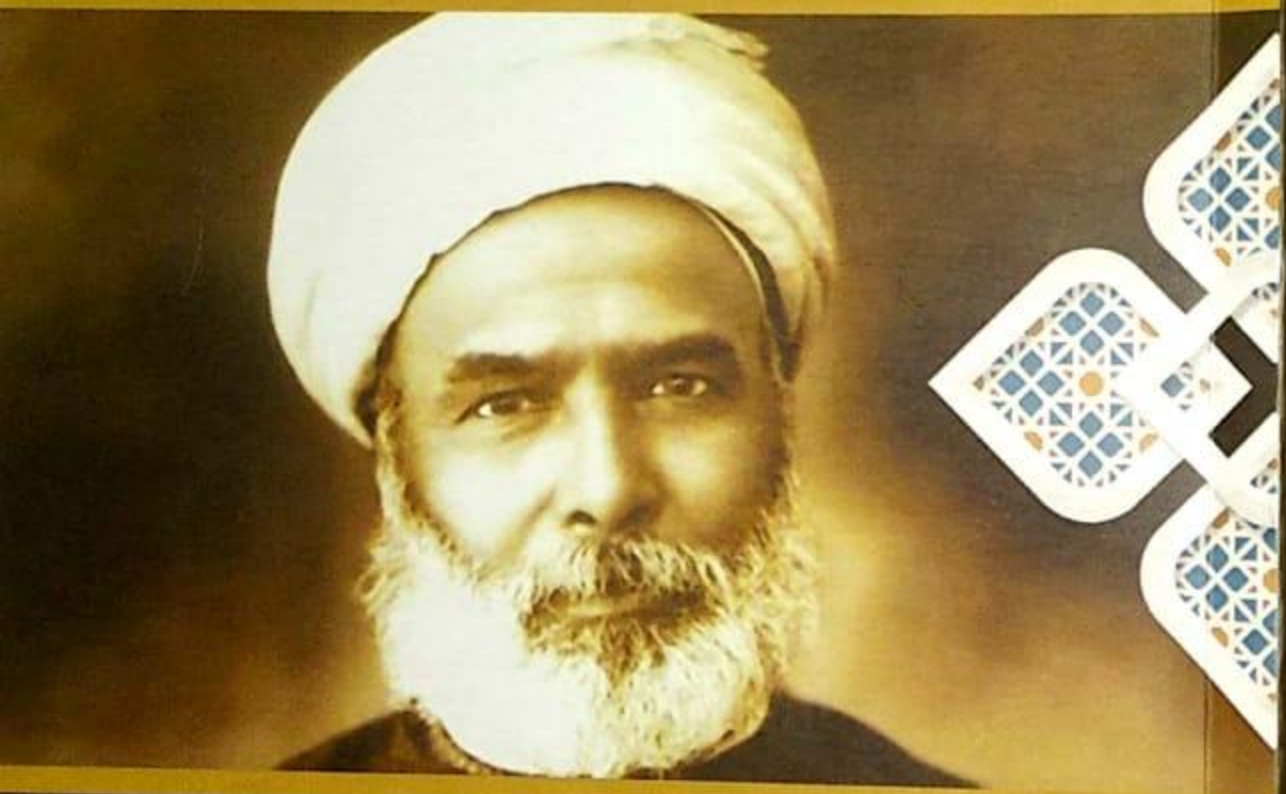

الدكتور منظر عالم

إن أخانا الدكتور منظر عالم شخصية معروفة في الأوساط الثقافة العربية في الهند. وقد تخرج في جامعة الفلاح في أوترابراديش. ثم التحق بالجامعة الملية الإسلامية في مرحلة البكالوريوس. ودرس الماجستر والدكتوراه في جامعة جواهر لال نهرو بنيو دلهي وعمل بعد التخرج في بعض الشركات حتى انسلك أخيرا في سلك التدريس بجامعة غلام شاه بادشاه. راجوري. جامو وكشمير. وله خبرة لتدريس اللغة العربية فيها لحوالي تسع سنوات على ما أعتقد. وهو شخص هادئ مجد ورجل محترم عند زملائه وطلابه.

وعلى كل حال. فإنه صاحبنا الدكتور منظر عالم قدم لنا صورة واضحة لشخصية الشيخ محمد عبده. وأرجو أن هذا الكتاب سوف ينفع ليس فقط طلابنا في أقسام اللغة العربية بالجامعات الهندية والمدارس الإسلامية الأهلية بل يفيد أيضا أساتذة اللغة العربية في بلادنا.

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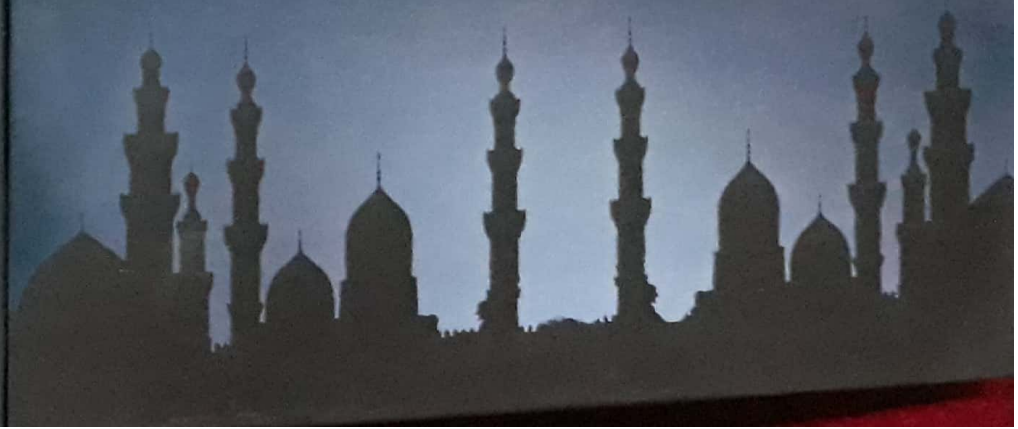

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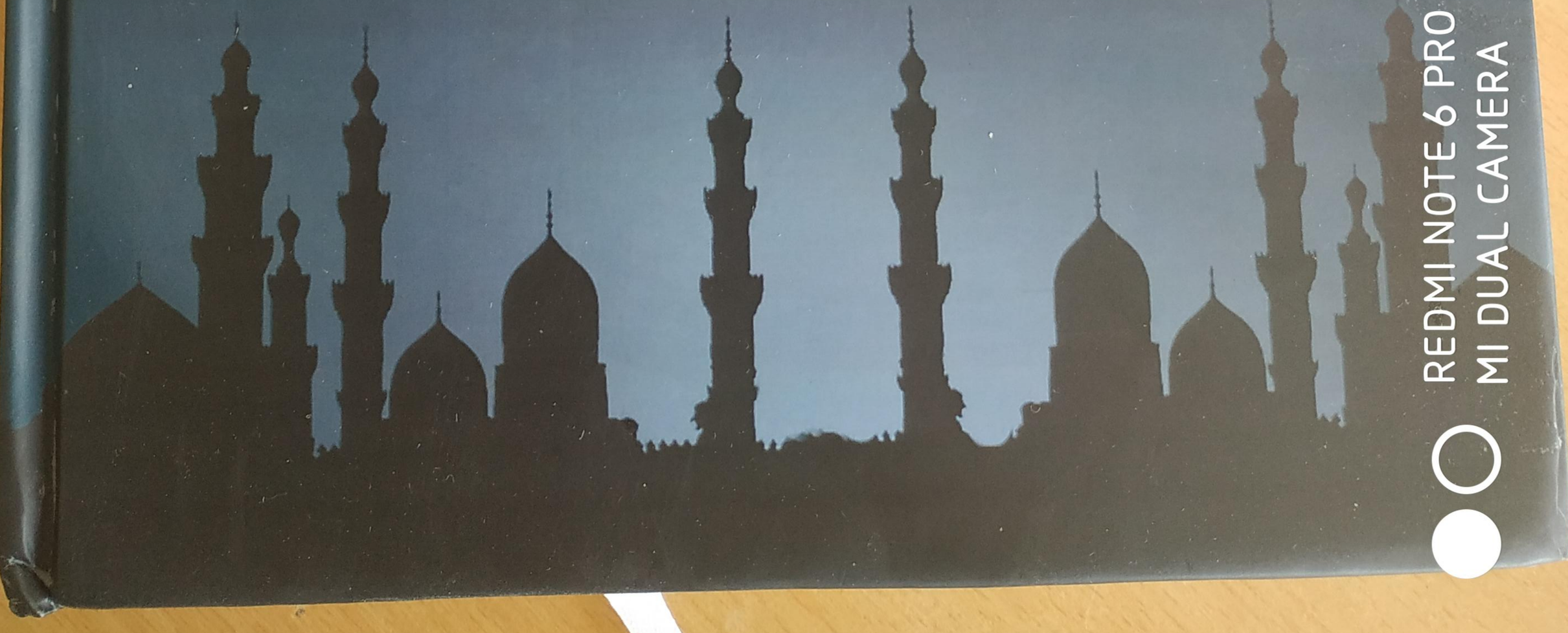

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