



THE 9th IEEE GCC CONFERENCE & EXHIBITION

Gulf Hotel, Manama, Bahrain :: 8-11 May 2017

Conference Theme :: Solutions for a Smarter Economy

Students & Young Professionals Congress May 7-8 :: Main Conference & Exhibition May 9-11



2017 9th IEEE-GCC Conference and Exhibition (GCCCE) Program



	Tuesday, May 9	Wednesday, May 10	Thursday, May 11
8:00 - 8:30	Reg-1: <i>Registration</i>	S11: <i>Hybrid Renewables</i>	S31: <i>Wind Power - Renewable Energy</i>
8:30 - 9:30	OPC: <i>Opening Ceremony</i>	S12: <i>Cyber Security - 1</i>	S32: <i>Internet of Things (IoT)</i>
9:30 - 9:45		S13: <i>Smart Grids</i>	S33: <i>Optical Communication</i>
9:45 - 10:00		S14: <i>Antennas and Propagation - 1</i>	S34: <i>(Industrial) Renewable Energy</i>
10:00 - 10:30		S15: <i>WIE Women In Engineering</i>	S35: <i>Business Engineering</i>
10:30 - 10:45		D2B1: <i>Day-2 Break One</i>	D3B1: <i>Day-3 Break One</i>
10:45 - 11:00	D1LP: <i>Day-1 Lunch & Prayer</i>	KN-2: <i>KEYNOTE SPEAKER - 2</i>	KN-3: <i>KEYNOTE SPEAKER - 3</i>
11:00 - 11:30		D2B2: <i>Day-2 Break Two</i>	D3B2: <i>Day-3 Break Two</i>
11:30 - 12:30		S16: <i>Solar Power - Renewable Energy</i>	S36: <i>Energy Conservation</i>
12:30 - 13:15		S17: <i>Big Data Management</i>	S37: <i>Robotics - Artificial Intelligence</i>
13:15 - 13:30	KN-1: <i>KEYNOTE SPEAKER - 1</i>	S18: <i>Power Quality</i>	S38: <i>Invited Speaker -3</i>
	D1B1: <i>Day-1 Break One</i>	S19: <i>Embedded Systems</i>	S39: <i>Smart Intelligent Buildings</i>
	S01: <i>Image & Video Processing</i>	S20: <i>Antennas & Propagation - 2</i>	S40: <i>Novel Wireless Sensor Networks</i>
13:30 - 15:15	S02: <i>Digital Signal Processing</i>	D2LP: <i>Day-2 Lunch & Prayer</i>	D3LP: <i>Day-3 Lunch & Prayer</i>
	S03: <i>Reconfigurable Computing</i>	S21: <i>Power System Monitoring & Control</i>	S41: <i>Bio Medical Signal & Image Processing</i>
	S04: <i>Automation & Asset Management</i>	S22: <i>OFDM & Cognitive Radio</i>	S42: <i>Dynamic Modeling - Adaptive Control</i>
	S05: <i>(Industrial) Advanced Power Systems</i>	S23: <i>Invited Speaker -2</i>	S43: <i>Ad-hoc Network</i>
15:15 - 15:30	PR1: <i>Prayer</i>	S24: <i>Power Electronics-Micro grids</i>	S44: <i>Advanced Teaching & Learning Technologies</i>
	S06: <i>Social Media & Parallel Processing</i>	S25: <i>Power System Analysis</i>	S45: <i>Power Systems & Renewable Energy</i>
15:30 - 17:15	S07: <i>Invited Speaker -1</i>	PR2: <i>Prayer</i>	CLS: <i>Closing Session</i>
	S08: <i>Power System Protection</i>	S26: <i>Modelling & Simulation</i>	
	S09: <i>Wireless Communications</i>	S27: <i>Power System Quality & Optimization</i>	
	S10: <i>Bio Medical Engineering</i>	S28: <i>Cyber Security - 2</i>	
		S29: <i>Mobile Applications - Novel Approaches</i>	
		S30: <i>Cloud Computing</i>	

Tuesday, May 9, 08:00 - 08:30

Reg-1: Registration  TOP

Room: Reception

Tuesday, May 9, 08:30 - 11:30

OPC: Opening Ceremony  TOP

Rooms: AL DANA 1, AL DANA 2, AL DANA 3, AL DANA 4, AL MURJAN 1

Tuesday, May 9, 11:30 - 12:30

D1LP: Day-1 Lunch & Prayer  TOP

Rooms: Exhibition Hall, Mosque

Tuesday, May 9, 12:30 - 13:15

KN-1: KEYNOTE SPEAKER - 1  TOP

Improving reliability with Transformer Intelligence

Mr. Stephen Pearce - ABB Global Program Manager

Rooms: AL DANA 2, AL DANA 3

Chair: Ibrahim Elamin

Tuesday, May 9, 13:15 - 13:30

D1B1: Day-1 Break One  TOP

Tuesday, May 9, 13:30 - 15:15

S01: Image & Video Processing  TOP

Room: AL DANA 1

Chair: Mohamed Deriche

S01.1 13:30 Integration of Gabor Features with Bag-of-Features Framework for Arabic Handwritten Word Recognition

[Mohammed Assayony](#) and [Sabri Mahmoud](#)

Handwriting recognition is a challenge task due to the large variability in human writings. Improving the feature representations that rely on the visual appearance of the handwritten text would lead to better recognition. In this paper, we integrate two powerful appearance-based features for producing robust statistical features for handwritten text. A handwritten text image is filtered by a set of Gabor filters of different scales and orientations for extracting texture-based local features that are organized into two layouts that are fed to the Bag-of-Features for learning robust statistical representations for the handwritten text. The produced features are utilized in a holistic handwritten word recognition system and evaluated on a public dataset of Arabic handwritten subwords of Arabic checks legal amounts. The best average recognition accuracy achieved by the produced features is 86.44% which is promising in such challenge dataset of large number of classes.

S01.2 13:47 Modified Three Diamonds Motion Search for Video Coding

[Abdelrahman Abdelazim](#), [Ahmed Hamza](#) and [Djamel Ait-Boudaoud](#)

The fundamental principle of Video Coding Standards is reducing the spatial and temporal redundancies from the consecutive frames through what is called motion Estimation. Efficient video coding standards have very sophisticated motion Estimation algorithms. However, those schemes are complicated and consume the majority of the encoding time. In this paper a new matching algorithm for fast block motion estimation is proposed which is a Modified Three Diamonds Search Algorithm using the Four Step-Search and the Half-Pel Diamond Search. It reduces the motion estimation time without affecting the video quality compared to the existing algorithms. Experimental results demonstrate the efficiency of the proposed scheme.

S01.3 14:05 Cross Search Frequency Domain Motion Estimation Algorithm for the High Efficiency Video Coding Standard

[Abdelrahman Abdelazim](#), [Ahmed Hamza](#) and [Djamel Ait-Boudaoud](#)

Development in video coding technology is at the heart of rapid recent advances in streamed and live digital video technologies. This paper proposes the implementation of the Large Cross Search Algorithm in the H.265/High Efficiency Video Coding motion estimation process, a technique common to most hybrid block-based video encoders. Our speed optimization through frequency domain phase-correlation enables the user to compress a video in a short time while maintaining high image quality with similar bit rates to the standard implementation. The implementation was tested with preliminary results on common video sequences.

S01.4 14:22 Using Color, Edge Descriptors, Neural Networks for Multi-Class Image Classification

[Abdullah Al Mamun](#) and [Somaya Ali Al-maadeed](#)

annotating images automatically is needed for indexing and searching images in a big database. Image annotation can be regarded as a multi-class classification problem, where an image may need one or more labels. In this work, we proposed One-Against-All (OAA) multi-class ANNs architecture approach to classifying multi-label images. The proposed ANN's use inputs created by feature extraction techniques from color and edge features. A number of tests were performed to obtain the optimal number of hidden neurons for each neural network classifying its corresponding target. The results outperform some multiple label learning approaches.

S01.5 14:40 Face Recognition Using Diagonal Two-Dimensional Linear Discriminant Analysis and Wavelet Transform

[Falah Alsaqre](#) and [Muhanned Alfarras](#)

Linear discriminant analysis (LDA) is one of the most popular subspace techniques widely used in face recognition (FR) to extract low dimensional features that discriminate a set of facial images belong to a certain classes. In LDA-based FR, 2D images modeled as 1D image vectors. The high dimensionality and singularity problem are two important drawbacks of such modeling. An alternative version of LDA has been proposed to resolve these drawbacks named two-dimensional linear discriminant analysis (2D-LDA) which directly operates on 2D facial image matrices. 2D-LDA significantly lowered the computational cost of LDA, and straightforward in features extraction, hence, possess high discriminatively and accuracy, as well as it completely alleviated singularity problem. Further, subspace-based FR methods have been implemented in wavelet domain motivated by the fact that mapping images from pixels space to that of wavelets can provide enhanced features carrying the most informative information of the images in reduced dimensionality. Likewise other 2D subspace methods, 2D-LDA only reflects the correlation between image rows when evaluating the scatter matrices. An improvement has been made to these methods via correlating the information between image rows and that of columns by using diagonal facial images. Accordance to aforementioned observations, a FR method is proposed in this paper in which diagonal 2D-LDA performed in wavelet subspace aiming to implicitly combine the beneficial properties of 2D-LDA, wavelet transform (WT) and diagonal image in one framework to achieve improved recognition performance. The competitiveness of proposed method is demonstrated by experimental results on standard face dataset.

S01.6 14:57 Forensic Detection of Median Filtering by Hough Transform of Digital Image

[Jae Jeong Hwang](#) and [Kang Hyeon Rhee](#)

In a distribution of the digital image, there is a serious problem like as an apportionment of the altered image by a forger. For the solution of this kind problem, this paper proposes a median filtering (MF) detection algorithm using a feature vector that extracted from the peaks of degree and distance parameters in the Hough transform of the image. In the proposed algorithm, the coordinates of the peaks to be the feature vectors. The proposed MF detection scheme compares to the MFR (Median Filter Residual) and the VNLP (Variation of Neighboring Line Pairs) schemes that have the same 10 Dim. feature vectors. The defined 10-dim. feature vector is trained in a SVM (Support Vector Machine) classifier for the MF detection of the forged images. The performance of the proposed MF detection is measured at Unaltered, Averaging filtering (3×3), JPEG (QF=90), Downscaling (0.9) and Gaussian filtering (3×3) images respectively. Subsequently, in experimental items; AUC (Area Under Curve) by the sensitivity and 1-specificity, Pe (a minimal average decision error), and PTP at PFP=0.01 are performed. Thus, it is confirmed that the grade evaluation of the proposed algorithm is 'Excellent (A)'.

Chair: Ali A. Al-Shaikhi

S02.1 13:30 Global PCA for In-Field Compression of Seismic Data Acquisition

[Bader Almubarak](#), [Yousef Aleisa](#), [Bo Liu](#) and [Ali H Muqabel](#)

This paper is to propose a new global approach in using Principle Component Analysis (PCA) to compress seismic data. The proposed method is based on the idea that a global covariance matrix can be derived from knowing only the statistics about the data at each sensor. A computer-based simulation was used to demonstrate the ability of the global PCA technique to reach compression ratio of 10 times higher than the local PCA technique.

S02.2 13:51 Seismic Data Compression using Signal Alignment and PCA

[Hilal H. Nuha](#), [Bo Liu](#), [Mohamed Mohandes](#) and [Mohamed Deriche](#)

Principal Component Analysis (PCA) offers optimal dimensionality reduction while maintaining the variances. Set of seismic traces data from a sensor can be compressed by projecting the data to the Principal Components (PC)s. The reconstruction error can be determined by choosing eigenvalues of the PCs. If the traces are aligned according to some references, number of PCs becomes fewer for the same preserved eigenvalues. Since the fewer PCs are required, compression rate becomes higher and transmission cost from each sensor becomes smaller. Maximum amplitude and cross-correlation techniques are evaluated to perform traces alignment. Aligned PCA achieves 12:1 compression rate outperforming conventional PCA with 9.9:1 preserving approximately 99% of energy with reconstruction error 0.8% and 0.68%, respectively. Such reconstruction errors are visually unnoticeable.

S02.3 14:12 Car Model Recognition Mobile App

[Somaya Ali Al-maadeed](#), [Mary Puthren](#) and [Ahmed Bouridane](#)

This paper proposes a mobile application for an investigation into recognizing cars by their make and model from images captured by mobile camera. This work builds off of Al-Maadeed S. et al.'s previous work [1] on recognizing cars. App makes a template matching strategy to find an exact match for the query image from a database of known car models using SIFT feature point extraction.

S02.4 14:33 Digital Signal Processing Effect on Power System Overcurrent Protection Relay Behavior and Operation Time

[Abdullah Abdulrahman Al-Nujaimi](#), [Abdulaziz Abdullah AlMuhanna](#) and [Azzedine Zerquine](#)

Power system availability is very important in terms providing continues power supply with no interruption. However, faults are existing in power systems due to equipment aging, unexpected behavior from a specific equipment or sometimes from human errors during operation and maintenance. In order to limit the fault to the equipment and preventing this fault from damaging other equipment or effecting the system behavior, relays are developed. Relays are instrument equipment continuously monitoring the system and taking a proper action according to the situation. The decision and the time delay for the action based on the fault type. The faults type and how bad the fault is are the inputted data to the relay. Digital Signal Processing (DSP) will take samples from the inputted data continuously and take an action when needed. The internal connection and how DSP is utilized in protective relays will be discussed in this paper. In addition to a SIMULINK case study is included to see the DSP effect on protective relaying.

S02.5 14:54 A two-stage Hierarchical Multilingual Emotion Recognition System Using Hidden Markov Models and Neural Networks

[Ahmed Abo absa](#) and [Mohamed Deriche](#)

Speech emotion recognition continues to attract a lot of research especially under mixed language speech. Here, we show that emotion is culture/language dependent. In this paper, we propose a two-stage emotion recognition system that starts by identifying the language then using a dedicated language-dependent recognition system for identifying the type of emotion, The system is able to recognize accurately the four main types of emotion, namely Neutral, happy, angry, and sad. These types of emotion states are widely used in practical setups. To keep the computation complexity low, we identify the language using a feature vector consisting of energies from a basic wavelet decomposition of the speech signal. The Hidden Markov Model is then used to track the changes of this energy feature vector to identify the language achieving recognition of accuracy close to 100%. Once the language is identified, a set of traditional speech processing features including pitch, formats, MFCCs ...etc, are used with a basic Neural Network architecture to identify the type of emotion. The results show that that identifying the language first can substantially improve the overall accuracy in identifying emotions. The overall accuracy achieved with the proposed hierarchical system was above 93%. The work shows the strong correlation between language/culture and type of emotion, and can further be extended to other scenarios such as gender-based recognition, facial-expression based recognition, age-based recognition...etc

S03: Reconfigurable Computing



Room: AL DANA 3

Chair: Wael M El-Medany

S03.1 13:30 OCR-based Hardware Implementation for Qatari Number Plate on the Zynq SoC

[Ali A. H. Farhat](#), [Ali Al-Zawqari](#), [Omar Hommos](#), [Abdulhadi Al-Qahtani](#), [Faycal Bensaali](#), [Abbes Amira](#) and [Xiaojun Zhai](#)

Automatic Number Plate Recognition (ANPR) systems have become widely used for safety, security, and commercial purposes. A typical ANPR system is based on three essential stages: Number Plate Localization (NPL), Character Segmentation (CS), and Optical Character Recognition (OCR). Recently, ANPR systems started to use High Definition (HD) cameras to improve the recognition rate of the system. In this paper, a proposed OCR stage for a HD ANPR system is presented. The software implementation of the proposed algorithm was carried on as a proof of concept using MATLAB, followed by its hardware implementation using a heterogeneous System on Chip (SoC) platform. The selected platform is Xilinx Zynq-7000 All Programmable SoC that consists of an ARM processor and a Field Programmable Gate Array (FPGA). The stage was implemented using both processing units separately and it was found that the FPGA is capable of processing one character

faster the ARM processor. The hardware implementation results show that the proposed FPGA based OCR stage recognize one character in 0.63 ms, with an accuracy of 99.5%.

S03.2 13:47 Solving 0/1 Knapsack Problem Using Meta-heuristic Techniques

[Hayatullahi Adeyemo](#) and [Moataz Ahmed](#)

Knapsack problem has gained popularity in the field of combinatorial optimization. In this paper, different types of problem instances were selected. Two each of S-Metaheuristic methods and P-Metaheuristic methods were applied on the problem instances. S-Metaheuristics were apply to both the small problems and large problems while P-Metaheuristics were applied on only the large problems. Simulated Annealing and Iterated Local Search were tested on the problem instances and the results are compared. Also, Genetic Algorithm and Particle Swarm Optimization were also compared. The techniques perform excellently with slight difference in the efficiency and time.

S03.3 14:05 FPGA Implementation of Fully Pipelined Advanced Encryption Standard

[Abdullah Al Mamun](#) and [Somaya Ali Al-maadeed](#)

A huge value of sensitive data is transferred daily via different channels such as e-commerce, electronic banking and even over simple email applications. There is always a chance of threat of data confidentiality, data integrity and also of data availability. Information has become one of the most important assets in growing demand of need to store every single importance of events in everyday life. Encryption is the popular method to protect private data. According to the National Institute of Standards and Technology (NIST), Advanced Encryption Standard (AES) is the latest known secure encryption algorithm. However, data size is growing up dramatically, thus it is required to encrypt a high volume of data in a second that is achievable using pipeline technique. AES can be implemented in both software and hardware. As compared to software implementation hardware implementation of AES has an advantage of increased throughput and more security. This paper presents a 128 bit Field Programmable Gate Array (FPGA) implementation of the 128-bit block and 128 bit key AES cipher. Selected FPGA family is Spartan 6. This FPGA is able to encrypt 22,832 Mbps with the delay 352 ns. Synthesis result is the use of 5% of total register slices, 11% of total Lookup table (LUTs) and 68% of total Input Output Block (IOBs) those are operated at frequency 185.2 MHz. The design target was high throughput using pipeline architecture.

S03.4 14:22 CNFET based Reconfigurable First Order Filter

[Muhammad I. Masud](#), [Abu Aain](#) and [Iqbal Ahmad Khan](#)

In this paper, a new voltage mode CNFET based reconfigurable first order multifunctional filter is presented. The proposed filter is realized using one capacitor, one resistor and one CNFET based digitally controlled differential voltage current conveyor, as an active building block. The realized circuit provides digitally controlled first order all pass, high pass and low pass filter responses. The proposed filter's pole- ω_0 is controlled by an independently external n-bit digital control word. The proposed filter operates under low supply voltage of $\pm 0.9V$. The realized filter circuit performance is verified through HSPICE simulations and results thus substantiate the theoretical predictions.

S03.5 14:40 Multiple Sclerosis Prediction and Assessment Approaches: A Comparison Framework

[Muhammad Faisal](#), [Moataz Ahmed](#), [Reem Bunyan](#) and [Adel F Ahmed](#)

Multiple Sclerosis (MS) is a complex neurological disorder of the Central Nervous System. It results in progressive loss of neurological functions and produces disability for the patient. This causes also a high cost for both the patient and the society. The etiology of MS is unknown and it is hard to predict the progression of the disease. There has been a number of machine learning based approaches proposed to address this problem. However, there is no framework that could be used to guide researchers to evolve new methods and strategies to better understand this disease. This motivated us to research previous works that attempt to predict diseases in general and MS and its progression in particular using machine learning approaches. Our goal is to compare current approaches and identify gaps present in this field of study. To allow a systematic comparison of current approaches, we developed an evaluation framework composed of a set attributes. These attributes were identified based on a thorough analysis of existing approaches and in consultation with prominent neurologists as well. The paper discusses a number of representative machine learning disease approaches against the framework. Analysis of the discussion highlights some open issues for future research.

S03.6 14:57 MULTICORE AND MANY CORE INTEGRATED Circuits

[Mashhour Alqahtani](#)

Multicore ICs and systems are the future of computing and networking. Trend of multicore ICs is increasing due to many limitations in uncore systems including clock speed, heating issues and large size. A few years back the concept of multicore ICs was not a burning topic because developers were increasing the clock speed using single core. Then dual core processors were introduced and it was considered to be a revolutionary step in ICs' world. They were considered to be very fast processors and within a short time the concept of multicore ICs was introduced. But now these days the trend is shifting from multicore to many core integrated circuits due to a lot of reasons that prefer many core circuits over multicore circuits. However the difference is not a big one it lies just in the number of processing units. In this report the concept of multicore and many-core ICs and processors is discussed in detail with some of their advantages as well as disadvantages. Memory sharing in multicore system, Clock speed trends and protocols of memory sharing are also the part of this paper. Index Terms—Multicores, Many cores, Multiple cores, power efficiency in integrated circuits

S04: Automation & Asset Management



Room: AL DANA 4

Chair: Wasan Awad

S04.1 13:30 Inferential Active Disturbance Rejection Control of a Heat Integrated Distillation Column Using Dynamic Principle Component Regression Models

[Fahad Al Kalbani](#) and [Jie Zhang](#)

This paper presents a multivariable inferential active disturbance rejection control strategy for product composition control in a heat integrated distillation column (HIDiC) to overcome the large measurement delay associated with composition measurement. The inferential estimator uses multiple tray temperature measurements to estimate the product composition. Dynamic principle component regression is used to overcome the strong co-linearity among tray temperatures and incorporate dynamics to build the inferential estimator model. The effectiveness of the proposed method is demonstrated on a simulated HIDiC based on mechanistic model.

S04.2 13:47 SysSMART Outdoor Services: A System of Connected and Smart Supermarkets

[Yazan Mohamad](#), [Majd Makdessi](#), [Omar Raad](#) and [Issam W. Damaj](#)

Smart cities are today's modern trend. Many high-tech industrial firms are exploring different approaches to implement smart cities. Various projects aim at internet-of-things and smart solutions. Current implementations are mostly localized to a specific building or area, however the growth is crossing space and geographic location limits. Shopping is a central activity that is frequent and typically a time consuming task. SysSMART is system of connected and smart supermarkets. SysSMART enables a plausible shopping experience for customers. The aim of SysSMART is to provide an advanced lifestyle with its ease of use functionality. SysSMART outdoor services support distant parking availability, traffic status, and remote inventory checks for supermarkets in a chain. SysSMART implementation relies on cutting edge technologies that support rapid prototyping and precision data acquisition, such as, National Instrument devices. The selected development environment is LabView with its world-class interfacing libraries. The paper comprises a detailed system description, development strategy, interface design, software engineering, and a thorough analysis and evaluation.

S04.3 14:05 Modern H-infinity Control Design for Ultra-Precise Micro/Nanopositioning with Hysteresis Compensation

[Akram Abdurraqeab](#), [Irfan Ahmad](#) and [Waqar Ahmad](#)

Micro/nanopositioning is an important aspect of research in micro/nanotechnology where piezoelectric actuators are widely used for different applications. These actuators generally exhibit nonlinear hysteresis characteristics. The compensation of hysteretic behavior of piezoelectric actuators is mandatory for ultra-precise micro/nanopositioning. This paper proposes a modern H-infinity feedback controller for ultra-precise micro/nanopositioning with hysteresis compensation. To design the proposed controller, first the dynamics of the considered piezoelectric actuator system is identified experimentally. Then, the mixed-sensitivity H-infinity control design methodology is adopted in order to achieve the desired performances of the considered system. The performance of the proposed controller is compared with a general approach of using inverse Prandtl-Ishlinskii hysteresis model as a feed-forward controller. The achieved experimental results with H-infinity feedback controller show improved performances with respect to those obtained with inverse Prandtl-Ishlinskii hysteresis model. The peak to peak tracking error of less than 1% for the desired displacement of 12 μm with tracking frequency of 10 Hz is achieved.

S04.4 14:22 Development of Intelligent Smart Portable Checkout System

[Muhammad Hamad Abdul Rashid](#), [Prashant Kumar Soori](#) and [Sibi Chacko](#)

This paper explains the design and fabrication of self-service checkout system using Raspberry-pi-single-board computer. The need for self-service checkout system in the market is highlighted. Detailed study on types of checkout system used in supermarkets, its significance, drawbacks and features are discussed. An efficient, environment-friendly design approach is presented to make it easier for shoppers, make shopping exciting, hassle-free and less-time consuming. The proposed system consists of barcode scanner, Raspberry-pi, Radio-Frequency Identification Device (RFID) module and a Database server. The fabricated prototype shall reduce stress on shoppers, benefit the storeowners and helps the environment using recyclable-bags and paperless bills. This product can be taken forward as a unique start-up idea as it incorporates a simple yet innovative combination of technology and a completely portable unit, which can be easily, integrated to the existing trolleys in the supermarkets. Barcode reader scans the barcode of the products purchased. When an item is scanned, information of products such as price and other details are retrieved from database. Once all items are scanned, customers proceed for payment on the trolley itself. Payment is completed and verified using RFID reader, which reads the RFID card, provided to the customer by the supermarket.

S04.5 14:40 Saturated Digital Control for Regional Pole Placement

[Hisham Soliman](#) and [Rashid Said Al-Abri](#)

This manuscript presents a controller design method for regional pole placement of uncertain discrete-time systems. The design takes into consideration the control signal limits imposed in practice. A sufficient condition is derived for the robust stabilization and the desired dynamic performance represented by the settling time and damping ratio. Linear matrix inequality (LMI) optimization is used as a design tool. Two examples demonstrate the effectiveness of the proposed design. The first one is hard disk drives, whose uncertainty is modeled by a norm-bounded form. The resulting controller does not violate the limits, and the second example is on regional pole placement for an uncertain system with and without control saturation.

S04.6 14:57 A Virtual Temperature Sensor for an Infrared Dryer

[Morteza Mohammadzaheri](#), [Ali Firoozfar](#), [seyyed Mohammadreza Emadi](#) and [Dalileh Mehrabi](#)

This paper aims at introduction, design and validation of a temperature virtual sensor for an infrared dryer. As proposed in this article, a virtual sensor is an algorithm to estimate the temperature at one or some points in a thermal system (e.g. an infrared dryer) based on the measured temperature at a number of other points. In this research, the designed algorithm estimates the temperature of a single point; however, the methodology can be evidently extended to multiple points. Inspired by direct and inverse heat transfer models, a mathematical model is presented for virtual sensing. This model is developed and identified using artificial neural network (ANN) technique and laboratory experimental data. The proposed method exhibits excellent accuracy with no need to thermo-physical properties of the system.

S05: (Industrial) Advanced Power Systems



Room: AL MURJAN 1

Chair: Mohammed Al Farras

S05.1 13:30 Phenomenon Effect Of the Electrical Network on Railways

[Abdulaziz H. Alharbi](#) and [Khalid Alzarfi](#)

This paper discuss the effects of transmission and distribution ac overhead power lines on railroads that passes parallel or intersect with these lines. With many railroad are being constructed nowadays in Saudi Arabia, it is important to know what are the effects to them and how could be reduced. Effects such as magnetic and electric induction from transmission lines and conducted interference from distribution lines will be discussed in details.

S05.2 13:47 Effect of Electric Arc Furnace on the Electrical Network and nearby Generating Plants

[Firoz Ahmad](#) and [Mohammed Arif](#)

Voltage flicker and harmonics are the power quality problems which are introduced to the power system as a result of non linear and stochastic behavior of the Electric Arc Furnace (EAF) operation. To analyze harmonic and flicker generated by an arc furnace, accurate arc furnace models are needed. This case study will describe the assessment and the impacts of Electric Arc Furnace in a Steel Plant on the SEC's Electrical Networks and the nearby generating units. Two arc furnace models were developed to represent the arc furnace in the PSCAD environment. The data collected from the measurement at the LV and MV buses are used to tune and validate the parameters of the selected models. A Sub-Synchronous Resonance (SSR) investigation was conducted to study the interaction between the nearest power plant and the arc furnace load using the PSCAD EAF models. Sensitivity analyses were also carried out to investigate the impact on power quality, system stability, and SSR of the following parameters: arc furnace size and location, relative size between arc furnace capacity and nearby generator, and short-circuit levels. The performance and stability of power generating stations in the proximity of the steel plant were analyzed using PSS@E software. Both the steady state studies and transient stability analyses were conducted to study the impact of the arc furnaces variability on the power system operation. The study result shows that the power quality at the Point of Common Coupling (PCC) were in compliance with the international standards. The steady state system performance and transient stability of the generators in the proximity of the steel plant were found to be satisfactory and the SSR risk was found to be minimal.

S05.3 14:05 Smart Sensors for Digital Substations

[Georg Schett](#), [Stephen Clifford](#), [Hans-Dieter Schlemper](#), [Aleksandar Vujanic](#), [Richard Thomas](#), [Claudio Marchetti](#) and [Stefan Meier](#)

In most engineering fields, digital technologies such as communication have replaced point-to-point wiring since more than a decade. In fact, nobody has a problem today to enter an airplane. More and more commodities are connected to the internet in one way or the other. Internet of things is the new catchword. In Substations however still thousands of point-to-point signaling copper wires have to be laid out in the foundations of substations in order to interconnect the primary equipment such as switchgear and transformers with protection, control and monitoring devices. Maintenance and service procedures as well as keeping the substation signaling diagrams update during the long life cycle of a substation is a heavy burden for all operators. Current measurement transformers saturate, they have a limited dynamic and as a result various transformer cores have to be connected in parallel. Complex processing routines and filters have to be developed for reliable protection. Complicated interlocking schemes, hard-wired and slow due to electro-mechanical effects such as contact bouncing have to be engineered, tested on site and approved in lengthy procedures. State of the art Digital Substations overcome these and many more issues thanks to standardized fiber optic communication buses and sensors integrated into the primary high voltage apparatus. High precision analogue voltage and current sensors replace heavy and bulky current and voltage measurement transformers. The output signals of these sensors are sampled and digitized by means of high precision electronics directly at the sensor. From there these digital signals are broadcasted to substation control and protection equipment by means of communication buses based on standard Ethernet technologies. Time critical interlocking and tripping over goose protocols have been verified to be faster and more reliable than conventional schemes. Current and voltage sensors are core technologies for digital substations. In this paper the newest technology advances in current and voltage measurement sensor technologies will be highlighted. The basic sensing technologies such as optical current sensors are well known since quite some time. However there was a long journey from the first functional prototypes to mature products meeting all the requirements and specifications of electric power systems. This effort will be discussed and illustrated. This is a good example to underline the need for a close collaboration between scientific research performed at universities delivering pilots and product development in industries where base technologies must be converted to economically viable and reliable products. Finally the concept of the digital substation will be explained as a whole and the resulting benefits for utilities and industries will be laid out. Since a decade pilot digital substations are in operation successfully. Given the existing IEC 61850 and the process bus -9-2 standards, the trend for digital substation is starting to accelerate, it follows the global trend for digitalization. Digital substations will be one of the strategic core elements for flexible smart grids, needed for a safe and stable integration of intermittent renewable energy sources. Power utilities and industries are invited to get familiar with this new technology in order to successfully master the challenges ahead.

S05.4 14:22 Induced Voltage and Ferroresonance Due to Large Grading Capacitors Installed on 230 kV GIS Circuit Breakers

[Hasan Al-Ali](#), [Joseph Letèf](#) and [Saud Al-Shammari](#)

A 230 kV gas insulated switchgear (GIS), consisting of 22 circuit breakers (CBs) were recently installed at a Saudi Aramco gas facility substation (SS). These CBs are all equipped with grading capacitors (GCs). During energization, and upon closing the CB at the source end, while all 230 kV CBs were still open at the load end SS, a high induced voltage (IV) of 180 kV was instantaneously measured at the load SS. This led to immediate hold of the SS energization. Months later a 230 kV voltage transformer (VT) was severely damaged. A root cause investigation was launched and power system simulations were conducted. Results show that the 4000 Pico-Farad (pF) GCs, installed in parallel within the CBs breaking chamber and acute Ferro-Resonance, are respectively the main cause of high IV and damaged VT. As mitigation measures, a dumping resistor was installed in parallel with the VT and special switching, and operational procedures were developed for the GIS. This paper discusses these phenomena, conducted studies and simulation results, as well as implemented measures to mitigate the risk and its impact on the GIS operation, and modified protection schemes.

S05.5 14:40 Electrical Testing: Feasibility & Future Perspective

[Khalaf Musaeed](#) and [Saleh Alamri](#)

The Gulf Cooperation Council (GCC) countries are experiencing tremendous growth in electricity demand, leading to significant ongoing investments in new power generation and electrical transmission facilities. A lot of equipment will be imported from international markets to meet this demand. Additionally, local manufacturers have increased their capacity to produce cables, transformers, switchgears, motors and other components. Along with this growth in electrical assets and manufacturing capability, there has been growing demand for electrical testing laboratory to fulfill the need of operators, manufacturers, and research institutions to undertake required high-voltage and high-power testing of electrical equipment. • Huge Market (Growth rate 8-10%) • Growing Electrical Equip Factories • 50% Commodities not Manufactured • Obsolescence/Aging Challenges Recently in December 2015, strategic investors formed a new private company to be located in the Gulf Coast of Saudi Arabia, "GCC Electrical Equipment Testing Laboratory" in anticipation of serving this growing need. Investors in this venture include Saudi Electricity Company, Saudi Aramco, Public Investment Fund, Dhahran Techno- Valley of King Fahad University of Petroleum and Minerals, GCC Interconnection Authority, Saudi Specialized Laboratories Co, Al Fanar, ACWA Power, Electrical Industries Co. and Saudi Services for Electro- mechanic Works (SSEM). The facility will be built in Dammam, Eastern Province, Saudi Arabia (Modon# 3).

S05.6 14:57 Enhancement of Power Factor Correction Equipment Performance using Damping Reactors (Case Study)

[Mohammed Alghaiheb](#), [Ayat Albuai](#) and [Mahmoud Gamaeldin](#)

overheating in the equipment and conductors can be primarily caused by harmonics in power systems. Decrease of harmonics is considered necessary, especially when capacitor banks exist. Using a detuned harmonic filter is a traditional solution, however, current limiting reactors (CLR) can be an economical solution to damp harmonic pollution if installed in the optimal location. In this paper, power system studies, including load flow, motor starting, and short circuit are performed when placing CLR in different locations to find the optimal location. Similarly, limitation of using CLR and costs are discussed. Eventually, the study suggests CLR to reduce harmonic pollution while detuned filters are used in case the CLR fails to satisfy the voltage regulation aspects of the network.

Tuesday, May 9, 15:15 - 15:30

PR1: Prayer  TOP

Room: Mosque

Tuesday, May 9, 15:30 - 17:15

S06: Social Media & Parallel Processing  TOP

Room: AL DANA 2

Chair: Mansoor Al'Ali

S06.1 15:30 Arabica: Innovative Algorithm for Arabic Text Encoding in Quick Response Code

[Sara Aldoweesh](#), [Felwah Alhamed](#) and [Amr Alasaad](#)

Quick response (QR) code has been used widely in today's applications. QR code is very efficient due to its ability to increase the amount of information embedded in a small size of QR symbol as compared to other linear barcodes. However, the poor encoding capacity in QR for texts in languages other than English and particularly the Arabic text is a real challenge when QR code is used in a real application that requires dealing with Arabic text. This paper presents a simple yet very novel QR storage and size saving algorithm that efficiently encodes Arabic text or bilingual text which includes Arabic and English texts.

S06.2 15:47 Mobile Robot Neuro-fuzzy Navigation Based VSLAM Features Learning

[Ebrahim Abdulla Mattar](#) and [Khaled Mutib](#)

The presented approach was focused around building intelligence for mobile robot navigation. That was achieved by creating navigation intelligence capabilities while the robot is in motion. The adopted learning paradigm was a five layers Neuro-Fuzzy (NF) learning architecture, due to ability to create and inference for enhanced navigation. To meet such visual data gathering, the mobile robot platform have fully computer-interfaced stereo vision, and reliable 3D perception. Mobile robot intelligence (NF), hence learns navigation (SLAM) maps visual features, as it travels within spaces. Blinding intelligence with visual maps has resulted in better navigation capabilities.

S06.3 16:05 A Computationally Efficient Measure for Word Semantic Relatedness Using Time Series

[Arash Joorabchi](#), [Alaa Alahmadi](#), [Michael English](#) and [Abdulhussain Mahdi](#)

Measurement of words semantic relatedness plays an important role in a wide range of natural language processing and information retrieval applications, such as full-text search, summarization, classification and clustering. In this paper, we propose an easy to implement and low-cost method for estimating words semantic relatedness. The proposed method is based on the utilization of words temporal footprints as found in publicly available corpora such as Google Books Ngrams (GBN), and knowledge bases such as Wikipedia. The extracted footprints are represented as time series, their similarities is measured using the Minkowski distance, and averaged using a correlation-based weighting scheme to quantify the words semantic relatedness. The overall performance of the method and the quality of the two sources used for extracting words temporal footprints (i.e., GBN and Wikipedia) are evaluated using the MTurk-287 dataset and the standard measures of Pearson's r and Spearman's ρ .

S06.4 16:22 Massive Parallel Computational model for Heterogeneous Exascale Computing System

[Muhammad Usman Ashraf](#), [Fathy Eassa](#) and [Aiiad Albeshri](#)

In next half decade, a drastic change is anticipated in High Performance Computing (HPC) architectures to achieve emerging Exascale computing system which will be thousand-fold increase in current Petascale computing. This heterogeneous (CPUs + GPUs) framework based exascale computing system will be capable to perform one ExaFlops (10¹⁸) calculation per second. The pioneers in HPC have defined some limitations including energy (< 20 MW), budget (< 100 million \$) and time (2020) that leads the number of challenges for targeted technology system. Nevertheless, an early initiative is important that have been taken by different development communities and vendors. Looking forward the tremendous challenges on the road of Exascale, massive parallelism is one of them which requires a new parallel programming model to provide the performance level required for exascale computing. In this paper we have proposed a new hybrid parallel programming model that provides the coarse-grain and fine-grain parallelism at both intra-node and inter-node levels through heterogeneous architecture. The proposed model could be considered a leading

model to fulfill performance demand for exascale computing system.

S06.5 16:40 Semantic Chameleon Clustering Analysis Algorithm with Recommendation Rules for Efficient Web Usage Mining

[Anupama Prasanth](#) and [Sandhia V](#)

World Wide Web (WWW) is having a huge volume of information and each day millions of users are accessing it. So the major problem in this scenario is to provide relevant recommendations to the users' according to their request. The web usage mining is one of the efficient approaches where the web logs are mined to generate the user search model and provide recommendations and the recommendation process provides significant search options that the user expects. So the recommended options are needed to be more meaningful and relevant to present search. In this paper, we suggest an approach for generating the frequent pattern with strong recommendations for user search with semantic relation. The semantically similar patterns are derived by applying semantic analysis on frequent search pattern. The CHAMELEON, a Two-phase Clustering Algorithm is used for the discovering the frequent search pattern. Finally the Recommendation Rules Generation component is used to find the matching web pages and links for recommendations to the users.

S06.6 16:57 Survey on Target Dependent Sentiment Analysis of Micro-Blogs in Social Media

[Shadi Abudalfa](#) and [Moataz Ahmed](#)

Tremendous amount of topics and opinions are available on the internet these days through using social media. All evidences proof that these opinions play important role in our life and affect on behaviors of communities and governments. Availability of this effective data on social media opens the door to scholars to develop automatic systems for detecting these opinions. Many online tools are available nowadays for opinion mining of micro-blogs with different languages. Most of these tools detect the corresponding opinion to a given micro-blog independently and some of them find opinion towards a specific target (entity) in the micro-blog. In this paper, we introduce a comprehensive review on sentiment analysis in social media. A survey on target dependent sentiment analysis is presented also with summarized results. Our study finds some gaps that can be filled in future research and illustrates that there are still many limits in previous research works. Some discussions are included in this survey on target dependent sentiment analysis as promising future research direction.



S07: Invited Speaker -1

Female Engineering Workforce in Bahrain
Eng. Mariam Jumaan (Bahrain)

Room: AL DANA 1

Chair: Nora Alghatam



S08: Power System Protection

Room: AL DANA 3

Chair: Shawqi Al Dallal

S08.1 15:30 Adaptive Overcurrent Protection to Mitigate High penetration of Distributed Generation In Weak Distribution Systems

[Naser El Naily](#), [Saad Saad](#), [Jamal Alwafi](#), [Abdelsalam Elhaffar](#) and [Nasser Hosseinzadeh](#)

The Growth in Distributed Generation (DG) penetration in distribution networks due to the increasing demand for electricity, leads to a significant change in the characteristics and configuration of the network in many aspects. The effect of connecting the DG to the distribution network could influence the protection configuration. For example, with DG high penetrations, mis-coordination may happen in distance protection or over-current protection. This paper presents a case study of the integration of a relatively large amount of DG into a weak distribution network. The focus is to address the planning and operation of distribution network protection with significant penetrations of DG. The approach is presented to overcome the mis-coordination problems due to the connection of the DG to a typical distribution grid based on activating the directional feature and switching among multiple group setting that exist in the numerical protective relays. The theoretical analysis will be validated using simplified power system simulated in NEPLAN package. The simulation and results indicate that the proposed adaptive protection scheme is a viable method to effectively mitigate the impact of DG on protective devices, therefore, enhancing the reliability of the distribution network.

S08.2 15:47 Experimental and EMTP Modeling of Numerical Transformer Protection for Enhancing Relay Transient Performance: A Case Study

[Saad Saad](#), [Naser El Naily](#) and [Abdelsalam Elhaffar](#)

This paper aims to present modeling and simulation of numerical differential protection for power transformer using Alternative Transient Program ATP/EMTP and its MODELS environment. The model presents the design, modeling and implementation of a numerical percentage differential relay that can be used in the protection of power system components, such as transformers, and transmission line. The relay design provides the characteristic of the percentage differential relay and evaluate its performance. To validate the performance of the modeled relay, simulations of a simplified power system in ATP/EMTP with parameters obtained from a real 30/11 KV power transformer has been carried out and compared against Siemens 7UT-612 differential relay. The advantages of modeling protection relays are to provide good indication of the system performance against protection system, also in addition provide indication of the relay response for different power system operating conditions such as external faults, internal faults, and switching inrush currents. Numerical differential protection in power system network gives the ability to capture and analyze the recorded transient operation conditions, and optimize relay setting due to each transformer characteristic and its location in the network.

S08.3 16:05 Study on Feasibility of Vapour Absorption Air Conditioning System in Automobiles

[Mithun Varghese](#)

The vapor compression air condition system, presently used in cars generally utilizes a portion of the engine shaft power as its input, thus reducing brake power output and increasing fuel consumption. In view of the universal fuel crisis, it is imperative to save petroleum fuel. The use of vapor absorption refrigeration in automobile air-conditioning system can cut down the shaft load and thereby save precious fuel. This work delves into the development of a vapor absorption system model for a small petrol car by analyzing the available source of waste heat. Furthermore, it aims to develop a shell and tube heat exchanger as a heat recovery system to extract the heat from the exhaust of an internal combustion engine. The heat extracted is used to supply the input thermal energy in the generator of the modeled absorption refrigeration system. The exhaust gas energy availability, impact of the engine load on the effectiveness of the heat exchanger and pressure drop on the heat exchanger are evaluated.

S08.4 16:22 Continuous Wavelet Transform Based Detection and Localization of High Impedance Fault in Distribution Systems

[HIimadri Lala](#), [Subrata Karmakar](#) and [Sanjib Ganguly](#)

The detection and localization of high impedance fault (HIF) is necessary in order to maintain high level of reliability and quality of power. The equipments deployed in the substations fails to detect the HIF as its impact on the current profile of the system is very less. A multi-stage time-frequency based approach for HIF detection and localization is carried out in distribution systems. The continuous wavelet transform (CWT) approach is utilized to extract distinct attributes of the transient signals captured from the different buses of the distribution network and the artificial neural network (ANN) for the training and testing of appropriate neural architecture for the fault detection and localization. The proposed scheme provides an efficient algorithm for classification as well as localization of HIF of various fault impedances ranging from 100 Ω to 6 k Ω in different locations in 11 kV practical Indian distribution system.

S08.5 16:40 Performance Evaluation of Quasi-Square Fed Five-Phase Induction Machine with Single-Tooth Winding

[Noha Elmalhy](#), [Mohamed Ahmed](#), [Ibrahim Elarabawy](#) and [Shehab Ahmed](#)

The application of single-tooth winding in multiphase induction machines has met a recent interest due to its potential merits in some industrial applications. Unlike a conventional multiphase distributed winding, this paper proves that the value of the magnetizing inductances of the fundamental and secondary subspaces are relatively close. This is different from a conventional distributed winding that is characterized by its very small secondary subspace inductance, which yields significant harmonic current components under non-sinusoidal excitation. Based on this merit, a five-phase induction machine with a single-tooth winding is investigated when fed from a quasi-square waveform, which corresponds to the minimum possible switching frequency for an inverter fed motor. A comparison with conventional sinusoidal excitation is also added for a fair assessment. The comparison is carried out based on both simulation and experimental results using a 1Hp prototype five-phase machine.

S08.6 16:57 Combined Fourier Transform and Mexican Hat Wavelet for Fault Detection in Distribution Networks

[Sejla Dzakmic](#), [Tarik Namas](#) and [Alma Husagic-Selman](#)

This paper presents a combined application of fast Fourier transform (FFT) and the Mexican hat wavelet for fault detection within distribution networks. The short time fast Fourier transform (STFFT) can replace FFT as well. One of the two Fourier transforms is used to determine the high frequency harmonics due to abrupt changes in line currents, those harmonics take place when various faults occur. The Mexican hat wavelet is used with a scaling factor which is found based on the frequency of the harmonics and the sampling rate of the measurement device. The results show good performance of the suggested approach, and the next step would be the classification of the fault type.

S09: Wireless Communications



Room: AL DANA 4

Chair: Oussama H. Hamid

S09.1 15:30 LTE Pathloss Propagation Using Cost231-Hata Model For Oman

[Mahmoud Mahajneh](#), [Mohamed Elfatih](#), [Mohammed Al Belushi](#) and [Zia Nadir](#)

Theoretical and empirical models were introduced in this paper with focus on Cost231-Hata Model for a suburban area in Oman. Data points were provided by Omantel for cells in Al Buraimi. Cost231-Hata predicted data for the pathloss were compared to the measured data points. The Mean Square Error (MSE) was considered amongst the theoretical and experimental values. Therefore, a modification was introduced to Cost231-Hata model theoretical equation to achieve acceptable MSE value for of 6 dB which is needed for signal prediction. The error has been reduced by adding correction factor to the original equation for the model. The work was further verified for another suburban cell in Oman and acceptable results were seen. Finally, curve fitting method results were compared to the simulation which was done for adapted model and measured data. Cubic Regression method showed the best correlation coefficient values when calculated against the theoretical and experimental data.

S09.2 15:47 High Accuracy GPS-free Vehicular Positioning based on V2V Communications and RSU-assisted DOA Estimation

[Md Anwar Hossain](#), [Ibrahim Elshafiey](#) and [Abdulhameed Alsanie](#)

Traffic congestion has increased, especially in urban cities with population growth and increase in economic activities. Traffic congestions are responsible for economic losses, environmental pollution and road accidents. This research addresses these challenges, by proposing intelligent transportation system (ITS) based on vehicular communications and vehicular positioning. Roadside units (RSU) are considered for transmitting reference signals for vehicle positioning. Vehicular communication is used to exchange estimated position information among vehicles. Vehicular channel model for urban road is developed using Wireless Insite ray-tracing simulator considering IEEE 802.11p dedicated short range communication (DSRC) band at 5.9 GHz. Direction-of-arrival (DOA) of reference signals are analyzed and fused in the vehicle on-board unit (OBU) to estimate and enhance the vehicle position accuracy. Results show that the capability of the proposed method provides higher positioning accuracy than the state-of-the-art GPS based vehicular positioning. Estimated bit-error-rate (BER) results of developed systems indicate that reliable communication is feasible

with vehicle-to-vehicle (V2V) and vehicle-to-roadside unit (V2R), to exchange vehicle position information to surrounding vehicles.

S09.3 16:05 A Compact Chipless RFID Tag Based on Frequency Signature

[Wazie Mohammed Abdulkawi](#) and [Abdel Fattah Sheta](#)

A chipless RFID tag based on multi-resonators is discussed in this paper. As a preliminary design the tag has a data capacity of 3-bits in the range from 2 to 2.25 GHz. The proposed tag consists of a multi-resonating spiral circuit and two orthogonally polarized ultra wideband (UWB) monopole antennas for realizing the cross polarization retransmission process. The prototype of the tag is designed on a Taconic TLX-8 substrate of dielectric constant 2.55 and thickness 0.787 millimeters. The resonators are mainly based on spiral type placed in compact shape.

S09.4 16:22 A QoS based AHP Algorithm for the vertical handover between Heterogeneous Wireless Networks

[Nasser Ahmed](#) and [Nasser-Eddine Rikli](#)

This paper presents a vertical handover algorithm between IEEE 802.11e and IEEE 802.16e based on the QoS. The optimal decision was obtained by taking into account the RSS, user preferences, monetary cost, MN velocity and QoS such as data rate, delay, and BER. The proposed algorithm is based on the Analytic Hierarchy Process (AHP). Four Profiles were proposed for best effort, conversational, streaming, and interactive applications. The proposed algorithm was evaluated using blocking probability, data rate, and delay. The results show that all the QoS requirement for the considered applications were completely satisfied

S09.5 16:40 Investigations of Beamforming Designs and Millimeter Wave Channel Modeling for Multiuser sub MIMO Systems

[Isa Altoobchy](#) and [Mohab A. Mangoud](#)

Massive multi user multiple-input multipleoutput (MU-MIMO) system requires a low complexity precoding processing schemes due to a large number of antenna at both the base Station (BS) and the mobile stations (MSs). This can be achieved by reducing the number of RF chains compared to the number of antennas. In this paper, beamformers for massive MU-MIMO with lower design complexity are simulated and compared to traditional beamforming design for millimeter wave communications. Also, an accurate millimeter wave (mmWave) channel model is applied and simulation results were conducted for different parameters such as different carrier frequencies, number of channel paths and antenna array types.

S09.6 16:57 Handover Performance Evaluation of Centralized and Distributed Network-based Mobility Management in Vehicular Urban Environment

[Mohammed Balfaqih](#), [Mahamod Ismail](#), [Rosdiadee Nordin](#) and [Zain Balfaqih](#)

The demand for real-time applications such as short video clips of CCTVs on a roadway, raises the need of for seamless and ubiquitous Internet connectivity in vehicular networks. Wireless Access in Vehicular Environment (WAVE) architecture defines the IPv6 mobility protocols to be deployed in network layer. However, the Current IP mobility management protocols, including Proxy Mobile IPv6 (PMIPv6), employ a centralized and single anchor to register MU's location information and establish communication which causes excessive burden on that central anchor. Recently, Distributed Mobility Management (DMM) based on PMIPv6 has been introduced to overcome these problems. In this paper, we investigate the vehicle velocity effect in urban environment where a map within the city of Bangi is taken. We compare the handover performance of network-based DMM with PMIPv6 in aspects of handover latency, session recovery, packet loss and throughput. The results show that network-based DMM outperforms PMIPv6 slightly.

S10: Bio Medical Engineering



Room: AL MURJAN 1

Chair: Adel F Ahmed

S10.1 15:30 Wavelets in the Breast Cancer Detection and Diagnosis: A Review

[Armin Kobilica](#), [Hamzah Luqman](#) and [Emad Ramadan](#)

Breast cancer detection is one of the most challenging task even for the experienced radiologists due to high similarity between benign and malign tissues of the breast. The most common procedure for early breast cancer detection is through the X-ray images of breasts (mammograms) preprocessed and classified using computer-aided techniques. Different image processing techniques for X-ray images are used in combination with various classification algorithms and different results are reported in literature. Many of these techniques are imported in autonomous computer-aided systems for cancer detection and many of them include wavelet transforms. Wavelet transforms are part of general concept of multiresolutional theory that matured in image compression and gained high popularity in other image processing fields. This paper reviews wavelet transforms techniques used in literature for breast cancer detection and diagnosis.

S10.2 15:56 Nonlinear Diffusion Filter for Low Count Positron Emission Tomography Utilizing Orientation Information of Neighbouring Gradient Vectors

[Mahbubunnabi Tamal](#)

Positron Emission Tomography (PET) data are inherently noisy due to low photon counts. To achieve an acceptable signal-to-noise ratio (SNR), Gaussian Filter (GF) with varying levels of full width half maximum (FWHM) accounting for the intrinsic resolutions of different scanners are employed at the expense of reduction in spatial resolution and hence accurate delineation and quantification of lesions. Edge preserving Bilateral Filter (BF) provides a potential alternative to GF along with Nonlinear Diffusion Filter (NDF) with limited applicability for high count and low noise cases only. A novel parameter free nonlinear diffusion filter using gradient vector orientation information for clinical low count and high noise case is proposed in this paper and results are compared with GF, BF and NDF for different count levels for NEMA torso phantom.

S10.3 16:22 Sea Water Salinity Detection Using Circular Fringes Formation Based on Diffraction of Laser Light

[Haider Ali](#), [Faycal Bensaali](#), [Abbes Amira](#) and [Fadi Jaber](#)

Salinity describes the amount of salt dissolved in water and brininess of water makes it unsuitable for drinking, industrial and agriculture use. The sea water salinity is most often detected by total dissolved salt method in laboratory. This process is both time consuming and requires laboratory facilities. Various sensors are developed for automated measurements of salinity using light in order to establish a relationship between sodium chloride concentrations and output voltage. The main disadvantage of these voltage based sensors is that output voltage depends on temperature, ambient light and water clarity. In this paper a simple system for salinity detection in sea water is proposed and demonstrated using laser light and ultrasound. The working mechanism of the proposed system is based on the outer most circular fringe radius variations, which consequently alters refractive index. Passing laser light (650 nm) and ultrasound (9 MHz) simultaneously through sodium chloride (NaCl) solutions produce circular fringes at the output. Radii of the circular fringes decrease with increase in the concentration of NaCl dissolved in water and consequently increase the refractive index. The effectiveness of the system is tested on various sodium chloride concentrations. As the NaCl solution concentration increases from 0% to 9% (0 g/l - 90 g/l), the radius of the outer most circular fringe decreases from 16.95 mm to 16.45 mm and the refractive index increases from 1.333 to 1.373. The proposed system has more than 98% accuracy and 99% linearity.

S10.4 16:48 Digitally Programmable First Order Filter Section

[Iqbal Ahmad Khan](#), [Syed Moiz](#), [Waheed Younis](#), [Yasir Ismail](#) and [Muhammad I. Masud](#)

The digitally programmable differential difference current conveyor has been used to realize a novel digitally controlled continuous time voltage mode first order multifunctional filter. The realized filter can provide first order voltage mode low pass, high pass and all pass responses. The pole frequency of the continuous time filter is directly proportional to an n-bit digital control word. The realized digitally controlled continuous time filter is designed and verified using PSPICE and the results thus obtained justify the theory.

Wednesday, May 10

Wednesday, May 10, 08:00 - 09:30

S11: Hybrid Renewables  **TOP**

Room: AL DANA 1

Chair: Husham Ahmed

S11.1 08:00 Combined Operation of Renewable Energy Sources and Active Power Filter: A Review

[Abdullrahman Al-Shamma'a](#) and [Khaled Addoweesh](#)

Distributed generation (DG) such as solar and wind systems have attracted energy sectors as an alternative sources to produce electrical energy either in grid-connected or islanding mode. The increase of DGs penetration cause a power quality problems and it necessary to use power conditioners such as active power filters to mitigate these problems, since passive filter lack the ability to completely mitigate power quality problems in presence of nonlinear loads. This paper gives an overview of the main topologies of the combined operation of DGs based on photovoltaic, wind turbines and active power filters.

S11.2 08:18 A Case Study for Five Phase Induction Motor Design: Evaluation using Finite Element Analysis

[Mahmoud Masoud](#) and [Haitham Al-Ajmi](#)

The Multiphase machine coupled with multiphase converters can be a candidate for adjustable speed drives where the machine can have the same control principal as conventional three-phase but it is superior from fault tolerant capability aspect. Numerous research topics deal with multiphase machines are introduced, specifically five-phase. One of the research topics is the machine design. The design procedure starts by finding motor dimensions, winding dimensions for both stator and rotor. Second step is to evaluate the motor parameters. Lastly, the design should be evaluated through the motor performance using both analytical and numerical techniques. A case study of designing a 3 hp five-phase induction motor, is introduced to the same conference in two parts where part I covers the dimensions side and part II covers the performance evaluation for the designed motor using analytical technique (MATLAB/ SIMULINK). The target of this paper is to assess the designed motor and investigate the performance using numerical technique such as Finite Elements, (FE).

S11.3 08:36 Renewable Energy in Kingdom of Saudi Arabia: Opportunities and Prospects

[Waqar Ahmad](#), [Irfan Ahmad](#) and [Akram Abdurraqueeb](#)

Saudi Arabia is one of a handful of countries that burn crude oil directly for power generation. Almost 60% of electricity is generated through oil and rest through the natural gas. Saudi Arabia is selling the oil at cheapest ever price in international market. If continued this way the Kingdom may face oil reserves depletion in coming decades. Saudi Arabia has a lot of capacity in renewable energies i.e. solar, wind, geothermal, and waste to energy resources. Saudi Arabia, therefore, should conserve its oil reserves in order to maintain its vital role as a respected major supplier of energy globally whilst also ensuring the long term prosperity and energy security of the Kingdom. This can be achieved if reliance of electricity production on oil is minimized in future. The paper analyzes the opportunities and prospects of renewable energy sources for Electricity production in Kingdom of Saudi Arabia.

S11.4 08:54 Impact of Addition of Large Scale Renewable Generation in North West Territory of KSA

[Firoz Ahmad](#), [Mohammed Arif](#), [Tarek Abdel-Galil](#), [Ravi Kashyap](#) and [Ibrahim Elamin](#)

The electricity demand in the Saudi Arabia is expected to reach around 125 GW by 2032. The ever increasing electric demand coupled with the need to conserve the oil and natural gas resources

has provided KSA an incentive to move towards the path of the renewable. The North West (NWOA) territory close to Gulf of Aqaba in Saudi Arabia has been identified as one region with good potential for renewable energy development. This region is characterized by excellent and steady wind speed profile and solar irradiation. However, one of the major hurdles that slow down the increased utilization of renewable is grid access. This paper examines several alternatives to connect 6000+ MW of NWOA/NEOA renewable generation to the load centers in Central Operating areas. Alternatives span the use of 380kV, 725kV, and HVDC technologies is considered. Detailed techno-economic evaluation of those alternatives is presented in this paper.

S11.5 09:12 Renewable Energy in Saudi Arabia: Current Status, Initiatives and Challenges

[Samir Elnakla](#)

There is an increased demand for energy worldwide, and 80 % of the present energy use is based on fossil fuels. Fossil fuels are not sustainable and generate many concerns that challenged the scientific community for decades. Renewable energy technologies can address most of these concerns including energy security, economic growth, competitiveness, health costs and environmental degradation. In this context, the utilization of renewable energy resources such as solar, wind, biomass and geothermal energy appears to be one of the most efficient and effective ways of achieving this goal since renewable energy is abundant universally and holds huge ecological and economic promise. Although the Kingdom of Saudi Arabia (KSA) is the world's major producer and exporter of fuel, and represents one of the biggest consumers of petroleum in the Middle East, Saudi Arabia is interested in taking an active part in the development and exploitation of renewable energy technologies. The KSA has developed an ambitious plan to generate more than 50% of the country energy demand from renewable energy by the year 2040. This paper highlights the current status of energy industry in KSA with focus on renewable and energy-efficient technologies, major achievements, and current government policies and challenges.



S12: Cyber Security - 1

Room: AL DANA 2

Chair: Abdulla Al Thawadi

S12.1 08:00 Study and Implementation of a Secure Random Number Generator for DSRC Devices

[Imed Saad Ben Dhaou](#), [Haikel Skhiri](#) and [Hannu Tenhunen](#)

This work presents an algorithm to select a low-cost modulus for the implementation of Blum Blum Shub pseudorandom number generator in an FPGA device. Additionally, it elaborates a low-latency architecture for the BBS algorithm suitable for the security service of the IEEE 1609.2 standard. The architecture uses diminished-1 arithmetic and is $\log_2(N)$ faster than previously reported implementation using Montgomery multiplier. The architecture is able to implement 224-bit and 256-bit BBS sequences. Synthesis results show that the latencies for the 224-bit and 256-bit BBS are, respectively, 1:12s and 1:28s.

S12.2 08:22 BACnet - Bridging the Cyber Physical Divide One HVAC at a Time

[Craig Valli](#), [Michael N Johnstone](#), [Matthew Peacock](#) and [Andy Jones](#)

Building Management Systems (BMSs), which centralise the management of building services, are commonly accessed remotely for operational management and emergency purposes. The protocols used in BMSs were not originally designed with security as a requirement, thus the majority of systems operate with sub-standard or non-existent security implementations. Existing signature-based approaches to threat detection typically deal only with known threats or suffer from a high false positive rate (in the case of anomaly-based approaches). In this paper we present an overview of the problem space with respect to BMS, discuss a common protocol in detail (BACnet) and show how a threat that cannot be detected with conventional intrusion detection methods could be mitigated.

S12.3 08:45 Privacy Provision In E-learning Systems

[Aisha Bushager](#)

Through the last decade education has evolved dramatically, shifting from blackboards, whiteboards, paper based systems and other traditional learning systems where privacy of students have been sustained behind locked offices to new revolutionary educational system called the E-learning system, the delivery of a learning, training or education programs by electronic means is generally known as E-learning. Since privacy is considered as an essential element in our lives, hence, it is important to shed the light on privacy in E-learning systems. This study aims to examine the privacy issues related to the use of E-learning systems. The study also generated hypotheses to investigate the users' differences in genders as well as the differences in years of study at the higher educational level. The data gathered from reviewing previous studies was modified and then presented in a survey for the users of the E-learning system in the University of Bahrain, specifically BlackBoard. The results show that 30% of students improve their understanding of privacy by the period they study in the university, and IT female students show better understanding of privacy principles than non-IT female students, in addition, IT students care about implementing the privacy principles more than other colleges. The study highlights that the privacy of E-learning systems revolves around the user perspective and provider compliance to privacy principles.

S12.4 09:07 Data Security among ISO/IEEE 11073 Compliant Personal Healthcare Devices through Statistical Fingerprinting

[Junaid Chaudhry](#), [Uvais Qidwai](#), [Mahdi H. Miraz](#), [Ahmed Ibrahim](#) and [Craig Valli](#)

The translation of healthcare data into a unified format e.g. Health Level Seven (HL7) and sensors transmitting their readings data periodically provide an excellent opportunity to incorporate statistical fingerprinting. The security of healthcare data has been of prime importance in recent years. However due to technological limitations at leaf nodes in a Healthcare Information System (HIS), it is not always possible to use cryptographic protocols for data security. A smart alternative of data obfuscation is Statistical Fingerprinting (SF). In this paper, we provide important insights into our research in healthcare data security and the use of statistical fingerprinting in HL7 communication protocols. We substantiate the conversion of sensor data through the SF into HL7 format and define policies of a seamless switch to a non HL7-based non-secure HIS to a secure HIS.

Room: AL DANA 3

Chair: Amer S. Al-Hinai

S13.1 08:00 Development of Energy Management System for Solar-Powered Electric Vehicles with Battery-Ultracapacitor Energy Storage System

[Mena Elmenshawy](#), [Mariam ElMenshawy](#), [Ahmed Massoud](#) and [Adel Gastli](#)

Solar-powered vehicles still have limitations in terms of energy management technology, including Photovoltaic (PV) and energy storage systems. A solar car energy management system should ensure that the flow of electrical power from the PV and from/to the energy storage devices to the motor are optimised and well-monitored. Energy efficiency and light weight are important factors for a successful vehicle design. In order to achieve that in this work, a Lithium ion battery, in-wheel axial flux permanent magnet brushless DC motor with a monocrystalline PV modules, and silicon carbide devices-based power converters are selected to attain such constraints. In addition, ultra-capacitors are used as a second energy storage device to take the advantages of the fast charging and discharging. Practical implementation of the Maximum Power Point Tracking, in addition to different energy management scenarios are presented.

S13.2 08:18 Reliability Assessment of Sustainable Photovoltaic- Electric Vehicles System

[Ibrahem M. Hussein](#) and [Ali T. Al-Awami](#)

Energy saving is an important issue addressed by electric utilities and consumers. Electric vehicles contribute to the world's emissions reduction, especially under renewable power generating systems. This research aims to investigate the feasibility of installing a photovoltaic system to sustain a proposed electric vehicles load demand at King Fahd University of Petroleum & Minerals campus, Dhahran. The Kingdom has a very attractive solar energy resources and can be effectively employed. The PV systems will be mainly applied to the free space areas of existing parking lots through the university campus. The total amount of available area will be approximated in which the system to be installed. The system will be designed in standalone basis. The simulation will investigate the system performance for a system with and without storage units. The effect of various losses factors, e.g. temperature losses, will be taken into account. The PV system will be responsible for satisfying the total EV load demand, which is assumed to be existing in the university parking lots. A reliability assessment will be carried out in terms of availability of service and the average interruption and duration indices to assist in selecting a battery size.

S13.3 08:36 Ontology Powered Knowledge Modeling For A Smart Home

[Nor Shahriza Abdul Karim](#) and [Reem Al Osami](#)

The development and expansion of ontology is highly important in building smart applications such as a smart home. This research seeks to identify and develop an extension framework for personalized smart home ontology that can be used in an intelligent home to reduce and manage the energy consumption. The ontology framework was developed based on a methodology known as Natalya and Deborah Methodology. In the design, the researcher added the home appliances as sub classes, and grouped them based on their functional properties. This approach was not used before in the previous work. With this approach, any kind of home appliances can be semantically defined. In order to validate the proposed framework, the researcher developed a prototype to check the consistency and the correction of a Smart Home Ontology and Semantic Web Rule (SWRL). The ontology was validated through the pellet reasoning engine and Simple Protocol and RDF Query language (SPARQL) query to test and correct any logical mistake in the SWRL rules or in the ontology created.

S13.4 08:54 Optimal Dispatch of Electric Vehicle at Charging Stations for Cost Minimization and Ancillary Services Provision in V2G Concept

[Ahmad Saleem](#) and [Ibrahim Elamin](#)

Optimal charging of electric vehicles (EVs) at charging stations is considered in this work. The goals are to minimize the total charging costs of all vehicles available at charging stations. Moreover, a novel approach investigated the possibility of utilizing the EVs as controllable loads to provide ancillary services in V2G concept. Cost reductions were achieved through bidirectional power flow between the EVs and the grid through the stations. A variable daily price profile was considered. When EV batteries are considered as controllable loads, EV owners can minimize their charging costs through optimized coordinated charging which guaranteed buying electricity at lowest prices. Charging stations can also provide ancillary services to the system when studying EV availability through historical data and considering the energy storage capabilities the EV batteries can potentially provide.

S13.5 09:12 Impact of Vehicle-to-Grid Technology on the Reliability of Distribution Systems

[Mustafa Ammous](#), [Mohammad AlMuhaini](#) and [Mohamad Nagi Khater](#)

Electric vehicles (EVs) are expected to play an important role in the future in the operation and planning of power system. This is due to the increased utilization of EVs and the increased demand of more reliable and efficient power supply. The purpose of this paper is to analyse the behaviour of a distribution system, in terms of the reliability, with the integration of electric vehicles (EVs) in vehicle-to-grid (V2G) mode. The reliability indices are calculated before the integration of EVs at certain failures during one year. Then, a proposed model is used to estimate the available energy in the EVs during 24 hours which can be used to supply power back to the grid in emergency conditions such as failures or outages. At the end, a comparison between the two cases is made to evaluate the effectiveness of V2G technology on the overall reliability of the distribution system. The results have shown apparent enhancement in the reliability indices of the distribution system.

Room: AL DANA 4

S14.1 08:00 On the Switching Noise Mitigation in High-Speed PCBs Using Engineered Materials

[Mohammed Bait-Suwailam](#) and [Haitham Al Ajmi](#)

The increased demands for fast, compact electronic devices had significantly been noticed in the past twenty years, especially with the massive development in technology and fabrication tools. This need including many more have posed significant challenges for the designers especially in high- frequency high-switching electronic devices. One of such challenges is the excessive noise generated from high speed integrated circuits, well known as Simultaneous Switching Noise. Over the years, several approaches were introduced to overcome such disturbance. With the birth of metamaterials, potential use of them in switching noise mitigation started to evolve. In this paper, two approaches to tackle the switching noise are explored targeting applications for high-speed printed circuit boards at 2.45 GHz. One of which suits narrowband applications, while the other works for wideband applications. A new populated power plane using complementary metamaterials is also presented and results are discussed.

S14.2 08:18 Time to Frequency Modeling of UWB Antennas

[Sajjad Ur Rehman](#) and [Majeed Alkanhal](#)

In this paper, two Ultra-Wide Band (UWB) antennas have been modeled using Singularity Expansion Method (SEM). To acquire the complex poles and the corresponding residues of the SEM model, Matrix Pencil (MP) method has been applied to the far field time response of the antennas. The poles extracted by the MP method are located precisely within the operating bands of each UWB antennas. This modeling scheme is attractive as one set of parameters are used to characterize antennas in both time and complex frequency domains. Using the basic SEM model, the transfer functions of both UWB antennas can be directly constructed.

S14.3 08:36 Resonance Characteristics and Tunability of Calcium Vanadium Garnets as Ferrite Resonator Antennas

[Emad Alkhazraji](#) and [Sharif Iqbal Miru Sheikh](#)

The main scope of this work is to employ a Calcium Vanadium Garnets ceramic composite as a ferrite resonator cylindrical antenna and investigate tunability in the presence an external biasing magnetic field. The numerical analysis is carried out via Ansoft's High Frequency Structure Simulator (HFSS) software package. The antenna is fed through a side coaxial probe whose geometrical configurations are parametrically studied and optimized. The resonance profile of the antenna is characterized and compared to a traditional dielectric resonator antenna. The ferrite resonator antenna displayed two resonance dips rather than that collectively resulted in widening its resonance bandwidth to 1.17 GHz. The paper next discusses the significance of optimizing the length of feeding coaxial probe and its distance from the antenna by explaining to the behavior of the radiation of the structure with respect to the variation of these parameters. The study is concluded by a characterization of the tuning capabilities of the structure in the form of variation in the resonance frequency of the antenna in addition to its bandwidth with respect increasing of the applied external magnetic field intensity. The tunability of each respective parameter was found to be 4.29 MHz/mT and 0.29 MHz/mT.

S14.4 08:54 From GADIA to Pairwise Synchronous Algorithm for 2-Channel Case

[Zekeriya Uykan](#) and [Sinan Kapcak](#)

The fully distributed and asynchronous interference reduction algorithm GADIA developed by B. Babadi and V. Tarokh [1] is a very powerful and effective algorithm. It has been the source of various other asynchronous distributed interference reduction algorithms. Due to the time varying channel gains, the convergence speed in all these asynchronous algorithms plays an important role. In this paper, we turn the asynchronous GADIA algorithm into a pairwise synchronous dynamic system in order to improve the convergence speed, and propose a two-node synchronous system. We analyze the proposed system from a mathematical perspective using the results in [5]. Wireless systems simulations show that the proposed pairwise synchronous algorithm (PSA) remarkably increases the convergence speed at the expense of some extra signal exchanges between nodes and at the expense of a probability of a slight performance deterioration as compared to the fully asynchronous GADIA algorithm.

S14.5 09:12 Low Profile Circularly Polarized Elliptical Dielectric Resonator Antenna

[Hassan Al-Lawati](#) and [Salam Khamas](#)

Two circularly polarized conformal excited elliptical dielectric resonator antenna are presented. The first one has a dielectric constant of $\epsilon_r=20$ and the second one has dielectric constant of $\epsilon_r=25$. The two antennas provide S11 bandwidths of 7.8% and 5.6% respectively. The axial ratio bandwidths of the antennas have been calculated as 1.9% and 1.5% respectively. Both antennas have provided useful bore-sight gain at the desired frequency range.

S15: WIE Women In Engineering



Room: AL MURJAN 1

Chair: Raida AlAlawi

S15.1 08:00 Faster Processing of Traffic Collisions to Reduce Road Congestion: Motivation, Design, Implementation, and Testing of a Remotely Piloted Aerial System

[Hajer Sameh](#), [Kulthoom Aiman](#) and [Dilek Dustegor](#)

This work presents the motivation, design, implementation, and testing of a remotely piloted aerial system created to facilitate police officers processing traffic collisions. A drone (Fig. 1) remotely controlled by the police officer (Fig. 2) can reach faster the accident scene and act as the police officer's eye, ear, and voice in the sky. Several systems have been proposed for road safety and traffic reduction, however none of them provide communication between the police and the motorists. Our proposed system also has the advantage of using either Wi-Fi or 4G signals depending on

the flying range which will avoid range limitation. Finally our system (Fig. 3) has the ability to record the mission information in addition to the mission's video and pictures which is a feature non-existing in other similar systems.

S15.2 08:22 Undergraduates' Perceptions of Software Design

[Raghda M. Zahran](#)

This research investigates undergraduates' perceptions of software design. This is a pilot mini case study that follows qualitative approach and employs literature review, contextual analysis, semi-structured interviews, and observations to allow direct, in-depth exploration. The sample includes undergraduates, who completed a mandatory course entitled System Analysis and Design (SAD). They undertook the course during their second year in the Bachelor of Information and Communication Technology (BICT) degree at Bahrain Polytechnic. Bahrain Polytechnic is a higher education institute that follows hands-on teaching and learning strategies using problem-based and project-based teaching and learning strategies. This study attempts to answer a central question as to how do undergraduates perceive learning software design. There is a broad range of issues affecting learning software design in an academic context. The reviewed literature shows little evidence of research on perceptions of learning software design in the Middle East. The results revealed inescapable facts. Although perceived as an active mental processing activity, undergraduates expressed their motivation and interest in software design. Surprisingly, their design decisions are influenced by extrinsic input and not by their logical and mental judgement.

S15.3 08:45 TinyDuino-based Device Tracking and Mobile Monitoring System

[Sarah Abualsaud](#), [Rayan AlShubbar](#), [Wala'a AlHamal](#), [Sahar AlSadah](#) and [Abul Bashar](#)

It is very difficult to keep track of our belongings when our focus is constantly being distracted by the daily life necessities. As technology evolved, attention towards our valuable non-electronic belongings has become the victim of oblivion. One could realize they lost their belongings after a period of time, which makes it harder to remember where they last left it. This was the motivation of creating a tracking system that can be controlled by the ubiquitous mobile phone. With a mobile application in hand, the user can locate, get audio alerts, and acquire information from the tracking device directly. In order to achieve the objective of locating and tracking lost items, a TinyDuino processor was used in conjunction with an Android mobile application. Moreover, a Raspberry Pi processor was utilized as a gateway between the TinyDuino and the Internet, so that the TinyDuino was able to access/update the database of monitored devices through the Raspberry Pi. The database utilized in this project was the Firebase cloud database, which was connected to both the processors and the mobile Android application. The results of the implemented tracking system were promising and the setup was able to reduce the time spent looking for a misplaced item, in addition to easing the search and update process. The novelty of this implementation is that it is based on open source technologies, small-sized, faster, accurate and economical. One possible application of this small sized tracker is that it can be attached to personal belongings, which then can be monitored by a mobile application controlled by the user.

S15.4 09:07 Smart Wheel Chair

[Maali Al-Ansari](#), [Fajet Al-Shammari](#) and [Mohammed ElAbd](#)

As thousands of accidents occur each day, the number of disabled people grows more and more. They became destitute of using their hands, legs or sometimes both. As a result, robots were utilized as solutions in order to overcome the deficiencies that the disabled have. There are different types of wheelchairs available in the market, in this abstract we propose the development of a wheelchair designed for disabled children. The user can control the wheel chair using four different methods it by head movement at first. Then we came up with the smart wheelchair that can be moved with four types of movement; by head, by mobile, by joystick and by voice.

Wednesday, May 10, 09:30 - 09:45

D2B1: Day-2 Break One



Wednesday, May 10, 09:45 - 10:30

KN-2: KEYNOTE SPEAKER - 2



Power system automation & management

Yusuf Zafer Korkmaz, Regional Technical Manager at SEL

Rooms: AL DANA 2, AL DANA 3

Chair: Ibrahim Elamin

Wednesday, May 10, 10:30 - 10:45

D2B2: Day-2 Break Two





Room: AL DANA 1

Chair: Mohammad A. Abido

S16.1 10:45 Assessment of Isolated and Non-Isolated DC-DC Converters for Medium-Voltage PV Applications

[Abdulrahman Alassi](#), [Ayat Al-Aswad](#), [Adel Gastli](#), [Lazhar Ben-Brahim](#) and [Ahmed Massoud](#)

Photovoltaic (PV) panels' technology is one of the most widely spread tools to harness solar energy. PV panels require power conditioning and conversion stage that vary with the given application. This paper focuses on the conversion of a 22kW PV array output from low-voltage to medium-voltage level (400V to 7kV). This high voltage conversion ratio is difficult to achieve using conventional single-stage DC-DC converters. Thus, different alternatives are proposed and compared here, namely, the Parallel-Input Series-Output (PISO) connection of two different stages using both isolated (full-bridge) and non-isolated DC-DC converters. The converters are compared on the basis of efficiency, footprint, components rating and reliability. Thus, the isolated DC-DC converter system efficiency was estimated at 97%, compared to 93% for the non-isolated system, keeping into account the variations in terms of the filtering capacitor requirements to maintain a constant minimal voltage ripple at the output which is in favor of the non-isolated systems. Finally, the perturb and observe maximum power point tracking technique is applied to the non-isolated system to verify PISO systems' ability of maximum PV power extraction, where similar techniques can be also applied to the isolated system.

S16.2 11:02 Sun Chaser Robot

[Manal Al-Enezi](#), [Esraa Al-Qattan](#) and [Seyed Ebrahim Esmaeili](#)

Solar energy is the process of harnessing the sun's power by solar panels to generate electricity. However, there is a probability that large amount of energy is being lost due to the sun's movement during the day. To solve this problem, we decided to build a system that can help to reduce the wasted solar energy, increases the produced efficiency, and encourage people to use solar energy as a main source of energy. Sun Chaser Robot is a tracker system that can track the position or the direction of the sun. The idea of the system is based on the fact that when an object faced the sun directly, it receives more heat. The system consists of the following components: Four LDR sensors, two servo motors, solar panels, Voltage sensor, Current sensor, light sensor, advanced servo controller, interface kit, charger, a dual relay, and rechargeable batteries. The system works as following: first it detects which angle has the maximum sunlight. Then, the system gives order to the servo motors to move the solar panels and direct them to that angle. After directing the Solar Panels to the sun, the system use to extracted sun's power to charge batteries that can be used for different applications. The system is able to charge more than one battery automatically by using a relay to switch charging from one battery to the other. In addition, a load is connected to the system in a way that can help to save on electricity. The technique is to use a light sensor and connect it with the load in a relay to switch on the load during the day time and switch off the load during the night. The goal of Sun Chaser Robot is to take full advantage of the solar energy by moving the solar panels according to the movement of the sun instead of being fixed in one direction. As engineers, we want to reduce pollution and provide clean air and at the same time have a source of long lasting energy. What distinguishes Sun Chaser robot is that if it put in any environment, it can automatically direct itself toward the direction of the sun. It do not need any help from any resources to do it job. A GUI built for the system that can show a graph of extracted Current and voltage over time and to control the system manually which makes it user friendly system. Sun Chaser Robot project can serve many countries with a clean and affordable source of energy. Moreover, this project can be implemented anywhere as long as it senses the sunlight. As an environmental impact, Sun Chaser Robot can help to provide energy to countries with clean air and healthy environment.

S16.3 11:20 Optimal Duty Cycle Modeling for Maximum Power Point Tracking of Photovoltaic System

[Ahmad Al-Subhi](#) and [Ibrahim Elamin](#)

Maximum Power Point Tracking (MPPT) concept is an important topic in the control and optimization of the power obtained from the Photovoltaic system (PV). It helps ensuring harvesting the maximum possible power at any change in irradiance and temperature values. As irradiance and temperature change with time, the power extracted from the PV also changes. Efficient MPPT control is thus necessary to keep the output power at its maximum value irrespective of any sudden change in such environmental conditions. This paper presents a mathematical-based MPPT control based on the optimization of the converter duty cycle values. The main idea is to build a mathematical model relating the optimal duty cycle with the irradiance and temperature. The model is built based on simulations of a grid-connected PV system incorporated with the Incremental Conductance (INC) MPPT algorithm. The simulations are carried out according to varying irradiance and temperature values while monitoring and recording the corresponding optimal duty cycle achieved by the INC algorithm. Using EUREQA software, a mathematical model relating the optimal duty cycle as a function of irradiance and temperature values has been built. The results from the proposed model are compared with the simulated results using INC method. The maximum recorded error is less than 0.76 %.

S16.4 11:37 Extraction of Unknown Parameters of PV Modules

[Ahmed Hussein](#)

All PV module's datasheets provide I-V curve as well as the values of selected parameters at Standard Test Conditions (STC). Other parameters such as series resistance (R_s), shunt resistance (R_{sh}), photocurrent (I_{ph}), diode reverse-saturation current (I_0) and ideality factor (a) are not measurable. Therefore, they are not provided by manufacturers. These parameters are unique for the electrical characterization of any PV module. Based on the parameters I_{ph} , I_0 , R_s , and R_{sh} , four equations are formed and used to obtain an exact, closed-form expression for R_s that solved numerically while increasing the value of a in small increments. To validate the proposed approach, a set of I-V curves are obtained at different values of a , and compared to the reference curve given by the manufacturer, then the parameters that corresponds to the curve that fits closest are taken. This process is done for BP SX150 and MSX60 solar modules. The proposed algorithm is compared with alternative methods available in the literature. The superiority of the proposed algorithm is verified.

S16.5 11:55 Techno Economical Feasibility Analysis of Solar Powered RO Desalination in Sultanate of Oman

[Arun Gopinath](#) and [Mohammed Washahi](#)

Desalination is of prime importance in middle east countries as its water requirement is increasing day by day. Breakdown in the cost of the solar technologies and the improvements in the technologies of desalination pave the way for a feasibility analysis of solar powered desalination in Sultanate of Oman. Among the desalination processes, Reverse Osmosis (RO) with Pressure exchange membrane found to be less energy consuming and more suitable for solar powered desalination. Emission analysis is done and tonnes of carbon dioxide emission saved on each solar powered desalination projects are calculated. Financial feasibility of the solar PV powered and concentrated solar powered projects are analyzed with different cases in RET screen software and found that the concentrated solar power projects will be a viable option for RO desalination in middle east countries like Oman if carbon credit scheme is implemented and proper energy storage devices are incorporated to the solar thermal concentrators for its power generation capability.

S16.6 12:12 Performance of Smart PV Modules Under Non-Uniform Solar Irradiance

[Mohamed Ahmed Azab](#)

The objective of this paper is to study and help understanding the performance of smart PV modules when exposed to non-uniform illumination. A PV string composed of five smart modules connected in series are employed to conduct the study. Each smart module is composed of a single PV incorporated with its own perturb and observe MPPT and a power conditioner as distributed dc power optimizer. The performance of smart modules PV string is compared with that of conventional single MPPT system at the same operating conditions. According to the obtained results, the smart PVs modules have superior performance in terms of: elimination of local maximum power points that exist in conventional PV system (due to partial shading) and extracting higher power from the entire PV string with nil domino effect. Owing to the results, the performance degradation in any non-uniformly illuminated module is kept localized and does not deteriorate the performance of other modules. While in the conventional PV system of a single MPPT the poorest performing module drags down the performance of the entire array resulting in lower power capability apart from the single MPPT can succeed to work at GMPP as the GMPP is lower than the power that the array can produce. Besides to that, the conventional PV system is subjected to trap in one of local maximum power points deteriorating the overall performance and reducing the output power capability.



S17: Big Data Management

Room: AL DANA 2

Chair: James Egan

S17.1 10:45 Efficient Fuzzy Techniques for Medical Data Clustering

[Maryam A. Abdullah](#), [Fawaz Al-Anzi](#) and [Salah Al-Sharhan](#)

Researchers in data mining field aims to design efficient and scalable algorithms when clustering high dimensional data. Nowadays, data have become more massive and complex resulting in big data and high dimension datasets that require efficient methods to analyze them. For that reason, as the data become larger and more diverse, maintaining cluster quality and speed is necessary when adapting an existing algorithms. Various clustering methods can deal with low dimension datasets yet as the dimensionality increases these methods tend to fail. There are number of fuzzy clustering techniques that are available for clustering high dimension data efficiently. Fuzzy C-mean, FCM, and its extension Gustafson Kessel, GK, are two examples for clustering data of high dimensions. In this paper, FCM and GK were used for medical data clustering in particular, Wisconsin Breast Cancer, WBC, dataset obtained from UCI repository were used in the experiments. The results of the experiments showed a high performance in accuracy for both FCM and GK. Moreover, the results showed a consistency in the performance when varying the data sizes which indicates a high learning capability and high reliability of the employed algorithms.

S17.2 11:02 Acquisition Budget Allocation Using Decision Support System

[Wasan Awad](#) and [Salma Mohamed Saad Abouamod](#)

This research is conducted to study the problem of budget allocation for acquisitions in academic libraries, especially for book collections and how to solve this problem using decision support systems. Several attributes that affect the decision making process have been investigated through the literature review and an interview conducted with the director of the Applied Science University's library which is the subject of this study. After identifying the problem and the attributes affecting the decision making process, a decision support system is proposed. A classification model was used to classify library departments under different management budget allocation classes, using a decision tree classifier.

S17.3 11:20 Tebyan: Interactive Spelling Correction Application for Quranic Verse

[Anhar AlMutlag](#)

Spelling errors when writing Quranic verses require special handling in terms of detection and correction. This paper aims to demonstrate the significance of the character-level errors correction approach for written Quranic text. It concentrates mainly on discussing the Algorithm and the implementation of the system.

S17.4 11:37 Visualization as a mean of Big Data Management: Using Qatar's Electricity Consumption Data

[Engy Soliman](#) and [Noora H Fetais](#)

Visualization as a mean of big data management is the new century revolution. Managing data became a great challenge today, as the amount of raw data size is increasing rapidly. For an area, such as electricity consumption, a new data value is received every minute. This creates the well-known five challenges for any data analyst trying to deliver a visual representation of such huge raw data. Adding to that, a data analyst should understand the four dimensions of the given data; Volume, variety, velocity and veracity. The integration of big data and visualization is the key for addressing real market significant shift in enterprise technology. This paper aim is to give an insight of how managing Qatar electricity consumption raw data provided by electricity companies properly can give a much better visualization solution so analysts and top-level managers can understand how to act towards their resources and plan.

S17.5 11:55 Breaking through Opacity: A Context-Aware Data-Driven Conceptual Design for a Predictive Anti Money Laundering System

[Oussama H. Hamid](#)

We studied the problem of money laundering. Current anti money laundering artificial systems solve this problem by tracking transactions. However, several inherent aspects impede a full uncovering of the underlying process. Most arguably, the abstract nature of transactions and the 'legitimacy dilemma'. We circumvent these issues by proposing a context-aware and data-driven software/hardware system that tracks physical money, rather than abstract transactions. The proposed system identifies banknotes by their unique serial numbers, allowing a meta data component that accumulates further contextual information to better detect unusual patterns of transactional behaviours. In addition, using 'social network analysis', the system can be used to predict future money laundering processes.

S17.6 12:12 Word Retrieval System for Ancient Arabic Manuscripts

[Somaya Ali Al-maadeed](#), [Fatema Issawi](#) and [Ahmed Bouridane](#)

Many museums and libraries that have archives containing historical Arabic manuscripts are beginning to digitize their collections to enable researchers and the general public access to them. Most of these collections are available in digital format with no annotation, limiting researchers to fully utilize them efficiently. This paper reports on a system we developed for word retrieval in Historical Arabic Handwritten manuscripts. Unlike other systems, this system does not use Optical Character Recognition or word spotting techniques. The system performs three different steps: segmentation, annotation, and word search. We designed a new interface to read and query Historical Arabic Handwritten manuscripts using text queries. The queried word is then highlighted in the page image of the manuscript.



S18: Power Quality

Room: AL DANA 3

Chair: S Ali Al-Mawsawi

S18.1 10:45 Dual Unified Power Quality Conditioner Based on Open-End Winding Transformers and Series Converters for Grid-Connected PV Systems

[Abdullrahman Al-Shamma'a](#) and [Khaled Addoweesh](#)

A new scheme for a grid connected photovoltaic system capable of enhancing power quality of a distribution system is presented in this paper. The proposed system is consisted of a dual unified power quality conditioner (D-UPQC) based on open-end winding (OEW) transformer and series connected converters. The D-UPQC is consisted of four series converters connected to the grid via two three-phase transformer with open-end winding on the converters side. The proposed scheme uses two PV arrays, each array feeds a separate dc-link of a two three phase voltage source converter (VSC). The structure, control and capability of the proposed configuration are discussed in this paper. The effectiveness of the proposed configuration has been verified through simulation studies using Simulink/Matlab.

S18.2 11:02 Reducing transformer oil leakages in projects

[Hani Hajjar](#) and [Abdullrahman Alsomali](#)

This paper discusses a study conducted on historical transformer oil leakages reported during projects at a major Oil Company. The Company's executed projects experienced numerous delays as result of transformer oil leakages as the project stakeholders spent longer time to restore and fix affected transformers. This impacted planned commission dates for the Company's projects. The study involved review of all data reported over a 10-year period relating to transformer deficiencies during the electrical equipment manufacturing phase of many projects. The scope of study was further narrowed down to focus on data and deficiencies related to oil leakages. All contributing factors to this problem were investigated and analyzed including the effectiveness of Company's Inspection and testing requirements during the Manufacturing Stage of the transformers. The study revealed some identified risk inspection areas that needs more attention during the In-process inspection and would lead to oil leakages if not properly verified and successfully inspected. Examples of risk areas include the visual inspection of welds, and liquid penetrant testing prior to leak test.

S18.3 11:20 Inclusion of Cold Load Pickup Events in Reliability Calculation for Residential Power Distribution Systems

[Abdullah Abdullrahman Al-Nujaimi](#) and [Mohammad AlMuhaini](#)

Residential power distribution systems are subjected to cold load pickup failures after extended outages due to the presence of high number of thermostatically-controlled loads. This event can cause protection devices activation and consequently a restoration failure. Also, this event can cause electrical equipment such as transformer to be overloaded. The cold load pickup is usually not included in the reliability evaluation of power systems. This paper presents a method to model the residential load points with high concentration of thermostatic loads. This model depends on the ambient temperature and stochastic customer lifestyle as Monte Carlo sampling method used to randomly obtained the operation status of every device in every hour. This model, along with the outage duration effect, was then used to calculate the load pickup occurrence rate in residential loads and the effect of such an event in the reliability calculation of power distribution system. A simple test radial system was used to compute the system and load reliability indices with and without consideration of the cold load pickup events. Sequential Monte Carlo simulation was used in this reliability analysis.

S18.4 11:37 Switchless Power Decoupling and Switchless Leakage Current Elimination in Grid-Tied Inverters

[Ahmad Khan](#), [Mahdi Houchati](#), [Jamil Ur-rehman](#), [Lazhar Ben-Brahim](#) and [Adel Gastli](#)

This paper presents a grid-tied single-phase transformerless inverter that eliminates simultaneously the leakage current issue and the double grid frequency power pulsation without additional active circuitry. The control scheme views the full bridge inverter as two buck converters that are connected differentially with the utility grid. Thus, controlling the two converters duty-cycle assures that the double frequency power pulsation is decoupled at the AC side of the inverter and the current injected to the grid is sinusoidal with unity power factor. In other words, this configuration would improve the system reliability since the power decoupling allows the usage of film capacitors at the DC link and the elimination of the leakage current improves the system safety.

S18.5 11:55 Performance Assessment of Three Selective Harmonic Elimination Techniques for Gird-Connected Three-Phase Cascaded H-Bridge Multilevel Converters

[Mina Gerges Fakhry](#), [Ahmed Massoud](#) and [Shehab Ahmed](#)

The performance of a high power grid-connected three-phase Cascaded H-Bridge Multilevel Inverter (CHB-MLI) operating with three different Selective Harmonic Elimination (SHE) techniques, complying with the low switching frequency operation limitation in high power applications, is assessed in this paper. In addition to the conventional SHE (C-SHE) technique, Quasi seven-level SHE (Q-SHE) and Asymmetrical seven-level SHE (A-SHE) approaches are considered. Q-SHE and A-SHE approaches are based on eliminating the 5th and 7th order harmonics (a higher number of low order harmonics can be considered), irrelevant of the number of employed levels and provided that the number of levels allows for the required harmonic elimination. Compared with the C-SHE approach, the Q-SHE and A-SHE require less computational burden in solving the required equation groups, especially when a high number of levels and/or multiple switching angles for each voltage level are needed. A 5MW grid-connected three-phase CHB-MLI (17-level) controlled in the synchronous rotating reference frame has been employed to validate the presented approach.

S18.6 12:12 Minimization of Harmonics Penetration into Transmission and Distribution Systems by Utilizing Tertiary Winding of the Transformer

[Ammar Elagab](#) and [Ibrahim Elamin](#)

The transmission and distribution systems are a part and parcel from each other. Thus, the harmonics that produced by the loads in the residential homes has a considerable amount of total harmonics in the transmission systems. The harmonics must be prevented from the propagation into the transmission system. One of the most effective and economical methods that can be used for this purpose is by utilizing the tertiary winding of the substation transformer by creating a tuned low impedance path for the current harmonics. This proposed design has capability to absorb two zero-sequence harmonics and three non-zero-sequence harmonics simultaneously. In this paper a full design of tertiary filter scheme has been developed. SIMULINK-MATLAB has been used to demonstrate and evaluate the performance of this new type of filter scheme.

S19: Embedded Systems

Room: AL DANA 4

Chair: Madina Hamiane

S19.1 10:45 A Remotely Piloted Aerial System for a Faster Processing of Traffic Collisions

[Hajer Sameh](#), [Kulthoom Aiman](#) and [Dilek Dustegor](#)

This paper presents the motivation, design, implementation, and testing of a remotely piloted aerial system, designed to facilitate police officers processing traffic collisions. A drone remotely controlled by the police officer can reach faster the accident scene and act as the police officer's eye, ear, and voice in the sky. A complete system prototype has been constructed and tested to validate the proposed system. The results show that the system performance is promising in terms of system functionality, safety, and cost.

S19.2 11:06 Designing Robust Multi-Regulator Power Management Architectures for Automotive System-on-Chips

[Gautham Shivender Harinarayan](#), [Manmohan Rana](#) and [Akshat Gupta](#)

This paper describes the design, pre-Silicon mixed-mode verification and post-Silicon testing of an architecture for a Power Management Controller (PMC) for automotive applications in 40nm CMOS. This PMC supports multiple-regulators and multiple power-saving modes like Standby, Low Power, Reduced Clocking mode, etc. This PMC is also reconfigurable and supports both internal and external regulation for its highest power consuming domain. This is to provide a viable solution to several different customers with different needs, but while ensuring minimal product development costs. In the external regulation mode, one domain is powered by an External Regulator/PMIC, while two other domains are internally regulated. Similar to how supply monitoring circuits are crucial for the monitoring supplies within a SOC, the External Regulator must provide a supply stability indicator to the SOC. To complicate the situation further, the External Regulator may need to be shut off based on mode transitions being performed within the SOC. Thus there is a need to create a handshake mechanism between the SOC and the external regulator. We discuss a systematic approach to defining a complex PMC architecture and also enabling this handshake mechanism between a multi-mode multi-regulator on-chip PMC with an external power regulator. This PMC architecture is used as part of a 32-bit MCU fabricated in 40nm CMOS. Silicon results are provided.

S19.3 11:27 Fault Detection of an Automobile Cylinder Head Using Mechanical Vibrations and Artificial Intelligence

[Morteza Mohammadzaheri](#), [Amirhossein Amouzadeh](#), [Ehsan Jamshidi](#), [Mohammad reza Permoon](#), [Mojataba Doustmohammadi](#) and [Jamaloddin Jamali](#)

This paper proposes a vibration-based fault-diagnosis technique. The algorithm is developed in three major stages, (i) Experiments (or developing a validated FEM and simulations, if experimentation is limited), (ii) Finding a signature for each faulty part based on a single experiment, which is called modified fault signature in short and is an array of 16 numbers. At this stage, Fourier transform and statistical analysis are employed. (iii) Developing a mathematical model/algorithm, an artificial neural network, which receives the signature of the faulty part and returns the location of the fault. After completion of the algorithm, the proposed method does not need modal analysis and only requires a single inexpensive test on the part which could take as short as one second. The proposed technique was tried on an automobile head cylinder. The presented accuracy is noteworthy, and the whole data used in algorithm development and fault diagnosis were collected from fairly low frequency range (below 1200 Hz). This initial assessment of the method was carried out to find the locations of a fault on a line in head cylinder, but it is shown that the technique can be extended to higher dimensions.

S19.4 11:48 License Plate Number Extraction using Mat Lab

[Hashika Liyanage](#) and [Vrajesh Maheta](#)

With globalization and the increase of automobiles, parking at institutions like airports, residency complexes, colleges and hospitals becomes more and more difficult and hazardous. Hence there is a

need of a unique parking system to maximize security while making it convenient to the consumers and owners of the institutions at a lower cost. The License Plate Number Extraction using MatLab is a process which identifies and extracts the vehicle's license plate number from a picture captured by the camera, following which other needs could be deduced such as the duration for which the vehicle parked and the applicable charges or identification of registered user and accordingly inform the specified parking area. This is based on the fact that every car has its unique identity based on the plate number.

S19.5 12:09 Temperature Control of a Greenhouse System using Embedded Systems Technology

[Christakis Papageorgiou](#) and [Mohamed Almoalem](#)

This paper presents the application of an automated temperature control system for a prototype greenhouse system using commercial embedded systems technology. The prototype greenhouse system was developed and instrumented with appropriate temperature sensors to measure the temperature of the air in the growing area, the temperature of the air from the outlet of the cooling actuator and the temperature of the air from the outlet of the heating actuator. These measurements are provided to a cascaded PID control algorithm which is implemented on a commercial embedded system and manipulates various actuators like a heating and cooling actuator and their respective fans in order to achieve the desired set-points, as specified by the user through a Human-Machine Interface implemented in LabView software. All major subsystems of the greenhouse prototype have been modeled in Matlab/Simulink using a mixture of nonlinear differential equations and gain-scheduled transfer functions and the simulation model has been validated against experimental data, showing good agreement between the simulation and the experimental data. The purpose of this work is to enhance research related to the accurate environmental control of greenhouse systems in order to minimize energy and water consumption and to develop a robust educational platform for teaching control system design, analysis, instrumentation and embedded systems development at the Engineering School of Bahrain Polytechnic.



S20: Antennas & Propagation - 2

Room: AL MURJAN 1

Chair: Mohammed Bait-Suwailam

S20.1 10:45 Quad Band SRR loaded Square Slot Antenna

[Princy Paul](#), [Krishnamoorthy Kandasamy](#) and [Mohammad S. Sharawi](#)

This paper proposes a Split Ring Resonator (SRR) loaded quad band microstrip slot antenna designed to operate at 2.42 GHz, 4.33 GHz, 8.46 GHz and 10.9 GHz. The additional resonant bands are generated by loading the square slot antenna with two pairs of SRR structures on either side of the feed line. The bands centered at 8.46 GHz and 10.9 GHz are found to exhibit wideband and circular polarization properties respectively. The resonance band at 8.46 GHz provides a wide bandwidth of 2.43 GHz. One pair of the loaded SRR structure consists of two spiral shaped connected SRR's. The excitation of these structures gives rise to a circularly polarized band at 10.9 GHz with 3-dB axial ratio bandwidth of 390 MHz. Maximum gains of 3.82 dB, 3.95 dB, 7.5 dB and 4.2 dB are obtained at the four resonant frequencies, respectively. A minimum bandwidth of 270MHz is observed for all the bands of operation.

S20.2 11:06 Simulation of Five Microstrip Array Antennas: Gain and Power Efficiency

[Rudy Yuwono](#) and [Okny Wijaya](#)

Advancement of emerging technologies in the telecommunications world lately is wireless communication. Users of wireless technology is directly proportional to the quantity of devices that are used, so that greater energy consumption is required. The efficiency of telecommunication devices become essential nowadays. One of key devices of wireless communication system is antenna. Antenna's function is to transmit and to receive power in wireless communication system so that the power efficiency of the antenna become essential. Power efficiency of the antenna aims to reduce power loss. Low losses make antenna work optimally in emitting and receiving waves. The antenna's range can also be optimized because of greater power emitted, thus reducing the need of transceiver device which consumes a lot of power. Author considered using microstrip antenna because it is thin and small, is relatively simple to make, has a light weight and is easy to fabricate. The number of array patch are realized to find the different gain value. Different gain value can be used as references the effect of gain to the antenna power efficiency. In order to have accurate results, author considered to make five antennas and the frequency is set in 2.4 GHz. The result was that the greater the gain value of an antenna, the higher its power efficiency.

S20.3 11:27 Polarization Engineered Enhancement Mode High Breakdown Voltage GaN CAVET

[Sajad A. Loan](#), [Sumit Verma](#), [Abdullah Alharbi](#) and [Asim Murshid](#)

In this work we propose and simulate a polarization engineered enhancement mode current aperture vertical electron transistor (P-CAVET). The novelty of the proposed structure lies in using polarization engineering to achieve enhancement mode operation. The current blocking layer (CBL) of proposed P-CAVET is hybrid in nature and consist of an oxide part and AlN part. Aluminum Nitride (AlN) portion of CBL is used to lift the triangular well existing at AlGaIn/GaN interface above the fermi level, thus achieving enhancement mode operation. The CBL provide better suppression of vertical leakage which improves the breakdown voltage. The proposed structure does not need any p-type doping either for achieving enhancement mode operation or for forming current blocking layer. A 2-D calibrated simulation study revealed that the device exhibits a threshold voltage of 3.1V and breakdown voltage improvement of 100% over conventional CAVET.

S20.4 11:48 Capacity of Gaussian MIMO Channel for Network Intra-Chip RF Interconnect

[Muhammad Sana Ullah](#), [Abdullah G. Alharbi](#) and [Masud H. Chowdhury](#)

Continuous increase of integration density, operating frequency, thermal stress and other complexities are pushing the conventional metal interconnects based IC technology to its material and physical limits. Radical alternative like on-chip radio frequency (RF) and wireless communication is being explored to replace the hard-wired metal interconnect. Currently for inter-chip and intra-chip RF/wireless communication various single-input- single-output (SISO) schemes like BPSK, QPSK, MSK and GMSK are being investigated. This paper presents a multiple input-multiple output (MIMO) system for on-chip RF/wireless communication to significantly enhance system performance compared to the conventional systems. We propose to utilize a Gaussian channel environment for the MIMO system. This paper evaluates the capacity (bit/s/Hz) of the wireless Gaussian MIMO channel system and compares it with the SISO channel system currently under investigation.

S20.5 12:09 Analysis of graphene and graphene-copper based hybrid patch antenna for terahertz range wireless communication

[Md Hosne Mobarok Shamim](#) and [Sharif Iqbal Miru Sheikh](#)

In this paper, the performance of a graphene and graphene-copper hybrid patch antenna has been analyzed at terahertz range. The conductivity of graphene has been studied using Kubo's formula. Return loss, radiation pattern and gain of these antennas have been shown and analyzed. The graphene based antenna resonates at 4.5 THz whereas the hybrid antenna gives us a wide band of transmission from 1.25 THz to 8 THz with a directivity of more than 6 dB. Polyimide of $\epsilon = 3.5$ has been used as the substrate with a thickness of 2.5 μm . For terahertz communication a graphene-copper hybrid antenna has been proposed especially for wide-band applications.

Wednesday, May 10, 12:30 - 13:30

D2LP: Day-2 Lunch & Prayer



Rooms: Exhibition Hall, Mosque

Wednesday, May 10, 13:30 - 15:15

S21: Power System Monitoring & Control



Room: AL DANA 2

Chair: Mohammad AlMuhaini

S21.1 13:30 Designing Lead-Lag PSS Employing Backtracking Search Algorithm to Improve Power System Damping

[Md Shafiullah](#), [Md Juel Rana](#), [Coelho Leandro dos Santos](#), [Mohammad A. Abido](#) and [Ahmad Al-Subhi](#)

The power system is a complex network having highly nonlinear dynamics. Being electrically interconnected power systems are vulnerable to instability due to the disturbances in any one portion of the system. Even low-frequency oscillations (LFOs) originated from small disturbances in any part of the network may cause the outage of the whole system. Power System Stabilizer (PSS) with optimal parameter settings is an efficient tool for the suppression of these oscillations. In this paper, a novel approach is proposed to tune lead-lag controller based PSS for a single machine infinite bus (SMIB) network by using backtracking search algorithm (BSA) to suppress LFOs through improvement of power system damping. The efficacy of BSA tuned PSS has been investigated by comparing the simulation results with fixed gain conventional PSS. In addition, the damping ratio and eigenvalues of the same network have been compared with genetic algorithm (GA) based tuned PSS.

S21.2 13:47 Heuristic Placement of PMU in Power System State Estimation

[Ibrahim Habiballah](#) and [Mohammad Sahito](#)

This paper implements heuristic PMU placement (HPP) of Phasor measurement units (PMU's) in power system state estimation. PMU meters are expensive when compared to traditional Supervisory Control and Data Acquisition (SCADA) meters. Due to such economic constraint, power companies placed PMUs in gradual phases in power system. Efficient placement is required in order to allocate the minimum number of PMU's to improve estimation accuracy. Weighted least absolute value using iteratively reweighted least square (LAVIRLS) algorithm is used in this paper. The proposed algorithm is used to verify the efficient PMU placement on IEEE 14 test system.

S21.3 14:05 Optimal PMU Placement for Large Practical Systems: Qatar Grid as an Example

[Mohamed O Mahgoub](#), [Adel Gastli](#) and [Lazhar Ben-Brahim](#)

With power grids being driven near their limits, the demand for better monitoring is in need more than ever. Among the most prominent devices for fulfilling this demand is the Phasor Measurement Unit (PMU) due to its high accuracy and report rate in comparison to conventional measurement devices and even the recent ones such as smart meters. However, PMUs have high installation cost, when combining both the direct and indirect costs. Thus, numerous methods to select the most suitable locations to place the PMUs have been proposed throughout the literature. These methods attempt to tackle the placement problem from different perspectives, such as stability requirements, observability requirements, resistance to contingencies, power oscillation monitoring...etc. Nonetheless, the widely used placement is the optimal PMU placement (OPP) for achieving full system observability. This paper tries to address the OPP for large power systems while including injection measurement, as well as, considering the zero injection bus (ZIB) effect. The selected large power system is the Qatar Grid and the system is solved using Integer Linear Programming (ILP) techniques. The paper does not only focus on the number of PMUs required for full observability, it extends to take into consideration N-1 contingency. It also measures the ratio of conventional measurements to PMUs for the Qatar Grid in order to provide an estimate for this ratio. The paper is concluded with the obtained results as well as recommendations for the practical application of OPP.

S21.4 14:22 Load Frequency Control of a Multi-Area Power System with PV penetration: Fuzzy logic Approach in presence of Time Delay

[Saif Al-Kalbani](#), [Hasan Yousef](#) and [Rashid Said Al-Abri](#)

In this paper, a methodology for load frequency control (LFC) in multi-area power systems is developed based on the intelligent controllers through the fuzzy logic. LFCs for each area are designed

based on availability of frequency deviation of each area and tie-line power deviation between areas. The fuzzy logic controllers are tuned based on each area parameters to achieve acceptable response. The PV penetration was introduced and found tolerable with the fuzzy logic controllers. The proposed controller guarantees stability of the overall closed-loop system in the presence of time delay. Simulation results for a real four-area power system prove the effectiveness of the proposed LFC and also show its effectiveness in the presence of time delay.

S21.5 14:40 Real Time Digital Simulation of Voltage Source Converter Controller for HVDC Application

[Mohammad Alam](#), [Md Juel Rana](#) and [Mohammad A. Abido](#)

Different contingencies in dc grid such as converter outages lead to a current imbalance and consequently give rise to dc link voltage variations. Due to voltage variations in dc link, in particular, dc link voltage exceeding link capacity may lead damage to the link. This paper proposes DC link voltage control technique in two-phase rotating co-ordinate system. The control system is based on a fast inner current control loop controlling the ac current and the outer control loop controlling the dc link voltage. Measured dc link voltage is compared with reference dc voltage and passed through proportional integral (PI) controller which gives reference direct axis current. Real time digital simulation has been performed to validate the proposed controller.

S21.6 14:57 Comparison of artificial neural network and multiple regression for partial discharge sources recognition

[Abdullahi Abubakar Mas'ud](#), [Firdaus Muhammad-Sukki](#), [Ricardo Albarracín](#), [Jorge Alfredo Ardila Rey](#), [Siti Hawa Abu-Bakar](#), [Nur Fadilah Ab Aziz](#), [Nurul Aini Bani](#) and [Mohd Nabil Muhtazaruddin](#)

This paper compares the capabilities of the artificial neural network (ANN) and multiple linear regression (MLR) for recognizing and discriminating partial discharge (PD) defects. Statistical fingerprints obtained from a several PD measurement were applied for training and testing both the ANN and MLR. The result indicates that for both the ANN and MLR trained and tested with the same insulation defect, the ANN has better recognition capability. But, when both ANN and MLR were trained and tested with different PD defects, the MLR is generally more sensitive in discriminating them. In this paper, the results were evaluated for practical PD recognition and it shows that both of them can be used simultaneously for both online and offline PD detection.

S22: OFDM & Cognitive Radio



Room: AL DANA 3

Chair: Azzedine Zerguine

S22.1 13:30 A Weighted Cooperative Spectrum Sensing Algorithm in Cognitive Networks

[Mohamed Deriche](#)

In this paper, a novel approach is proposed for a weighted cooperative spectrum sensing (WCSS) in cognitive radio networks (CRNs) aiming to maximize the probability of detection under a given probability of false alarm. In CRNs, Cooperative Spectrum Sensing (CSS) scheme is used to get over the problem of hidden terminal, fading and shadowing. The proposed algorithm can be applied for single and double thresholds energy detector. Our goal is to have an efficient WCSS with less complexity and high performance. The existing works showed that finding the optimal weights for probability of detection maximization is a difficult problem. Therefore, we propose a closed form suboptimal solution using the generalized eigenvalue that outperform some of the existing works in terms of performance and complexity. The proposed approach is compared to particle swarm optimization (PSO), equal gain combining (EGC), modified deflection coefficient (MDC) in terms of complexity and performance. Our results show that the proposed approach outperforms all these methods especially when the users receive different signal to noise ratio (SNR).

S22.2 13:47 UHF Spectrum Occupancy Measurements in Sharjah - UAE

[Firas Kiftaro](#), [Mohamed El-Tarhuni](#) and [Khaled Assaleh](#)

In this paper, we present the results of a spectrum measurement study conducted at the American University of Sharjah in United Arab Emirates covering the UHF band from 300 MHz to 3000 MHz. A Gaussian mixture model is used to estimate the noise parameters and set the threshold for data analysis using three different schemes; namely m-dB above the noise floor, outlier based, and constant false alarm probability. It is shown that the UHF band has an average occupancy varying from 10% to 35%. This indicated the great potential for using some of the bands (TV band for instance) for cognitive radio applications and future 5G systems.

S22.3 14:05 OFDM with Generalized Index Shift Keying

[Mohammad Umair Yaqub](#) and [Samir Al-Ghadhban](#)

Recently, a family of transmission techniques known as Index Modulation (IM) have been proposed. IM schemes such as OFDM with index modulation (OFDM-IM) provide better performance than uncoded OFDM especially at low SNR and in highly mobile environments. Furthermore, these schemes have found applications in modern day technologies such as large scale Multiple Input Multiple Output (MIMO) and Visible Light Communications (VLC). In this paper, a novel trans-receive scheme called OFDM with Generalized Index Shift Keying (OFDM-GISK) is designed and analyzed. The results show that the proposed OFDM-GISK scheme is better than OFDM-IM. Furthermore, it is shown analytically and by simulations that the error performance of OFDM-GISK falls more sharply compared to OFDM-IM at a cost of spectral efficiency (SE).

S22.4 14:22 OFDM Based Robust Digital Image Watermarking Resistant to Multipath Spatial Shifts

[Suja Kalarikkal Pulayikodi](#), [Naser Tarhuni](#), [Afaq Ahmad](#) and [Fahad Bait-Shiginah](#)

A digital watermark is a visible or invisible pattern embedded in a digital image which can be used for copyright protection, authentication, broadcast monitoring, telemedicine and many more. This paper describes how an efficient CDMA based spread spectrum technique can be combined with the most prominent spectrum efficient OFDM technology to formulate a robust watermarking algorithm which is suitable for image distortions due to time delays and spatial shift that may occur during the transmission of watermarked images. A detailed simulation of embedding and decoding algorithm was performed. Simulation results reveal that the algorithm is computationally efficient, robust and is well suited for wireless multipath fading channel. The algorithm was tested against a number of the possible noises in the wireless channels and various geometric and signal processing operations. The proposed algorithm is proved to be robust enough to extract a good quality

watermark compared to well-known techniques.

S22.5 14:40 Classification of Single Carrier Digital Modulations in presence of receiver parameter uncertainties

[Hazza Alharbi](#), [Mobien Shoaib](#), [Saleh A Alshebeili](#) and [Fathi Elsayed](#)

Automatic Modulation classification (AMC) is the process of identifying modulation type of a detected signal without prior information. AMC is critical for Signal Intelligence (SIGINT) and communication jamming. Many AMC algorithms exist in the literature targeting different set of modulations, known modulation parameters, and noise distributions. However, only a hand full investigate the effect of receiver parameter ambiguity on the AMC performance. We present an AMC algorithm that classifies 10 single carrier digital modulations in presence of uncertainties in parameters, such as, carrier frequency offset, pulse shaping, timing offset, and symbol rate. The proposed algorithm is based on Fourier Transformation and constellation diagram. A mix of Support Vector Machines (SVMs) and decision-tree is used as the classifier. A computer simulation is used to show the results of proposed AMC algorithm.

S22.6 14:57 Radio Frequency Near Communication (RFNC) Technology:An Integrated RFID-NFC System for Objects' localization

[Mohamed Mostafa A. Azim](#) and [Sakhaa Al-Sadie](#)

The recent advancements in the Internet of Things (IoT) has promoted for finding or localizing objects with different technologies. Radio-frequency identification (RFID) technology has been widely used in indoor localization applications due to its ease of deployment and low cost. With passive RFID tags, an object can be localized within less than 10cm. However, passive RFID localization systems cannot provide easy localization due to its limited reading range. Using Active RFID tags will provide longer localization range to a lost object. However, while pairing the mobile phone with the tag, the phone may capture any tag in its reading range; thus, the tag pairing process may be done improperly. Alternatively, Near Field Communication (NFC) has been proposed as an extension to the RFID technology in which the reader must be within close proximity to the NFC tag for achieving the reading task. With the deployment of NFC, several mobile phone applications have been developed employing NFC in payments and contactless systems. However, due to the short localization range of NFC, it becomes extremely difficult to find a lost item. Currently, RFID and NFC have been employed in object localization systems separately. Alternatively, in this paper we propose Radio Frequency Near Communication (RFNC) is an integrated RFID-NFC system for localization of lost item. Our experiments integrating RFID and NFC technologies confirm that NFC technology can be a complement to the RFID technology rather than an alternative.



S23: Invited Speaker -2

Recent Advancements in MIMO Antenna System Design for 4G & 5G Applications
Prof. M Sharawi (KSA)

Room: AL DANA 1

Chair: Mohab A. Mangoud



S24: Power Electronics-Micro grids

Room: AL DANA 4

Chair: Mahmoud Masoud

S24.1 13:30 DC- DC Boost Converter Controller Design for PV Applications

[Myada Shadoul](#), [Rashid Said Al-Abri](#), [Hasan Yousef](#) and [Mahmoud Masoud](#)

Modeling and simulation are important parts in analysis and design of electrical circuits. Nowadays, with the revolution in energy and penetration of renewable energy resources to the power grid, the power converters play vital role in power systems. The mathematical models of these converters are nonlinear due to switching behavior. In this paper, we consider controller design for boost converters. The DC-DC boost converter is modeled using small signal analysis where the duty cycle and the voltage are the control and output variables respectively. A controller for the linearized model of the boost converter is designed to achieve constant DC output voltage irrespective of load variation. The transfer function of the converter is derived and employed to design a PI controller using the root locus technique. The quality of the designed controller is tested in the MATLAB/SIMULINK environment. Simulation results of the closed-loop system are obtained for source and load disturbances. To validate the proposed control methodology, the designed controller is tested on the actual nonlinear converter using SIMULINK. The simulation results show accepted performance of the converter in the presence of disturbance. The contribution of the paper can be summarized as follows: 1)Present a general approach to derive DC-DC Boost converter transfer function. 2)Present a PI controller design approach to achieve constant DC output voltage irrespective of load variation. 3)Present implementation of the controller using MATLAB/SIMULINK to verify the design results.

S24.2 13:51 Performance Evaluation of an On-Board Integrated Battery Charger System Using a 12-Slot/10-Pole Surface-Mounted PM Propulsion Motor

[Ayman Abdel-khalik](#), [Shehab Ahmed](#) and [Ahmed Massoud](#)

The concept of Electric Vehicles (EVs) with on-board integrated battery chargers, which can be directly connected to the three-phase ac mains, has recently emerged as a cost effective and a practical alternative to charging stations. In such systems, the propulsion system power electronics are used to charge the battery, while, the stator winding of the propulsion motor is used to filter the charging current. This way, the need for separate bulky inductors typically used in battery charging converters is eliminated. Among the different configurations presented in the literature, those based on multiphase windings reduce the need for extra hardware components for winding reconfiguration to switch between propulsion and charging modes of operation. All systems provided in

the literature are either based on induction or PM synchronous motors with distributed windings. In recent motor designs employed to EV, PM machines with Fractional Slot Concentrated Winding (FSCW) is much preferred. This paper investigates the effect of different operational modes of an on-board integrated battery charger on the torque ripple and the induced rotor eddy current loss caused by different MMF space harmonics associated with such FSCW type. The well-known 12-slot/10-pole PM machine is employed in this study and simulated using 2D finite element simulations.

S24.3 14:12 Experimental Investigation of a Self Excited Induction Generator for Nanogrid Applications

[Mohamed Ahmed Azab](#)

In this paper, the performance of a self-excited 3-phase induction generator (SEIG), as a basic element of dc nanogrids, is investigated under different operating conditions. The experimental study involved the effects of varying (speed, excitation capacitance, and load) on the terminal voltage, output frequency and the power capability of the SEIG. The minimum values of excitation capacitance are explored for a wide speed range at different loading conditions. Collapse of SEIG terminal voltage has been investigated as well. According to the experimental results, the excitation capacitance plays important role not only for voltage building up and collapse but also to achieve the optimum power capability of the induction generator. Moreover, the paper presents also a dc voltage control scheme (through simulation and lab verification) to provide a stabilized dc voltage for a remote DC nanogrid. The investigated scheme provides satisfactory transient and steady state performance under different loading conditions and SEIG terminal voltage variations. The results prove the validity of such scheme to provide economic regulated dc voltage to feed DC nanogrids

S24.4 14:33 Novel Anti-Islanding Algorithm for Inverter Based Distributed Generation System

[Usama Bin Irshad](#), [Muhammad Sharjeel Javaid](#) and [Mohammad A. Abido](#)

Aside from benefits, integration of distributed generation (DG) exposes whole power system to risk. DG is not like the traditional generation through rotating masses, it's behavior is different with the traditional generators especially under fault conditions. A condition needs to be detected when DG is supplying power to load while the main grid is disconnected. One of the vital outcomes of this work is to detect the islanding events under weak grid and worst load conditions that will make the system more protected and reliable. In this work frequency variation, reactive power mismatch and rate of change of frequency over reactive power are used to detect islanding. A modified fuzzy logic based phase locked loop is proposed to detect islanding with zero non detection zone. The mentioned scheme will be applied and tested based on IEEE- 1547 standard. The results are presented and discussed in detail.

S24.5 14:54 Distributed Secondary Frequency and Voltage Control of Multiagent Based Autonomous Microgrids with Enhanced Active and Reactive Power Sharing

[Yahong Chen](#) and [He Junping](#)

The centralized Secondary frequency and voltage restoration in micro grid (MG) have high computational and communication reliability requirements for the PC, therefore when the PC have troubles the secondary restoration function can't be realized. In this paper the proposed secondary restoration function is based on multi agent systems, the function is realized in decentralized way, thus when some noncritical faults happened the systems can functioning normally .The primary voltage and frequency control adopt the droop control method and the secondary control restore the voltage and frequency to its rated value. However, because of the voltage at the DGs points are generally different it is difficult to share the active and reactive power for the dis-patchable DGs. Through dynamically changing the setting points of the droop curve in the DG agents we can share the power according to its power capacities. At last the simulations are carried out to verify the proposed control strategy.

S25: Power System Analysis



Room: AL MURJAN 1

Chair: Samir A. Baiyat

S25.1 13:30 Sparse Matrix Factorization using Diagonal Pivoting for Power Distribution Network Applications

[Alma Husagic-Selman](#)

Power distribution network (PDN) applications are real-time applications with complex data represented by sparse matrices that, depending on the application, may be definite or indefinite and irregular. Modifying existing algorithms to solve all types of PDN matrices would ease PDN solver design and reduce code maintenance cost, but that is very challenging task. Algorithms that deal with PDN matrices should provide stability to the system, yet process data fast and efficiently, utilizing the existing hardware architecture to the maximum. The algorithms that deal with PDN data are based on factorization of sparse matrices, where the pivoting strategy may destabilize the system. The algorithms used in commercial software ensure the system stability, but are complex and hard to implement. In this paper, we propose the usage of partial diagonal pivoting, with minimum degree ordering for matrix factorization in the domain of PDN applications. Results show that this pivoting technique ensures the stability over the tested set of matrices, and outperforms the commercial software in terms of time efficiency.

S25.2 13:47 Applications of Blocked Ordered LU Factorization in Balanced Power Distribution Network Applications

[Alma Husagic-Selman](#)

Power distribution networks (PDN) data is expressed through irregular and very sparse, definite and sometimes indefinite matrices, depending on the application used. For multi-phase PDN, matrices naturally contain blocks, whose size depends on the number of phases used. As matrices can be processed faster when blocked, many algorithms have been modified to process blocks. LU factorization is the simplest direct method for solving linear systems. It is not widely used in PDN applications as it tends to destabilize the system with indefinite matrices. Using right ordering and pivoting techniques, blocked LU factorization can be used efficiently for solving PDN application problems, without violation of system stability. In this paper we are proposing blocked, minimum degree ordered LU factorization algorithm to be used in PDN applications. Using partial diagonal pivoting the algorithm is tuned to solve both, definite and indefinite types of PDN matrices.

S25.3 14:05 Participant Based Distributed Slack Power Flow Model and Calculation of Participant Based Loss Factors using the Concept of Market Center

[Arunachalam Sundaram](#) and [Abdullah Khan Mohamed](#)

The transmission loss factors play a vital role in determining the loss component of the Locational Marginal Price. If single slack bus power flow approach is used, then the component for loss in Locational Marginal Price is found to vary exorbitantly whenever the slack bus changes. This paper proposes a Participant Based Distributed Slack Power Flow model where the losses are distributed to each participant instead of each bus. Using the Jacobian Matrix of the Participant Based Distributed Slack Power Flow model Participant based transmission loss factors are calculated which are slack bus independent and are obtained using a unique reference point. These loss factors overcome the problem of variations of loss component in Locational Marginal Price due to changes in slack bus. These loss factors are more suitable for competitive deregulated power market since it is calculated with respect to each participant and is different from existing techniques which calculates loss factors for each bus. This paper proposes the mathematical formulation of Participant based Distributed Slack Power Flow model and the calculation of Participant based loss factors. Case studies carried out using radial five bus system and IEEE 30 bus system indicate the effectiveness of the proposed model.

S25.4 14:22 Electricity Load Forecasting Using an Ensemble of Optimally-Pruned and Basic Extreme Learning Machines

[Lufuno Marwala](#) and [Bhekisipho Twaka](#)

In this paper the application of artificial intelligence on one-step ahead forecasting of electricity consumption is investigated. The total electricity consumption data sampled on a monthly basis (monthly consumption) from January 1985 to December 2011 in South Africa is used. Neural networks, Neuro-fuzzy systems, support vector machines and optimally-pruned and basic extreme learning machines (ELM) were used to develop nonlinear ensemble models for forecasting and their performance is compared. It was found that extreme learning machines significantly outperform traditional techniques except for support vector machines.

S25.5 14:40 Data Structures and Implementation of Fast Distribution System Power Flow and State Estimation

[Tarik Hrnjic](#), [Naida Fetić](#) and [Alma Husagic-Selman](#)

Distribution system state estimation (DSSE) and distribution system power flow (DSPF) are two applications provided by the distribution management(DMS) system that are constantly executed, as they provide inputs for other, optimization applications of DMS. This fact makes the performance of industrial DSSE and DSPF applications a crucial part in the performance of the entire system. This paper explores the possibilities for the improvement of the execution time of DSSE and DSPF provided by modern processing units.

S25.6 14:57 Sub-cyclic damaging ferroresonant overvoltages in 230kV transmission systems

[Nabil El Halabi Fares](#), [Jaafar Al Sheef](#), [Turki Malki](#) and [Thaiban Rajab](#)

Extensive research and world class standards have reported ferroresonance phenomenon as a low-frequency temporary overvoltage with a range of voltage shape starting from 1 cycle. This paper provides a case study for typical 230kV transformer-ended cable feeder configuration that has experienced damaging ferroresonant overvoltages in $\frac{3}{4}$ cycle. Ferroresonant overvoltages were recorded in two (2) different incidents and similar 230kV feeder configuration with magnitudes exceeding 2.75 pu in 12 ms causing phase insulation breakdown in power transformers and longitudinal insulation breakdown in circuit breakers. Waveform records captured at 32 samples per cycle are analyzed and used to validate PSCAD/EMTDC model. Trigger mechanisms of this sub-cyclic ferroresonance profile are identified and preventive/protective measures are discussed based on IEEE and IEC standards recommendations.

Wednesday, May 10, 15:15 - 15:30

PR2: Prayer  TOP

Room: Mosque

Wednesday, May 10, 15:30 - 17:15

S26: Modelling & Simulation  TOP

Room: AL MURJAN 1
Chair: Humam Elagha

S26.1 15:30 Improving Emergency Department Services Using Simulation: Case Study of Kuwait Hospital

[Seifedine Kadry](#), [Soraia Soraia Oueida](#), [Pierre Abi Char](#) and [Sorin Ionescu](#)

Healthcare, being a complex and very busy system, arise the need to use simulation modeling in order to alleviate the bottleneck faced in its various units. In this paper, emergency departments (EDs) is the focus, where increasing patient satisfaction and reducing waiting times, always maintaining a high level of care is the goal. The flow of patient from the time he reaches the ED until his discharge is studied. We derive a simulation model in order to study and alleviate the overcrowding and bottleneck of an emergency department in a Kuwait hospital. Different scenarios will be simulated in order to minimize the length of stay in the ED, maintaining always a high hospital revenue. Real data was gathered over one week. The model proposed saved the patient considerable time, maintaining the same level of patient care, and increased hospital revenue.

S26.2 15:56 Verification of Event-driven Process Chain with Timed Automata and Time Petri Nets

[Anam Amjad](#), [Farooque Azam](#), [Muhammad Waseem Anwar](#) and [Wasi Butt](#)

Event-driven Process Chain (EPC) is a known business process modeling language which is primarily renowned for efficient modeling of business requirements. It is a semi-formal modeling language which is commonly verified through various formal mechanisms for simple atomic events. However, the complexity of business requirements cannot be modeled through EPC atomic events alone especially in case of real time systems. Therefore, the complex events patterns like Event Time, Event location, Event Cardinality, Event Sequence, Event Exclusion, Event Trend and Data dependency are introduced in EPC from the novel area of complex event processing. However, to the best of our knowledge, there is no mechanism available in EPC to model and verify such complex events. Therefore, in this paper, we investigate the verification possibilities of both (atomic and complex) events in the context of Timed-Automata (TA) and Time Petri Nets (TPN). Particularly, we try to map the semantics of simple and complex events with the corresponding concepts of TA and TPN. It is analyzed that the simple EPC events can be formalized through TA and TPN but limited support is available for complex events. The restaurant process case study has been used for further investigation of complex events. It has been concluded that TA formalism is more suitable than TPN for the verification of complex events in EPC.

S26.3 16:22 Optimization of Emergency Department Using Simulation

[Seifedine Kadry](#)

waiting time is one of the common problems at a hospital emergency department (ED). Patients requiring urgent care must receive services more quickly than those requiring less urgent care. The waiting time and long processes at an emergency department affect negatively the patient and their health. If the patients wait for a long time to see the doctor or to receive the medical treatment needed their case might get worse. This paper is aiming to reduce the waiting time and the length of stay in the emergency department, and to increase the number of patients seen at an Emergency department when required.

S26.4 16:48 A Case Study for Five-Phase Induction Motor Design: Part I-Procedure

[Mahmoud Masoud](#), [Mundhr AlYahmadi](#), [Hafeed AlAbri](#), [Abdulrahman AlSakiti](#) and [Humaid AlShukaili](#)

The necessity for fault tolerant capability and high reliability within drive systems that may contain multiphase electric machines is a contemporary issue. Most undergraduate and postgraduate electrical machine courses stress three-phase induction motors but do not cover multiphase topics, especially the design process. This paper which is divided into two sections, (I and II), represents part of a final-year project focusing on five-phase induction motor design and performance. In it the authors present a detailed design process and performance evaluation for a multiphase induction machine, specifically a five-phase machine. The design includes stator dimensions, stator winding, rotor dimensions, magnetizing current, and parameter calculations. After the evaluation of the design, performance at steady-state for the designed case study is assessed. In addition, starting techniques using star/pentagon and star/pentacle switches are introduced. Part I (this paper) covers the physical dimensions and procedures, while magnetizing current, parameter calculations, performance assessment at steady state, and starting techniques are introduced in part II. Moreover, the study plan and outcomes assessment for the project are provided in part II.

S27: Power System Quality & Optimization



Room: AL DANA 1

Chair: Ali T. Al-Awami

S27.1 15:30 Financial Analysis of Improving the Reliability of Critical Power Distribution Networks

[Abdullah Alkhalidi](#), [Mohamed Mahmoud Hag Farhan Omer](#) and [Mohammad AlMuhaini](#)

as electricity become a major issue for many industries, power system equipment reliability is considered to be a vital part that everyone wants to achieve. Keeping these equipment in their high operation capability has become a necessity due to the high financial cost risk associated with power outages and interruption. Therefore, in making any decisions in designing any power system network, we have to evaluate the reliability along with the cost associated with power outage to prevent the loss in the profit and ensure continuity of the power supply to the customers. In this paper a typical power distribution plant was selected to conduct a formal reliability study to identify the present reliability indices of the system and the financial risk associated with the current reliability of the system. Afterward, network modification options were proposed to enhance the reliability of the system. After evaluation of different modification proposals, the paper concluded that the optimal modification, in terms of reliability and financial performance, is the addition of an existing redundant overhead distribution feeder with ratings of 13.8 KV.

S27.2 15:51 The Efficiency Enhancement in Thermal Power Plant by Controlling the Combustion Process

[Islam El Adly, i. y. el adly](#)

conventional steam produced from thermal power plants generates electricity through a series energy stages: fuel is burned in boilers to convert water to high pressure steam which is then used to drive a turbine to generate electricity. This paper investigates a proposed control system in combustion process to increase the thermal power plant efficiency. The proposed system controls the operation of the Furnace pressure and the amount of injected air into the combustion chamber to reduce the fuel consumption and the amount of carbon monoxide produced. Semiconductor gas sensors are used to measure the amount of carbon monoxide and the pressure of input mixture of gases inside the combustion chamber. The available data from these sensors are used to control the amount of injected air and the furnace pressure required to increase the efficiency of the thermal power plant. Since there are difficulties to test practically the proposed control system performance, a prototype, instead of the proposed system, is simulated and implemented. Satisfactory and acceptable results to the performance of the proposed system have been verified

S27.3 16:12 Optimizing a Grid-connected Micro-grid With Optimal Renewable Generation and Battery Energy Storage

[Umer Akram](#), [Muhammad Khalid](#) and [Saifullah Shafiq](#)

Optimal sizing of renewable energy sources and associated energy storage system is necessary for efficient, economic and reliable operation of a micro-grid (MG). Under sizing jeopardizes the reliability of the system while over sizing may lead to financial loss. In this study a constraint based iterative search methodology is proposed for the optimal sizing of renewable sources in a

grid-connected MG. The basic principle of the proposed technique is higher reliability at a lower possible cost. The technique is made more realistic by considering the forced outage rates of photovoltaic (PV) and wind turbine (WT) and utilization factor of battery energy storage (BES). The proposed technique is validated using the hourly solar irradiation, wind speed and demand data of Dammam region situated in the Eastern province of Saudi Arabia. The simulation results show the effectiveness of the proposed methodology.

S27.4 16:33 Optimization of Market-Based Energy Bidding of a Virtual Power Plant Using Genetic Algorithm

[Pathan Ilius, Md Juel Rana, Ibrahim Elamin](#) and [Mohammad AlMuhaini](#)

As of a few years ago, only a small number of power stations fed the national grids of entire countries (especially in developed countries); however, this number will soon increase to the thousands owing to the large-scale implementation of renewable plants and the deregulation of markets. Variability and uncertainty are intrinsic characteristics of power systems that become more complicated when renewable energy is introduced. The Virtual Power Plant (VPP) concept attempts to address the rapidly growing Distributed Energy Resource (DER) challenge, forcing it towards a more liberalized electricity market. VPP participation in a spot energy market may be an impressive solution for handling peak hour loads or other energy demands. In a day-ahead market, power producers must decide their offer curve based on the optimal dispatch of generators while considering profit maximization and constraints such as price uncertainty, the limits of generating units, ramping rates and many more, depending on the existing scenario. In this paper, a Genetic Algorithm (GA)-based technique is developed for the optimal dispatch of the generators included in a VPP participating in a day-ahead market with a profit maximization scheme. The paper considers the forecasted price and generation as uncertain parameters and uses the GA to model the uncertainties.

S27.5 16:54 Power Quality Classification Using Neuro Fuzzy Logic Inference System

[Mohannad Alkhrajah](#)

In this paper a power quality classification problem has been addressed. A proposed technique using Adaptive Neuro Fuzzy Inference System has been introduced to classify different type of disturbance events. The proposed technique uses fast Fourier transform and wavelet transform to extract five distinguish features of power disturbances types. The system consider four types of disturbances: sag, swell, harmonic and flicker.

S28: Cyber Security - 2  TOP

Room: AL DANA 2

Chair: Mahmoud Jazzar

S28.1 15:30 Selective Windowed Rate Limiting for DoS Mitigation

[Mohammed N. Alenezi](#), [Martin J Reed](#) and [Mohammed Alhomidi](#)

Denial of service, and in particular distributed denial of service, is a significant challenge for both users and Internet service providers. Common mitigation strategies include filtering and non-discriminatory rate-limiting. However, while these strategies reduce the attack traffic they often negatively affect legitimate user traffic as well. This paper proposes a discriminatory form of rate limiting for a more effective form of mitigation. The discriminatory rate limiting makes use of an efficient data structure, the count-min sketch, to measure the traffic volume from a given source, thus giving the ability to discriminate between high volume attacking sources and lower volume legitimate users. The sketch is applied within a given time window so that it can act on an active attack. The performance of the technique is validated using a simulation in NS-2, and this demonstrates that it is highly effective when compared to non-discriminatory rate limiting and filtering techniques.

S28.2 15:56 Network Protocol Covert Channels: Countermeasures Techniques

[Muawia Abdelmagid Elsadig](#) and [Yahia Fadlalla](#)

Advanced developments in intrusion detection systems (IDS) and computer network technology encourage hackers to find new ways to leak confidential information without being detected. When the interpretation of a security model adopted by a system is violated by a communication between two users, or processes operating on their behalf, it is said that the two users are communicating indirectly or covertly. A network covert channel refers to any communication channel that can be exploited by a process to transfer information in a manner that violates a system's security policy. Loopholes in network protocols attract covert channel exploitation. This paper sheds light on network covert channel countermeasures and the most recent detection and prevention methods of such channels. The achievements and limitations of these countermeasures are discussed. The paper further introduces the concept of network covert channel triangle (DSM - Development, Switching, and Micro-protocol); three elements that have the most direct positive impact in a network covert channel environment. In addition, the paper reflects on the challenges such covert channels impose.

S28.3 16:22 Short Survey of Techniques for Visualizing Events Recorded in Logs

[Rachael Fernandez](#) and [Noora H Fetais](#)

Nowadays data is being generated in large volumes and the users are left with a staggering amount of textual data which needs to be transformed into information to derive some knowledge from it. However, transforming and analyzing textual data is difficult. In this paper, we present a short survey of some popular Information Visualization (IV) techniques for data extracted from logs and some interactive features that can be endowed on these techniques to enhance their usefulness.

S28.4 16:48 The Effects of Cyber-Security on Healthcare Industry

[Aysha Khaled Alharam](#) and [Wael M El-Medany](#)

Nowadays cyber-security becomes a very important research field due to the widely use of internet on all applications from different fields. Healthcare application is very critical application that needs to be strongly secured. Thus, healthcare industries must ensure security and privacy and security of patient's information and fully protecting them against any type of threats or attacks. This research reviews different type of attacks and threat in the field of healthcare application and reviews possible security countermeasures that used to overcome these type of attacks.

S29: Mobile Applications - Novel Approaches



Room: AL DANA 3

Chair: Somaya Ali Al-maadeed

S29.1 15:30 High-Speed Blowfish on FPGAs

[Ali Kelkawi](#) and [Issam W. Damaj](#)

With the advancement in computing technologies in everyday tasks, securing data has become imperative. Various cryptographic algorithms have surfaced in the past few decades. Some offer a slow but secure option such as the RC5, while others offer a fast and highly secure option, such as the Blowfish algorithm. Blowfish is a symmetric-key cipher of 64-bit blocks and a key of variable length of 32-448 bits. VHDL is used under Altera Quartus and ModelSim to implement and analyze the hardware design. The development of Blowfish's hardware design adopts the following systematic methodology: Flowchart and concurrent process model derivation, Datapath design, Finite State Machine development, Hardware Description Language implementation, and finally FPGA mapping. Once the implementation is analyzed, the results are compared with existing hardware implementations. The obtained results offer better speed and performance, with a throughput of 1.15 Gbps using a Cyclone II FPGA.

S29.2 15:51 Rating Google-Play Apps' Energy Consumption on Android Smartphones

[Ahmed Sameh](#) and [Abdullah Almasri](#)

Current smartphones power saving strategies can be improved towards saving more power and/or gain more user satisfaction only if they start incubating "preventive" and/or user customized power saving plans in addition to traditional "detective" strategies. This paper develops a mixed preventive/detective power saving strategy which will help in saving the battery power without heavily relying on the power of the same battery for detecting abusers (only "detective" strategies). The paper develops a six stars rating schema in order to rate applications in Google Play android apps store in terms of power consumption (similar to appliances' power consumption ratings). This will help the users to have an idea of the power consumption habits of each application before installing the application (preventive). Google Play "Permissions" are traditionally used for security, privacy, and monetary control. This paper presents a first time usage of "Google Play Permissions" in the area of power consumption. With the help of power measurement tool (Power Tutor), we measure power consumption of the components of the smartphone that are linked to specific permissions such as: processor, screen, camera, audio, vibration, Bluetooth, WiFi, Cellular, flash light, microphone, GPS, etc. These measurements are used to compute the "Stars Rating" of the Google Play

Apps.

S29.3 16:12 Categorizing Smartphones Users for Saving Energy

[Ahmed Sameh](#) and [Abdullah Almasri](#)

A major issue of current power saving strategies is the "One Size Fits All" philosophy which does not take into consideration the factors that could distinguish different smartphone users. For example the nature of the workspace of the user (Indoor/Outdoor), the age, the gender, the user's applications categories of interests... etc. A very well-known example of a current "One Size Fits All" technique is "Samsung Ultra Power Saving Mode" which forces the user to end up using a black and white screen smartphone even if the user was a 60 years old book reader or a 17 years old heavy online gamer for the sake of 14 days battery life. This paper proposes a new strategy that will add another dimension to the current detective and preventive power saving strategies. The proposed addition is based on classifying smartphones users into groups based on different factors in order to improve power saving for each group.

S29.4 16:33 Weblog among EFL Students in BUC Writing Classroom: A case Study

[Yahia Alkhoudary, YA](#)

Abstract This study explores the extent to which integrating Weblog affect freshman students' performance at (AlBuraimi University College) BUC, hereafter. Moreover, this study intends to investigate the effect of using technology in teaching the writing skills. Therefore, sixty Omani EFL students at the Foundation Level who are planning to major in English Literature and Translation were divided into two groups: Experimental (n= 30) and control (n=30). Besides, 30 EFL teachers (15 males) and (15 females) who are currently working at BUC were selected randomly to contribute in this research paper. Questionnaires were administered to both students and interviews were conducted with teachers and students in the treatment group to get their attitudes towards the new technique. The treatment group was engaged in using weblogs following process approach in learning the writing skills. Whereas, the control group underwent the approach currently used in teaching the writing skills at BUC. The findings of statistical analysis indicated that students in EX. G outperformed students' writing achievement in the Con.G and both teachers and students who used blogs had positive attitude towards learning writing via weblogs.

S29.5 16:54 Smartphones for Improved Pilgrims Services

[Mohamed Mohandes](#)

Several million pilgrims from all over the world perform Hajj every year. This number is projected to grow up to 5 million by the year 2020. The Hajj authorities face several problems in managing the growing huge number of pilgrims and providing them essential services on timely basis. This paper describes the development of a system for solving some of the major problems faced by Hajj authorities and pilgrims each year. The developed system uses a smartphone with 3/4G, Wi-Fi, GPS, and NFC (Near Field Communication) technologies to provide services such as pilgrim identification, controlling access to the holy places, providing timely medical information and helping lost pilgrims. The identification, health support, and security modules were designed and developed in the form of Apps for a NFC compliant Android smartphones and NFC tags. In addition, web-based information system was also designed and developed to host the data related to pilgrims, such as personal identification information, health related information, and their addresses of accommodation in the several holy sites such as Makkah, Mina, Arafat, Muzdalifa, and Madinah. Results of the testing and positive feedback from both the pilgrims who used this application and the Hajj officers indicated the effectiveness of the developed system in providing improved services to the pilgrims and resolving some of the problems faced by Hajj authorities.

S30: Cloud Computing



Room: AL DANA 4

Chair: Fawzi Albalooshi

S30.1 15:30 A mmWave Cloud Cooperated and Mobility Dependant Scheme for 5G Cellular Networks

[Dimitrios Liarokapis](#)

The unavoidable and dramatic increase of mobile traffic load predicted to hit future cellular networks, has operated as a catalyst for the 5th generation (5G) mobile networks to envision the support of higher data rates by a factor of 1,000 in the next 10 years. The utilization of the ultra-wideband aspect of the mmWave bands has recently risen as a quite promising candidate that could support such an overwhelming demand. Armed with the exploitation of such high frequencies, several studies have proposed a logical split between the control plane (C-plane) operated by macro basestations (BSs) at the 2GHz band and the user plane (U-plane) operated by pico base stations at much higher frequencies (e.g. 3GHz or 60GHz bands). Thus, a heterogeneous cellular network (C-HetNet) is built, where macro and pico BSs could potentially function in a cooperative manner by connecting to a cloud radio access network (C-RAN). Despite the fact that such architecture provides a more efficient approach for handling signalling and user traffic, the use of mmWave bands introduces some major challenges. An appropriate user association scheme is still needed in order to successfully associate a specific user with a particular pico BS before user data transmission is initiated. It is clear that the process followed for user associations and re-associations introduces considerable latency; therefore high user equipment (UE) mobility may negatively affect user experience by demanding very frequent initiations of that process. In this paper, the author proposes a fair, user traffic off-loading mechanism, where highly mobile UEs, after a given grace period, are forced to shift the transmission of user data from the U-plane to the C-plane until the point where they become more stationary. Ultimately, this approach results in a lower amount of user re-associations needed as a trade-off to mobility and in the expense of lower data rates.

S30.2 15:51 Mobility Prediction for Traffic Offloading in Cloud Cooperated mmWave 5G Networks

[Dimitrios Liarokapis](#)

Future cellular networks are predicted to witness an extraordinary increase in mobile related traffic load in the next 10 years. This is the catalyst for the creation of the 5th generation (5G) cellular networks that could potentially accommodate much higher data rates by a factor of 1,000. Currently, there have been quite a few different proposed architectures that promise to support such an overwhelming demand. The utilization of the ultra-wideband aspect of the mmWave bands is considered at the moment one of the most promising approaches, since it makes use of very high frequencies and therefore it offers a much higher theoretical channel capacity for data transfer. Under the umbrella of mmWave bands to be used for the implementation of 5G networks, many

studies have proposed the incorporation of the currently dominant 4G/LTE technology to function alongside 5G and to be solely responsible for signaling and control data transfers (C-Plane), so as user data (U-Plane) will be given priority over higher 5G data rates whenever and wherever available. This heterogeneous network that could operate in a range of different frequencies over the same area and at the same time, may be enhanced even further with the use of a cloud infrastructure for radio access network (C-RAN) that would be responsible for overseeing the entire network topology's optimized functionality. Such a complex architecture is certain to bring to the surface some very challenging problems. The switching between 4G and 5G, whenever a User Equipment (UE) exits a pico cell or enters a new pico cell, is not as simple as normal handovers between cells that operate under the same technology. Service break ups and disruption of service are only two of the devastating results in user experience when dealing with sudden handovers between technologies and not just cells. In this paper, a mobility prediction scheme is proposed that makes use of C-RAN, titled Cloud Cooperated Mobility Prediction (CCMP) and instructs UEs under a certain probability whether or not they are predicted to exit a pico cell in the near future. If there is a positive chance for this to happen, the UE will take all the necessary actions to offload its data traffic from the U-Plane to the C-Plane in a much smoother and more efficient way.

S30.3 16:12 A Mobile Cloud -Based Data Migration and Staging Architecture

[Oluwarotimi Randle](#), [Tranos Zuva](#) and [Fezile Matsebula](#)

Big data is understood to be heterogeneous in nature comprising of structured, unstructured and semi structured data types. While the Hadoop framework is known as a solution to process these large volumes of heterogeneous data and has been effective in dealing with structured and certain unstructured data such as text messages, videos and images but is not effective to handle other forms of unstructured data which includes social media data, mobile cloud based data and social media data such as blogs, twitter and Facebook data. This inability to properly analyze these forms of vital unstructured data limits the level of processed data end users can obtain to make predictions and forecast events. Secondly data analysts and data end-users are struggling to provide data at a real-time level to users at an efficient and effective speed. To achieve this users expect services to be hosted on virtual machines in interrelated data centers and that these virtual machines will migrate dynamically to locations best suited for the user as well as connect the new users. This leads to the problem which is how can we provide a hybrid technique to analyze heterogeneous data to provide data to end users as well as improve the performance of Hadoop, as well as provide a means a novel procedure to migrate data between servers to improve end users data access. To solve the issue of data staging we aim to introduce a combination of Social media intelligent Location Tools (SMILT) which will assist Hadoop to obtain and manage mobile cloud-based applications data. The SMILT will be a combination of temporal dynamics, spatial dynamics, social dynamics and URL dynamics to collect and analyze social mobile data. This proposed architecture will implement a Dynamic Virtual Machine Server (DVMS) which will aim to speed up the process as well as ensure there is no delay by operating with two plugins to Hadoop which are Sqoop and Network levitated Merge (NLM). The dynamic virtual machine manages the large and growing data load by categorizing the data into 3 categories of pools called (1) Raw aggregated data pool, (2) Aggregated data to send and (3) Processed aggregated data pool which works in a loop to increase data migration speed as well as provide a medium to store data in preparation for new users.

S30.4 16:33 Exposition of Integrating Cloud Computing in Information and Communication Technology Courses in Higher Education

[Raghda M. Zahran](#), [Alan Walker-Gleaves](#) and [Caroline Walker-Gleaves](#)

The powerful processing mainframes and thin-client time-sharing model in the 1950s have evolved, with the invention of the internet; to a contemporary model we now call Cloud Computing (CC). Governments are enforcing the shift to CC like no other technology due to its cost effectiveness. However, the shift to CC in education is slower than industry. In this paper we discuss key challenges and possible opportunities in integrating CC in education. The literature shows, on the one hand; the key challenges include controversy about CC definition, concerns about trust due to vendor-lock, security concerns due to digital discovery, a new form of a digital divide, and the need to develop academics skills. On the other hand, integrating CC in Information and Communication Technology (ICT) courses in higher education institutions (HEI) allows for experiential learning and facilitates a new paradigm for learning spaces by using technology inside and outside the classroom. This research is limited to the selected literature. Further empirical research about the impact of integrating CC in the classroom is required to expand the knowledge about the efficacy of CC integration in the classroom.

S30.5 16:54 The Next Generation Cloud Services for Universities in Saudi Arabia

[Sarker Shakiur Rahman Shuvo](#), [Mohammad Asswad](#), [Faisal Ali](#) and [Abid Minhas](#)

Cloud computing, popularly known as "The Cloud", is considered as the future of Internet technologies. It is defined as a type of internet based computing model where different services - such as servers, storage and applications which are provided to the end users according to their demand. Now-a-days, almost all of the internet based services is utilizing the concepts of the cloud for better service and effective business. Cloud computing has been used on several fields such as- telemedicine, online banking, email services etc. We aim to design and construct a next generation public cloud for the private and public universities around the kingdom of Saudi Arabia. Through this Cloud where the universities will have access to different cloud based inexpensive, secure and reliable services such as- data storage, advanced applications and high-speed internet connectivity.

Thursday, May 11

Thursday, May 11, 08:00 - 09:45

S31: Wind Power - Renewable Energy



Room: AL DANA 1

Chair: Isa Qamber

S31.1 08:00 Rotor Fault Diagnosis of SCIG-Wind Turbine Using Hilbert Transform

[Lahcène Nouredine](#), [Ahmed Hafaifa](#) and [Kouzou Abdellah](#)

In this study, the possibility of rotor broken bar fault detection in squirrel cage induction generator (SCIG) based wind turbine using spectral analysis of the stator currents is investigated. The numerical method presented in this work is based on the Hilbert transform, it shows the possibility of improving the faults detection in electrical machines. The obtained results based on the proposed method are validated by simulation of an induction generators of 4 kW.

S31.2 08:17 Complying Grid-Connected Wind Farm according to the Requirements of Utility Grid Code Using STATCOM

[Mostafa A. Elshahed](#)

The high penetration of renewable energy sources in the past few years has led the utilities to necessitate the grid interconnection studies (GIS) to limit the problems that maybe appear in the grid from this penetration. GIS are obligatory to design the wind farm (WF) connection and verify its compliance with regulatory grid codes and international standards at the design stage. The paper presents how WFs could be complied with the Jordanian grid code using a hybrid STATCOM system. A grid-connected WF is modeled using the DlgSILENT program to examine the operational voltages and reactive power capabilities to determine the need for reactive power compensation. For more practical considerations, all information about the WF and the transmission grid components and conditions set in this paper were collected from the wind turbine producers and the utility. The results show that the performance of the WF is acceptable over the full range of operational voltages for different scenarios specified in the grid code and a 40 MVar STATCOM system should be used to compensate the difference between the required reactive power and the reactive power capability of the WF.

S31.3 08:35 A Method for Short-Term Wind Speed Time Series Forecasting Using Support Vector Machine Regression Model

[Shahbaz Ahmed](#), [Muhammad Khalid](#) and [Umer Akram](#)

Wind speed forecasting has drawn a lot of research interests around the globe as it plays a key role in wind power plant operation. Accurate wind speed forecasting is vital for the integration of wind energy conversion system into existing electric power grids. The important factor of wind speed forecast is the choice of accurate prediction algorithm. Support Vector Machine Regression Model (SVM-R), the most widely used algorithm for classification and forecasting measures, has shown extraordinary performance in various fields for short-term forecasting. Different SVM kernels including polynomial, linear and Gaussian have been explored. The performance of each kernel function has investigated on real time-series wind speed data for the site located at coastal areas of Sindh, Pakistan. The algorithm converts original training data into a higher dimension using nonlinear mapping. Optimal linear hyper-plane (LHP) is examined for separating data of one class from another one within this new dimension. The trend of root mean square error (RMSE) due to variation in various parameters, i.e., size of training sample, kernel parameters and regularization parameter has been presented. The LIBSVM software has been used in R environment to implement SVMR model. The results of minimum wind speed prediction error in SVM linear kernel reveal that better selection of kernels can improve the performance of SVM-R.

S31.4 08:52 A Nonlinear Autoregressive Neural Network Model for Short-Term Wind Forecasting

[Adil Ahmed](#) and [Muhammad Khalid](#)

Integration of wind power into an electricity grid can be greatly optimized with accurate forecasting of wind speed and subsequently the power. These forecasts aid the power utilities operating in a competitive electricity market with planning and operational management of a wind generation unit. This paper presents a swift and less data hungry prediction method based on nonlinear autoregressive neural networks for short-term wind speed prediction. An Artificial Intelligence (AI) method is chosen because AI techniques are considered to be more accurate than the conventional ones. The developed scheme is tested on two study sites and its effectiveness is demonstrated by comparison with a benchmark such as time series persistence. The impact of varying the size of required input data is also analyzed and it is concluded that using the developed method, minimal historical wind speed data is needed for one-hour ahead prediction.

S31.5 09:10 Transient Behavior Analysis for a 2 MW Grid-Connected DFIG-based WECS under Partial Symmetrical Voltage Dips

[Ridha Cheikh](#), [Arezki Menacer](#) and [Hocine Belmili](#)

Aiming to deeply understand the DFIG transient behavior if a grid fault occurs; then describe its equivalent model under this case, this paper deals with a theoretical analysis of a typical 2 MW DFIG-based WECS using the Superposition Principle Theory to analyze a partial symmetrical grid dips. Therefore the study has been achieved with emphasis on the impact of each voltage dip on the DFIG behavior. In fact as the DFIG is directly integrated to the grid via its stator and is controlled via its rotor by means of voltage-source current-regulated converter, the analysis aims to evaluate the low-voltage ride-through (LVRT) capability of the system, in which it can be known how the large induced rotor electromotive force can disturb the control scheme and what are the limits of such vulnerable rotor converter to keep working permanently, momentarily or even lost control definitely. The proposed analysis has been evaluated by simulation results using MATLAB/Simulink.

S31.6 09:27 Incentive-Based Game Theoretic Approach for Wind Power Balancing Using Electric Vehicles

[Ahmed Abdelmoaty](#), [Wessam Mesbah](#) and [Ali T. Al-Awami](#)

Integrating renewable energy sources (RES), specially, wind power into the smart grid has gained a significant importance in the last decade. However, more challenges have risen. The most important is the uncertainty of wind power production. Balancing the wind power generation is critical for each market participant. Usually, balancing the mismatch between the wind generation and the load is done in a centralized fashion where the operator controls the required actions. However, this may not be applicable with large numbers of consumers due to the vast computational cost. In this paper, we proposed a distributed model for electric vehicles (EVs) to balance the wind power generation. A game theoretic approach is adopted in order to transform the centralized model to a distributed one. We prove the existence and uniqueness of the Nash equilibrium (NE) analytically. Furthermore, a closed form solution for the NE is introduced. Simulation results show that the proposed game model is significantly efficient in reducing the imbalance with a very close results to the centralized solution.

S32: Internet of Things (IoT)



Room: AL DANA 2

Chair: Luisella Balbis

S32.1 08:00 Evaluation of Halstead and Cyclomatic Complexity Metrics in Measuring Defect Density

[Mahmoud Alfadel](#), [Armin Kobilica](#) and [Jameleddine Hassine](#)

Halstead Complexity (HC) and Cyclomatic Complexity(CC) are most common metrics used in measurement of software quality. Some recent case studies analyzed correlations between these metrics and number of defects. Since number of defects is not uniform metric, this work aims to examine correlation between metrics mentioned and their consistency with density of defects. Xalan 2.7.0 project is taken as a case study and correlation between metrics is analyzed and conclusion on its consistency is given. For Xalan 2.7.0 project, HC and CC are consistent software metrics.

S32.2 08:21 Zealth: ZigBee-Based WBAN System for e-Health Monitoring

[Mahmoud Imdoukh](#), [Yasser Khalil](#), [Ali Rady](#) and [Mounib Khanafer](#)

Electronic health (e-health) monitoring has attracted the attention of researchers due to its effectiveness in improving the services of healthcare systems. With e-health monitoring systems, one can get constant and live feedback on different health parameters without the need to go to a specialist. In this paper, we work on designing a wearable Wireless Body Area Network (WBAN) that monitors patients remotely for both preventive and diagnostic reasons. As the patient uses smart clothing that has the WBAN embedded in it, critical bio-signals are measured and communicated in real-time to a cloud server that builds a complete history of the patient's health data. An Android-based application is also developed to get easy access to the patient's history and to remotely communicate with the WBAN to control the sensors. The whole system is also supported with a pill-dispenser that can be accessed wirelessly to alert the patient about the exact times to take his/her pills. The proposed system architecture formulates the basis of a power and cost efficient practical smart clothing product.

S32.3 08:42 A study on the learning based human pose recognition

[Faisal Sajjad](#), [Adel F Ahmed](#) and [Moataz Ahmed](#)

Human pose recognition is considered a wellknown process of estimating the human body pose from a single image or a series of video frames. There exist many applications that can benefit from human pose technology e.g. activity recognition, human tracking, 3D gaming, character animation, clinical analysis of human gait and other HCI application. Due to its many challenges such as illumination, occlusion, outdoor environment and clothing, it is considered one of the active areas of computer vision. For last 15 years, the Human pose recognition problem significantly gained the interest of many researchers and therefore, many techniques were proposed in order to address the challenges of human pose recognition. In this study, we review the recently progressed work in human pose recognition using computer vision feature extraction and machine learning classification techniques. Accordingly, we identify the gaps in the existing work and give direction for future work

S32.4 09:03 Ethical Aspects of Internet of Things from Islamic Perspective

[Wazir Zada Khan](#), [Muhammad Zahid](#), [Mohammed Aalsalem](#), [Hussein Zangoti](#) and [Quratulain Arshad](#)

The Internet of Things (IoTs) is an evolving new face of technology that provides state of the art services using ubiquitously connected smart objects. These smart objects are capable of sensing, processing, collaborating, communicating the events and provide services. The IoT is a collection of heterogeneous technologies like Sensor, RFID, Communication and nanotechnology. These technologies enable smart objects to identify objects, collect information about their status, communicating the collected information for taking some desired actions. Widespread adaptations of IoT based devices and services raised the ethical challenges for their users. In this paper we highlight ethical challenges raised by IoT and discuss the solutions and methods for encouraging people to properly use these technologies according to Islamic teachings.

S32.5 09:24 Smart Mobile Robot Design with Real Time Applications

[Tasneem Yousif](#), [Wael M El-Medany](#) and [Aysha Al haram](#)

This paper presents a remote monitoring system using web-based/mobile application for detecting explosive gases. ROBODEM (Robot-Detection-Explosive-Materials) system aims to develop a remotely controlled explosive gas detection system handled by a LEGO-Mindstrom-NXT robot. The main controller has been designed using Arduino-Uno microcontroller with IP camera for live video streaming, GPS for live tracking and gas detection system using MQ6 and MQ5 sensors, and. This robot can be controlled either indoor using Bluetooth or outdoor using the Internet. ROBODEM provides sensors results, daily reports, an alarm and notification emails. The prototype has been tested experimentally and the results are analyzed and discussed.

S33: Optical Communication



Room: AL DANA 3

Chair: Sana Al-Mansoori

S33.1 08:00 Delaunay Triangulation Based Interpolation for Radio Map Construction with Reduced Calibration

[Abdullah Alonazi](#), [Yi Ma](#) and [Rahim Tafazolli](#)

Fingerprint-based indoor positioning technique is one of sustainable approaches to provide highly accurate information about mobile users location. However, it requires the constructing of a high-resolution radio map, which is time consuming and labor intensive. In this paper a novel Delaunay triangulation based interpolation approach to construct the radio map with reduced effort of calibration is proposed. The basic idea is to triangulate the area of interest according to the principle of Delaunay triangulation using a small number of calibration points. Then, the complete radio map is constructed through cubic interpolation inside each triangle. The proposed approach was implemented in real-world for two different types of indoor environment. The experimental results showed that the proposed approach can reduce the effort of calibration by around 75% in comparison with the conventional radio-map construction while providing comparable localization accuracy. Additionally, the results demonstrated considerable performance improvement in comparison with the existing approaches.

S33.2 08:21 Operation Mode Characterization of a Chirped InAs/InP Quantum-Dash Laser

[ad Talal Ali Khan](#) and [Mohammed Zahed Khan](#)

In this paper, we analyze the lasing characteristics of a chirped InP based InAs quantum dash in a well multi stacked laser structure under different operation modes. These modes are different short pulsed wave modes of different duty cycles (0.2, 0.5, 1, 2, 3, and 4%) and continuous wave mode. The investigation is carried out by obtaining the output light against injection current principle characteristics and then shedding light over the involved physics of carrier transitions and distribution with the active medium. Thereafter, the corresponding emission spectra are obtained while the effects of operation under these modes are compared. The results show that the junction temperature of the laser diode is sensitive to the operation mode due to the excess influx of carriers when the duration of pumping the current into the laser diode is increased. Depending on the application, proper optimization of the operation mode and the inhomogeneous structure become crucial in achieving optimal utilization of both of the input electrical power and output optical power alike.

S33.3 08:42 Sandstorm effect on Visible Light Communication

[Khalil Jasim Ebrahim Isa](#) and [Alauddin Yousif Al-Omary](#)

Visible Light Communication (VLC) is used as the alternative for the radio wave communication to overcome many of its limitations. VLC uses the LEDs illumination to transmit the data without the need of fibre cable. In this paper a simulation that investigates the effect different types of sandstorms on VLC has been conducted which is to the best of our knowledge not addressed by researchers so far. The simulation is conducted using Matlab R2013a software. The results showed that the effect of sandstorms on VLC, in general, is similar to the effect of fog and rain investigated by other researchers with some extra challenges due to the nature of sandstorm particles which have different size and different refraction index as compared with rain and fog particles. It was also found that clay sandstorm has the most severe effect on VLC connectivity and performance when the density of the clay sandstorm is high.

S33.4 09:03 33 GHz Spacing Multiwavelength Laser Source using Stimulated Brillouin Scattering Effects in Optical Fiber

[Mohammed Hayder Al-Mansoori](#), [Abdullah Al-Sheriyani](#) and [Salim Al-Nassri](#)

Multiwavelength laser sources have attracted enormous interest for their wide range of applications in optical communications system. In this paper, a tunable multiwavelength Brillouin-erbium fiber laser with ~ 33 GHz (~0.25nm) wavelength spacing is proposed and experimentally investigated. The proposed laser structure exhibits a stable output channels with a wide tuning range of 40 nm (from 1530 nm to 1570 nm) at 980 nm pump and Brillouin pump powers of 350 mW and 14 dBm, respectively. The average number of stable output channels produced within this wavelength range is four channels with a spacing of ~0.25 nm. The laser structure has potential to be used as a multiwavelength laser source for dense wavelength division multiplexing communication systems.

S33.5 09:24 Broadcast Storm Mitigation in a Vehicular Network using DBSMA

[Etienne Alain Feukeu](#) and [Tranos Zuva](#)

In view to reduce accident risks and improve safety on public roads, the vehicular Ad hoc network (VANET) standard was developed to enable inter-vehicular communication and facilitate safety message exchange among the involved nodes. Moreover, a successful message exchange can only be possible if the transmission medium is collision free. Under the Intelligent Transportation System (ITS), the cooperative Awareness messages (CAM) have to be transmitted at the rate of 10 Hz as per standard. To account for congestion management, the Distributed Congestion Control (DCC) mechanism was proposed. However, under higher node density, the DCC becomes inefficient and dramatically contribute to the deterioration of the VANET environment. The present work proposes a Dynamic Broadcast Storm Mitigation Algorithm (DBSMA) which can be used to combat the broadcast storm problem in a Vehicular Network (VN). Results from several simulations confirmed that the DBSMA has a potentiality to conquer the effect of broadcast storm by offering more than 120% improved efficiency against the DCC approach. Other advantage of the DBSMA is that it is simple to compute and easy to implement.

S34: (Industrial) Renewable Energy



Room: AL DANA 4

Chair: Alauddin Yousif Al-Omary

S34.1 08:00 Introducing MVAR Certificates for industrial Power Users

[Mahmoud Gamaleldin](#)

The Electricity and Co-Generation Regulatory Authority (ECRA) within Saudi Arabia issued a resolution on September 8, 2012, that allowed electric utilities to impose penalty charges of \$13.33/MVArh (Mega Volt-Ampere Reactive per hour) on government, commercial and industrial customers, operating their facilities below the Power Factor (PF) of 95%. Most of the power sector regulators worldwide are moving toward implementation of similar approaches targeting consumers to be charged for kVAR (Kilo VARh) consumptions at specific levels. A Green Certificate (GC) — terminology used in Europe — is a tradable commodity proving that electricity is generated using renewable energy sources. Typically one certificate represents generation of 1 Megawatt hour of electricity. The number of certificates issued is proportional to the electricity generated by the plant/system, and varies depending on the type of renewable source used and project (new, reactivated, upgraded, and renovated system/plant). The GC support scheme is based on the legislation, which requires producers and importers of nonrenewable electricity to inject a minimum quota of renewable electricity into the power system every year. Power distribution and transmission corporations are severely penalized for low power factor in their systems, and these expenses are usually passed on to the end user. This makes designing for a high power factor very important in the context of new utility regulations. This proposal outlines a new conceptual legalisation that introduces an analogy between the GC and "MVAR Certificates." MVAR Certificates are commodities, issued by electricity regulators in the market, for an electrical energy user that has a system injecting MVARs into the power supplier network at site (A). This certificate can then be utilized by the same user/consumer or sold to other consumers in the region — in a tradable commodity nature — such that a penalty can be reduced at other sites (B), or completely eliminated in certain situations, where the MVAR Certificate gained at site (A) covers for the whole amount of reactive power consumed at site (B). Keywords: Reactive Power, Green Certificates, Power system security, voltage control References [1] Morthorst, P.E., 2000: "The development of a green certificate market" Energy Policy vol 28, pp 1085-1094, 2000. [2] Nielsen, L., and T. Jeppesen 2003. Tradable Green Certificates in selected European countries- overview and assessment. Energy Policy 31(1). [3] Kirby, B., Hirst, E. "Ancillary Service Details: Voltage Control". December 1997. [4] Akwukwaegbu I. O, Okwe Gerald Ibe. "Concepts of Reactive Power Control and Voltage Stability Methods in

S34.2 08:26 The Selection Criteria and Requirements of Planning & Operation for Renewable Energy In Saudi Arabia

[Abdulaziz H. Alharbi](#)

In the upcoming Decade some countries are going to face an increase on the power demands, other countries are going to face an economy booming and some countries are trying to reduce their dependability on some conventional fossil sources such as: fuel oil, gasoline and coal. For those reasons, the demand on the renewable energy are going to increase. Therefore, there are some criteria's should be considered during the planning: the selection of the renewable energy that is going to add a competitive advantage for the country such as: Saudi Arabia should select a Solar energy more than ocean energy because the average length of the day in Saudi Arabia per year is twelve hours and two minuses and there are some other criteria's should be taken into consideration and other criteria is going to be highlighted. On other hand, the operation of the renewable energy during cloudy day which might cause a voltage dip and that is one of criteria shall be taken into account during the operation of the renewable energy and there are more other criteria should be taken into consideration and this the aim of this paper. Keywords: Renewable energy, Solar energy, Renewable Energy Planning & Operation, Control of solar energy, solar energy storage, voltage dip survival

S34.3 08:52 Photovoltaic systems study and installation in Bahrain and GCC countries

[Christina Georgantopoulou](#) and [Nikolaos Vasilikos](#)

The need of sustainable energy solutions in GCC Countries is a demand nowadays, due to the high electricity consumption in combination with the desired environmental friendly solutions for power production development. The solar panels systems development seems to be quite compatible according to the environmental and climate conditions of the region due to the high solar radiation which is presented. In this paper we try to identify and define the most important parameters for solar systems installation in Bahrain and GCC region in order to maximize the efficiency and produced electricity power. An extended investigation is presented concerning the tilt angle, the efficiency of the temperature panels, the behavior and performance of the most popular types of panels, trying to set the appropriate methodologies and values for the certain geographical location. The efficiency and power estimation is analyzed by an alternative empirical approach, giving particular interest to the specific factors that are responsible for the efficiency drop. It is concluded that the solar systems application can be high beneficial for the Bahrain region, if the installation is developed according to the specific climate conditions as the dust precedence in the atmosphere or the temperature on the cells during the operation. This type of environmental power production solution can be cost efficient and sustainable, providing to the region an alternative solution for the electricity production.

S34.4 09:18 The Effect of Plasmonic Anti-Reflection Layer on Solar Cell

[Marwa Tharwat](#), [Doaa Almohammadi](#), [Sereen Bilasi](#), [Sarah Felimban](#), [Lama Alnofaie](#) and [Malak Almansour](#)

A solar cell, or photo voltaic cell PV, is an electrical device that converts the energy of light directly into electricity. The only drawback of solar energy is the low absorption rate by the PV panel. The most popular technique is to improve the conversion efficiency of solar panels is using the thin film technique .Thin film technique is the implementation of an efficient anti reflection (AR) coating for solar cell applications. The initial idea of the AR coating is based on the nano structure of a moth's eyes. These nano structures can reduce the light reflection losses by creating a medium where refractive index changes from one medium to another. The AR coating reduces the reflection losses of the cells, hence, increasing the conversion efficiency of the solar cell. OptiFDTD software design suit will be used to plan, examine and simulate the reflection losses in solar cells. Different structures are designed and evaluated with various plasmonic structures. Evaluation techniques such as absorption are studied.



S35: Business Engineering

Room: AL MURJAN 1

Chair: Fouad Ben Abdelaziz

S35.1 08:00 A multi-objective genetic algorithm to solve a real life travelling salesman problem

[Khadija AbdulSattar](#), [Youssef Harrath](#), [Jihene Kaabi](#) and [Amine Mahjoub](#)

This research aims at solving a Real-Life optimization problem. In fact, the Electricity Company in Bahrain receives many daily requests to perform maintenance or survey tasks at different locations. A team of technicians and workers has to execute these tasks in a given order and return back to their initial location. This problem can be modeled as a symmetric Travelling Salesman Problem (TSP). This research provides the description of Electricity Company's Travelling Salesman proposed scenario including objectives and constraints. A method based on genetic algorithms was proposed and successfully tested using number of Bahrain's locations to solve the mentioned problem. A new crossover technique called "Complete Min sub-tour Exchange Crossover" was introduced. Two objectives were included one minimizing the total traveled distance and the second minimizing the total delay in completing all the tasks. We used the Pareto Optimal technique to compare the solutions generated by the genetic algorithm.

S35.2 08:17 Alternative heuristics for solving the multi-constrained order picking problem

[Thomas Chabot](#), [Rahma Lahyani](#), [Leandro Coelho](#) and [Jacques Renaud](#)

Warehouse order picking activities are among the ones that impact the most the bottom lines of warehouses. Many practical constraints arising in real-life have often been neglected in the scientific literature. In this paper, we solve a multi-constrained order picking problem under weight, fragility, and category constraints, motivated by our observation of a real-life application arising in the grocery retail industry. This difficult warehousing problem combines complex picking and routing decisions under the objective of minimizing the distance traveled. We first provide a description of the warehouse design. We then develop five heuristic methods, including extensions of the classical largest gap, mid point, S-shape, and combined heuristics. The fifth one is an implementation of the powerful adaptive large neighbourhood search algorithm specifically designed for the problem at hand. The performance of the proposed solution methods is assessed on a newly generated and realistic test bed containing up to 100 pickups and seven aisles. We compare the results provided by the five approximate solution methods. Our in-depth analysis shows which heuristic tends to perform better.

S35.3 08:35 A Tabu Search Approach for Designing Shopping Centers

[Sherif Fahmy](#), [Bader Alablani](#) and [Tamer Abdelmaguid](#)

The assignment of stores in shopping centers is a challenging task due to conflicting factors related to the accessibility of store locations and the power of attraction of the competing brands. In a previous work, the Authors proposed an evenhanded approach of assigning stores to empty locations in shopping centers, aiming to balance the distribution of flow across all shopping center areas (blocks). A mixed integer linear programming (MILP) model was devised targeting the minimization of the differences of flows between blocks. Because of the complexity and the relatively large size of the problem in real life, a solution algorithm based on tabu search (TS) is proposed in this sequel paper to provide efficient solutions. TS features such as tabu list, tabu tenure, aspiration criteria, short and long-term memory, and diversification are developed to improve the search process. The proposed TS algorithm is tested on a number of generated instances in a numerical study. Results prove the efficiency of the algorithm in solving large size instances for which exact methods cannot obtain feasible solutions in reasonable time.

S35.4 08:52 Solving the multi-layer dynamic facility location-allocation design problem in supply chain networks using SSP algorithm

[Sherif Fahmy](#) and [Marwa Mohamed](#)

The efficient design of the supply chain network is crucial for good performance and robust functionality. In this paper, the facility location-allocation problem, in the strategic stage of supply chain design, is considered. The problem is studied for a 4-layer supply chain network; suppliers, plants, distribution centers, and demand points (customers). Location decisions are considered in 2 layers; plants and distribution centers. The problem model addresses inventory levels, flow of products, and positions of the customer order decoupling point (CODP), in a multi-period (dynamic) planning horizon. In an earlier study, the problem was formulated as a non-linear integer programming model with a profit maximization objective. In this sequel paper, a solution algorithm is developed to solve the problem based on the successive shortest path (SSP) algorithm. A computational study is conducted, and it shows that the SSP algorithm performs well regarding solution quality and computational time.

S35.5 09:10 Context-Aware Group Recommender System for Tourists

[Tranos Zuva](#), [Mbaya Wa Mbaya, WM](#) and [Raoul Kwuimi](#)

Today many Group Recommender Systems (GRS)s are faced with how to handle the recommendation of items/services to a group of users. Getting the right item/service that can at least satisfy the group of users has become a real challenge because of the diversity of users' tastes or preferences. It is therefore vital to provide such a group of tourists with recommendations that take each individual's preferences into consideration but at the same time satisfying the group as a whole. This study proposed group recommendation system for tourists that takes into consideration context. Our results showed that addition of context improved the acceptability of the recommendations by the individuals in a group. In conclusion context plays a significant role in group recommender systems.

S35.6 09:27 Business Process Reengineering Using Enterprise Social Network

[Amjed Al-Thuhli](#) and [Mohammed Al-Badawi](#)

Organizations are using business process reengineering methods to improve their products and services in term of quality, speed and cost. In this study business process reengineering method used to enhance the Innovation and Support Center services. The method specifies the process to be reengineered, proposes alternative automated processes generated from Enterprise Social Network used by the Center and simulate the new proposed reengineered business process. The result shows that the reengineering of current business process using Enterprise Social Network business process is improving the Center services by delivering faster service with lower cost.

Thursday, May 11, 09:45 - 10:00

D3B1: Day-3 Break One



Thursday, May 11, 10:00 - 10:45

KN-3: KEYNOTE SPEAKER - 3



Power Quality as driver for better plant efficiency and reliability
Mr. Kurt Schipman, ABB Global Product Marketing Manager

Rooms: [AL DANA 2](#), [AL DANA 3](#)
Chair: Ibrahim Elamin

Thursday, May 11, 10:45 - 11:00



Thursday, May 11, 11:00 - 12:30



Room: AL DANA 2

Chair: AbdulJalil Zainal

S36.1 11:00 Sustainability Assessment of Enhanced Glazing Compositions of Commercial Buildings in Hot-Humid Climates

[Ammar H.A. Dehwah](#) and [Muhammad Asif](#)

Saudi Arabia is experiencing a rapid growth in energy demand as result of burgeoning population, modernization and economic development. The building sector has an import role in this respect as it accounts for almost 80% of the total national electricity consumption. Following the global trends, Saudi Arabia is also resorting to high rise and glass façade buildings especially in the commercial sector. Sustainability aspects of such buildings in terms of energy and environmental impacts, however, have not been duly addressed in the Kingdom yet. This study undertakes a sustainability assessment of glass façade of a hotel building situated in the city of Khober that has predominantly hot and humid climate. It considers three different type of commonly used glazing compositions - low-e double glazing, solar control double glazing as well as laminated glass were considered in the analysis - for the façade. Building energy modelling has been conducted with the help of Ecotect software. Results indicate that the application of low-e glass can reduce the HVAC load by 25% resulting into an annual energy saving of 564 MWh. The saving is realized through a reduction of 22% and 47% in conduction and solar gain respectively. The environmental benefit is observed in the form of 22,447 ton of CO₂ saving. The monitory payback period for the enhanced glazing has been calculated to be 4.5 years.

S36.2 11:18 Quantifying the Cost of Cooling in Qatar

[Faraj Saffouri](#), [Islam Safak Bayram](#) and [Muammer Koc](#)

Over the last decade, the electricity demand in Qatar has grown more than twofold. The residential sector is predicted to be responsible for two-third of the entire demand while air conditioning represents a substantial portion of the domestic electricity consumption. One of the grand challenges in Qatar, as in the GCC as well, is to reduce the electricity consumption and to improve the energy efficiency. Therefore, it is crucial to analyze and quantify the consumption patterns for different activities. In this paper, we estimate the electricity cost of air conditioning in Qatar based on the comparison of seasonal electricity consumption data. First, we collect high-resolution electricity data for one year (December 2015 - November 2016). Next, by following the literature we determine the cooling degree days (CDD) in which the average temperatures are higher than 18.3°C and air conditioning is assumed to be running. Then, the load curves for cooling demands are obtained by subtracting the load curves of the average of noncooling days (nCDD) from the CDD load curves. Next, we calculate the correlation between the heat index and cooling demand as 95%. The high correlation confirms that the resultant curves represent the cooling load with a reasonably high accuracy. Moreover, we calculate the annual demand for cooling as 14.675 TWh, which constitutes around 36% of total annual electricity consumption. This, in turn, translates into a total cost of 1.467 billion USD per year using the average cost of electricity assumptions. Such results are critical inputs to design right policies for demand-side management and energy efficiency programs to and curb the undesired effects of energy generation, distribution and usage including hazardous emissions, air quality degradation, public health expenses, and lost economic opportunities.

S36.3 11:36 Estimating the Cost of Summer Cooling in Bahrain

[Islam Safak Bayram](#), [Muneera Al-Qahtani](#), [Faraj Saffouri](#) and [Muammer Koc](#)

In this paper, we propose a technique to estimate the electrical energy used for air conditioning, and choose Bahrain as a case for the summer period, May to October 2016. The methodology uses the high-resolution electricity demand data gathered from the GCC Interconnection Authority (GCCIA) website. In the first part of the study, we present sample daily load curves for Bahrain. In the second part, we estimate the energy spent for cooling. The primary hypothesis of this paper is that since the power demand in summer days is mainly driven by the cooling load, the difference between the load profiles of the cool days with an average temperature lower than 65 Fahrenheit and the hot days (the remaining ones) gives us the cooling demand with a high accuracy. We estimate that 6.34 TWh of electrical energy is used for cooling during May to October 2016, most of which is consumed during June - September months. Moreover, the results are translated into a total electricity cost of 507.43 million USD. To the best of author's knowledge, this is the first study that quantifies the cost of cooling in Bahrain

S36.4 11:54 Using CIM for Data Exchange in Energy Utility Companies

[Adnan Fehratbegović](#), [Naida Fetić](#) and [Alma Husagic-Selman](#)

Main task of the energy utility companies is to generate, transfer and deliver electrical energy in an efficient and reliable manner. In order to complete these tasks it is necessary to enable interchange of data among different sectors of the power system. Information about outages, assets, locations, customers grid states etc., are required to keep business of electrical utilities operating effectively. This makes information systems one of the main parts of the electrical utilities management. Since every sector of the power system has its own computer based information model used in operating and maintaining its facilities, it is necessary to establish standardized universal model. The Common Information Model (CIM) is an information model standardized by International Electrotechnical Commission (IEC) and it is used for interconnection of data between the applications within an organization. This model enables automatic integration of data, that does not require developments of dozens interfaces between every single software. Data from the different systems can be accessed and interrelated.

S36.5 12:12 Residential Consumers Awareness of Energy Conservation Practices in Saudi Arabia

[Samir Elnakla](#)

Energy efficiency and conservation are significant policy tools that can be introduced by governments to reduce electricity demand. The kingdom of Saudi Arabia possesses a wealth of energy resources. The exploitation of these resources has allowed the country to keep domestic energy prices low, through a system of direct and indirect subsidies. Saudi Arabia boasts the world's largest proven oil reserves and among the world's largest producer and consumer of electricity. However, Saudi Arabia is facing unrestrained domestic fuel consumption, which has increased by more than 30% since 2000. This increased and inefficient consumption is causing environmental pollution and costing the country's budget in subsidizing electricity price which may add pressure on government. This study aims to measure the residential sector knowledge and awareness about energy conservation, which is the biggest sector in power consumption. The study uses questionnaire surveys containing quantitative and qualitative questions focused mainly on consumers' awareness in billing, efficient appliances and lighting systems. Results suggest that Saudi consumer behaviors in energy consuming are influenced by social, cultural, educational and economic factors.



S37: Robotics - Artificial Intelligence

Room: AL MURJAN 1

Chair: Nabil Hewahi

S37.1 11:00 Performance Evaluation of Digital Image Processing and Artificial Neural Networks for Weld Line Detection of Robotic Manipulator

[Lauren A Fernandes](#), [Aaditya Saraiya](#), [Kalaichelvi Venkatesan](#) and [Karthikeyan Ramanujam](#)

Robotic manipulators are used in industries for several purposes, with one of the purposes being welding. The objective of this paper is to automate the welding process by automating the task of weld line detection. A comparative evaluation between digital image processing technique and artificial neural networks to detect the center line of the weld piece has been analyzed. In the image processing technique, the image has been acquired and image pre-processing has been done in the form of RGB Thresholding, filtering, Binary thresholding, and morphological transformations to attain the center line. In utilizing artificial neural networks, a database of images for training and testing have been fed into the network with different training algorithms as well as different training ratios and learning rate, and the performance criteria of mean square error has been evaluated.

S37.2 11:18 A Theoretical Cooperative Work-Flow Net-Based Framework for Odometric and Probabilistic SLAM

[Yehia Kotb](#) and [Pierre Abi Char](#)

In robotic mapping and localization, simultaneous localization and mapping (SLAM) is defined as the computational problem of constructing or updating a map while simultaneously keeping track of the agent's location. In this paper, We present a formal framework for Work-flow net using SLAM and Odometric-based probabilistic approach. We also propose a new extension for work-flow nets, which themselves are an extension of Petri-Nets, to be learned by the robot to model the environment. The learned Workflow net is then used to facilitate navigation through this environment. We propose a theory of soundness for the extended work-flow net.

S37.3 11:36 A Comparative Study of Wavelet and CSP Features Classified using LDA, SVM and ANN in EEG based Motor Imagery

[Majid Aljajal](#) and [Ridha Djemal](#)

Brain-computer interface (BCI) can interchange messages and orders between the user's brain and the computer. The motor imagery (MI) is presented by specific signal features that reflect the user's intention to be extracted and interpreted as commands. This paper focuses on the classification of two types of MI tasks (Right Hand and Foot). We deployed various feature extraction techniques for EEG data using wavelet transform and common spatial pattern. For the wavelet features, statistical values, energy, entropy and band power were used to form the desired feature vectors. Before extracting wavelet coefficients, we performed two scenarios, with and without surface laplacian filter around the channels C3, C4 and Cz. Three types of classifiers were employed for classification, linear discriminant analysis (LDA), support vector machines (SVM) and artificial neural network (ANN). The aim of this work is to compare between them and to recommend the suitable combination for synchronous two-class motor-imagery-based brain-computer interface experiments. The data were recorded from five subjects, provided by BCI-Competition III. The results show that SVM is more suitable with the features than those extracted from wavelet coefficients and combination of entropy-energy-band power, and LDA is more suitable with common spatial pattern. Overall, the results from CSP-LDA are better than those obtained from WT-SVM with the average classification accuracy of 84.79% and 82.64%, respectively.

S37.4 11:54 Permanent Magnet Synchronous Motor Rotor Position Estimation Using Fuzzy-based Sliding Mode Observer

[Sunusi Sani Adamu](#) and [Musa Baba Lawan](#)

This work realizes position sensorless control of a permanent magnet synchronous motor (PMSM) using fuzzy-based sliding mode observer that estimates the rotor position. The system is modelled using α - β reference frame. The proposed system estimates the gain of the sliding surface using fuzzy inference system in contrast to the conventional sliding mode observer (SMO), where the gain is arbitrarily selected. Using an in-built motor model in Matlab environment as a base, the performances of the two systems in estimating the rotor position are compared. The results showed that the fuzzy approach produces better estimation than the conventional approach.

S37.5 12:12 The Design of A Boat Safety and Accident Prevention System

[Seyed Ebrahim Esmaeili](#), [AbdulAziz Al-Ramadhan](#), [Baker Al-Sahen](#) and [Mohanned Ayeshe](#)

Boating is a popular activity, and there are millions of boaters worldwide. Boat accidents are just as likely to occur as car accidents. Every day we hear many stories about boat trips that ended up tragically. Boaters can keep themselves and their passengers safe by learning about responsible boat operation, etiquette, and the rules of the waterways. In this paper, we propose a safety and accident prevention system for boat owners. Just as big automotive companies are developing technologies to help prevent accidents on roads, it would be a good idea to implement these safety measures for boats as well. The proposed system offers several features including a smart radar system, a crash detection system, and an application connected to the Coast Guard. The proposed system would help reduce or at least minimize boat accidents and save lives.

S38: Invited Speaker -3



Dr. Adil Albusaidi, Oman Grid, Oman
Asset Management in power systems

Room: AL DANA 1
Chair: Fadhel Albasri

S39: Smart Intelligent Buildings



Room: AL DANA 3
Chair: Ali H Zolait, AZ

S39.1 11:00 Smart Household Socket with Power Monitoring & Control using Android Application

[Arnold N. Santos](#), [Mary Anne Macabuhay](#) and [Jeferson Deleon](#)

This paper presents the idea of replacing old commercial wall sockets with smart sockets that can wirelessly control the operation of appliances using an Android application. The proposed design uses ATmega 328 microcontroller, Arduino mega 2560 board, current-sensor and HC05 transceiver bluetooth module. Each smart socket can handle 25 A load, it calculates the total cost of power consumption and allows users to control appliances up to a 20-meters distance. The calculation of real power, voltage and current were considered in discrete time and programmed in Android Studio using Java. Actual tests were carried out using 12 different resistive and inductive loads. A parameter comparative analysis was made between the proposed system and an existing energy logger.

S39.2 11:18 Designing and Implementation of Home Automation System Based on Remote Sensing Technique with Arduino Uno Microcontroller

[Iman Abu Sulayman](#), [Sami Almalki](#), [Mohamed Soliman](#) and [Majed Dwairi](#)

The main objective of this paper is to design and implement a remote sensing based home automation system using Arduino Uno Kit as a main controller for this scheme. The proposed system has two operational scenarios. The first scenario is to control the home devices from anywhere by using a smart phone with remote sensors and internet technologies controlling by the user, it is named a manual-scenario. The second scenario is to monitor and control the home devices by an automatic management between the remote sensors and the main controller 'Arduino Uno Kit', it is called an automatic scenario. To make an easy deal for a user the Matlab GUI platform is designed as a good interface to control and monitor the system. The proposed system is shown to be a simple, cost effective and flexible that making it a suitable and a good candidate for the smart home future.

S39.3 11:36 Designing Reliable Dual Mode Real-Time Home Automation System Based on Very High Speed Description Language

[Sami Almalki](#), [Iman Abu Sulayman](#), [Majed Dwairi](#) and [Mohamed Soliman](#)

This paper presents a design concept for a real-time home automation system based on Very High Speed Description Language (VHDL) used for programming microcontrollers boards as field-programmable gate array (FPGA). The proposed system has two operational modes. The first one is denoted as a manual mode in which the user can monitor and control the home appliances from any where over the world using the phone calling. The second one is referred to a self-automated mode that makes the user can be monitoring and controlling different household appliances in the home automatically in response to the signals comes from the related sensors. To support the usefulness of the proposed simulation system, a VHDL code for the system is carried out and the reliability of the system is introduced. The proposed simulation system is shown to be a simple, cost effective and flexible that making it a suitable and good candidate for the smart home future.

S39.4 11:54 Ambient Intelligence in Automated Houses

[Amr Lotfy](#), [Omar Abbas](#), [Ahmed Abdel-Basset](#) and [Mohammed ElAbd](#)

Smart houses are invading nearly all modern companies under the flag of the booming field of home automation. This field is being implemented with the highest technologies to be integrated in daily life and be a non-neglect able part of everyone's life style. This field is growing at a fast pace as the field of smart devices was years ago. The main purpose of smart houses and home automation is to provide a more luxurious lifestyle to its users. However, throughout the span of the past years, there was not as much attention paid to the possibility of dangerous situations as the attention paid to providing luxurious welfare. The proposed home automation system in this work provides both luxurious and emergency features. There are six features discussed throughout this paper that shows how a house can deal with home tenant and the surrounding environment in case of emergency or dangerous situation.

S39.5 12:12 Quantum Key Distribution with Pair-wise Correlation

[Naya Nagy](#) and [Marius Nagy](#)

Current cyber security solutions rely on ever increasing secret keys. The alternative solution to this trend is to use quantum security schemes. A quantum security scheme insures that there is no mathematical computation that allows for the computation of the key, as it is simply random. The present paper describes a quantum key distribution scheme that exploits correlation between pairs of bits. This new feature has the added quality that the intruder-Eve can be detected even on a qubit that Eve has not tampered with. The security of the protocol can be made arbitrarily high by increasing the safety parameter.

S40: Novel Wireless Sensor Networks



Room: AL DANA 4

Chair: Siddeeq Ameen

S40.1 11:00 Effects of Packet Fragmentation on QoS Provision for Proxy-based Mobile IPv6 Traffic over WiMAX Networks

[Walaa Alayed](#) and [Nasser-Eddine Rikli](#)

Handover characteristics over WiMAX networks using PMIPv6 are studied. A special look is taken at the QoS provisioning, that includes an analysis of the effects of the packet size and inter-arrival times on the average delay, the packet dropping rate, and the fragmentation rate. Then, this is followed by a thorough analysis of the sequence of packets exchange during the handover period. Finally, some changes in the PMIPv6 protocol that ought to improve the system performance are suggested, including means of decreasing the number of fragmented packets.

S40.2 11:18 A Novel Genetic-based Scheme for Broadcasting in Wireless Sensor Networks

[Tarek Moulahi](#), [Salah Zidi](#), [Bechir Alaya](#) and [Lamri Laouamer](#)

Broadcasting in Wireless Sensor Networks (WSNs) is a fundamental operation. Indeed, broadcasting is used to achieve neighborhood discovery, routing, data dissemination in the network, node localization, and time synchronization. On the other hand, sensor nodes, are designed to be deployed densely and randomly in unmonitored geographic zones, open environments, or in mobile settings. In addition, WSNs are prone to many factors like possibility of failure or node energy exhaustion. Therefore, broadcasting task becomes a challenging problem with such a dynamic behavior. In this paper, a novel genetic-based scheme to deal with this problem is proposed. The basic idea of our scheme is the use of relay approach to define a backbone. To be included in this backbone, a node is evaluated according to its characteristics (remaining energy, probability of reception, number of its neighbors and its probability of being in faulty status) through a genetic based approach. Furthermore, the performance of the proposed technique are measured to show its performance.

S40.3 11:36 A Novel Network Architecture and Communication Process of Distributed Wireless Networks

[Mohammed Aseeri](#), [Mohammed Nazmus Shakib](#), [Abdulaziz Alasows](#) and [Muhammad Raisuddin Ahmed](#)

A Wireless Distribution Systems are utilized to expand the coverage of the wireless network. Usually this types of systems enables the wireless interconnection of the radio units or access points. But the current distributed systems has constrain of spectrum reuse, optimum coverage and load sharing. Our Distributed Wireless Network (DWN) architecture improves on current wireless systems in three main ways (a) Beam forming from large numbers of distributed base stations allows spectrum to be completely reused. (b) The capability to coordinate and synchronize over a large geographical area significantly improves coverage and range and (c) each base station can be separately connected to the Internet thus allowing the back-haul load to be distributed. In order to do that our DWN utilizes the Multiple Input and Multiple Output (MIMO) method. The designed architecture presented in this paper is shared network architecture, star network architecture, wireless bridge architecture and wireless repeater architecture.

S40.4 11:54 Multi-Vendor Network Monitoring in Telecom Indoor Sites and Call Quality from end-user perspective

[Akram Aburas](#) and [Khalid Almashouq](#)

A novel approach to manage the call and bandwidth quality by associating the alarm monitoring system with the call quality from end-user perspective is proposed. The approach will make the system more robust by proposing the penalty model. In contrast to the computer networks, where the network resources are used to share the data, the telecom network especially the IBS (Indoor Building Solutions) sites that we are going embark upon are of multiple vendors supporting DAS(distributed antenna system) to enhance the coverage of indoor buildings such as Malls, Hospitals etc. The system developed for the monitoring of these resources is through SNMP (Simple Network Management Protocol) which is supported by almost all the network equipment vendors. In this paper, we present the novel approach of dealing with multi vendor equipment alarm monitoring and the challenges in dealing with these systems. Finally, we will compare the call quality from end-user perspective pertaining to the IBS cells using QMeter® and propose the penalty model to address the quality issues.

S40.5 12:12 Analysis and Design of a Hierarchical Opportunistic Sensor Network: Case of a Multi-Channel WLAN Environment

[Nasser-Eddine Rikli](#) and [Wedad Sanad Mater Al-Subhi AlHarbi](#)

A wireless sensor network consisting of nodes with cognitive radio capabilities is to be considered. This feature is to be used to allow these nodes, which will be considered as secondary users, to utilize dynamically another spectrum allocated to multi-channel WLAN primary users. A two-level hierarchical scheme is to be considered, with sensor nodes accessing the primary user's spectrum through a cluster head. The proposed scheme is used to enhance the main QoS performance metrics of the secondary users such as delay and throughput with minimal effects on the performance of the primary users. Two priority schemes will be considered, and in the multi-channel case various accessing techniques will be evaluated.

Thursday, May 11, 12:30 - 13:30

D3LP: Day-3 Lunch & Prayer



Rooms: Exhibition Hall, Mosque



Room: AL DANA 1

Chair: Hessa Al-Junaid

S41.1 13:30 ECC based-Approach for Keys Authentication and Security in WSN

[El Hanafi Teguig](#), [Youcef Touati](#) and [Ali-Cherif Arab](#)

In wireless sensor networks, ensuring secured exchanges during deployment taking into account constraints such as optimal use of resources has to be considered seriously. Usually, initial exchanges require the calculation of a secret key using ECDH with authority certification or implementing ECDSA algorithms for signature implying heavy calculations and several transmissions between sensor nodes. In this paper, we propose a new mechanism for public keys management using an elliptic curves cryptosystem where the objective is to optimize treatments by reducing significantly the calculation of scalar multiplications. Thus, public keys exchange mechanism allows a partial communication by transmitting simply the abscise and the LSB of the ordinate of the elliptic curve point totaling 161 bits instead of 320 bits. In order to show advantages of our contribution, we compare its performances in terms of execution time and implementation to ECDH, ECDSA and ECIES by performing real tests on a TMote Sky sensor.

S41.2 13:51 QR based De-noising Scheme for Medical Ultrasound Images

[Jawad Al-Asad](#) and [Adil Khan](#)

A novel scheme based on QR decomposition is proposed in this paper to remove multiplicative noise, speckle noise, from medical ultrasound images. A speckle noisy image is segmented into small overlapping blocks. A global covariance matrix for the whole image is obtained by calculating the average of covariances of the corresponding blocks. QR decomposition is then applied to the global covariance matrix. Based on the principle of orthogonality of signal and noise, it is found that the first subset of orthogonal vectors of the Q matrix resulted from the QR decomposition is sufficient to construct a projection matrix capable of filtering out speckle noise. When it is applied to simulated and real medical ultrasound images, and with reasonable performance in terms of resolution and edge detection, the proposed approach has outperformed benchmark filtering schemes such as Wavelets, Wiener and Lee. It has secured the highest Signal to Noise Ratio (SNR) and Peak Signal to Noise Ratio (PSNR).

S41.3 14:12 Automatic Multimodal Brain Image Classification using MLP and 3D Glioma Tumor Reconstruction

[Ghazanfar Latif](#), [Muhammad Mohsin Butt](#), [Adil Khan](#), [M. Omair Butt](#) and [Jawad Al-Asad](#)

This research study discusses an enhanced technique for multimodal brain image classification using Multilayer Perceptron (MLP) and introduces tumor location identification and tumor volume measurement techniques. Brain tumor classification and segmentation is an important task in medical image processing. In the proposed method, brain MR image features are extracted by using discrete wavelet transform (DWT) along with absolute Gaussian smooth filters. Supervised binary classification has been used to separate tumorous and non-tumorous images by MLP. The tumor part is segmented from MR images by employing anisotropic diffusion filters (ADF). The boundaries of all segmented tumors are used for volume measurement and 3D reconstruction of the tumor. Based on the 3D tumor model, location of the tumor inside brain is calculated which can help the radiologists in decision making. The proposed technique has been tested on MICCAI BraTS 2015 data. Results show an accuracy of 92.59% in classification of MR images and 90.12% in tumor segmentation and its volume measurements.

S41.4 14:33 Accelerated Fog Removal From Real Images for Car Detection

[Rawan Younis](#) and [Nabil Bastaki](#)

Image dehazing improves the visual quality of images in computer vision applications, such as object detection and object tracking. An accelerated image enhancement technique is presented for car detection as part of an effort to count cars using existing street cameras for the purpose of traffic management. Two aspects of car detection are tackled: 1) An existing image fog removal technique is accelerated by replacing a time consuming image filter with a faster filter while maintaining negligible image degradation, 2) A quick and practical algorithm to detect a car in a fog-free image is proposed and applied to a database of about 100 car images. Acceleration is the main goal of this research, in addition to car detection accuracy. The improved fog removal technique is performed by estimating the transmission map using the Proposed Adaptive Filter (PAF) to recover the scene depth of the foggy image. After filtering, a simple, yet exact and effective, car detection algorithm is executed to confirm the presence or absence of a car in the processed image. The system is fairly robust and although all images were obtained from existing sources, the proposed algorithm is expected to perform equally well with any side-view image of a car in the presence of heavy fog and under real conditions.

S41.5 14:54 Breast density classification using a bag of features and an SVM classifier

[Mahmoud Marwan Alhelou](#), [Mohamed Deriche](#) and [Lahouari Ghouti](#)

Breast cancer is one of the most common types of cancer, as well as the leading cause of mortality among women. Numerous attempts have been made in developing automated systems for identifying cancerous tissues from mammographic images. Breast density, in particular, is seen as the main factor used in Computer-Aided Diagnosis (CAD) systems. As such, breast density classification is seen as a crucial preprocessing stage in cancer detection. Here, we propose a new image preprocessing density classification approach for early detection of cancer from mammogram images using a set of robust texture and edge related features combined with an SVM classifier. The proposed algorithm achieves an accurate density classification of 93.56 % for Low and High densities. The results were validated using the IRMA database. A comparison to state-of-the-art has been carried and showed that the proposed approach achieves improved performance in terms of density classification accuracy.

Room: AL DANA 2

Chair: Ebrahim Abdulla Mattar

S42.1 13:30 Online Control of Stick-Slip in Rotary Steerable Drilling[Mahmoud Kamel](#), [Salaheldin Elkatatny](#), [Muhammad Mysorewala](#), [Moustafa Elshafei](#) and [Abdulaziz Al-Majed](#)

Rotary Steerable System is the current state of art of directional steering systems which has been developed for well drilling to achieve high reservoir productivity and to improve accessibility of oil reservoirs in complex locations. This work presents an online control scheme for real time optimization of drilling parameters to maximize rate of penetration and minimize the deviation from the planned well bore trajectory, and stick-slip oscillations. Nonlinear model for the drilling operation was developed using energy balance equation, where rock specific energy is used to calculate the minimum power required for a given rate of penetration. A proposed mass spring system was used to represent the phenomena of stick-slip oscillation. Detailed mathematical formulation and computer simulation will be used for evaluation of the performance of the proposed technique.

S42.2 13:47 Sliding Mode Controller Design for DC-DC Converters with Adaptive Gains[Abdulrahman Alassi](#), [Mahdi Houchati](#) and [Nader Meskin](#)

DC-DC converters are playing increasingly significant role in industry related and renewable energy applications. However, the degree of non-linearity that inherently exist in conventional DC-DC converters make it essential to develop robust control algorithms that can maintain the system operation as desired when subjected to disturbances of several types. Variable Space Structure (VSS) controllers are convenient for such systems as their switching nature matches the DC-DC converters operational principle. Mainly, the Sliding Mode Control (SMC) mechanism is usually employed in this context. This paper proposes an adaptive SMC method for the fourth order SEPIC converter, based on altering the sliding surface dynamics to continuously adjust the gains and drive the system to slide along the adaptive surface to achieve stability. Theoretical models are derived and are then confirmed via model simulation in MATLAB/Simulink, where it is also shown to provide enhanced performance compared to conventional SMC methods in face of system disturbances. The same methodology employed to SEPIC can also be expanded to other converters.

S42.3 14:05 Adaptive Estimation-Based Control for Uncertain Processes with Low Order Dynamics[Ashraf A Zaher](#)

This paper investigates the design of adaptive controllers for such applications that could be modeled by low order dynamics with some parameters uncertainties. Some of the control applications that fall into this category include industrial processes (e.g. level, flow, pressure, etc.) and some automotive applications (e.g. active suspension). The paper introduces two different design techniques and compares them to traditional PID controllers. The first design is based on using a combination of state feedback and Lyapunov-based techniques. This proposed controller has the advantage of being applicable to both linear and nonlinear models. The key issue in the design is arriving at the best parameter update law that guarantees both stability and satisfactory transient performance. The second design technique makes use of the well-known gradient algorithm to identify the unknown parameter(s). A comprehensive comparison is then presented to highlight the advantages and disadvantages of the proposed strategies. Tradeoffs between stability and performance are carefully studied. A simulated first order process, using MATLAB, is used to exemplify the suggested techniques. Finally a conclusion is submitted with comments regarding real-time compatibility of the proposed controllers.

S42.4 14:22 An Enhanced Smith Predictor Based Control System for Time-delay Processes[Morteza Mohammadzaheri](#) and [Reza Tafreshi](#)

This paper presents enhanced Smith predictor based control systems (SPBCSs) for processes with time-varying or fixed time delay. This work focuses on improving the arrangement and asynchrony of SPBCS components rather than the design of the predictor and the feedback controller which have been well discussed in the literature. The proposed control system advances SPBCS through implementation of two design recommendations: (i) replacing the classical feedback controller by a feedback-feedforward control system and (ii) synchronizing the reference signal and the predicted output. As a result, common shortcomings of SPBCSs or control systems based on Pade approximation, i.e. the trade-off between performance and steady state error, and instability associated with the non-minimum-phase systems do not exist in the proposed SPBCS. The superior performance of the proposed control system is demonstrated with two examples: temperature control of an infrared dryer (a system with fixed time-delay) and air-fuel ratio of a lean-burn spark-ignition engine (a system with time-varying delay and lag). The proposed control system is shown to clearly outperform the conventional SPBCS and Internal Model Control (IMC) PID based on Pade approximation for aforementioned examples and performs satisfactorily in the presence of noises, actuator saturations, and severe model inaccuracies.

S42.5 14:40 An Advanced Control Strategy for Magnetic Levitation Train System Based on an Online Adaptive PID Controller[Umer Akram](#), [Muhammad Khalid](#) and [Saifullah Shafiq](#)

Magnetic levitation train is an unstable system; state feedback and PID controllers can be used to stabilize the system. Traditional PID and state feedback controllers are simple in design and easy to tune but they cannot give satisfactory performance under larger variations. This paper proposes new control strategy based on adaptive PID (APID) for magnetic levitation train system. The proposed APID is robust against the parameter variations as it is capable of adjusting its parameters online according to variations in the system. Mathematical model of magnetic levitation train system, adaptive PID, state feedback and PID are derived and implemented in MATLAB. The proposed APID control strategy is assessed in presence of small and large disturbances and simulation results depict the effectiveness of the proposed methodology.

S42.6 14:57 Modeling and Simulation of Intelligent Cruise Control System[Ibrahim M. Hussein](#), [Ayyoub Hourani](#) and [Samir A. Baiyat](#)

In this paper, conventional, adaptive cruise and model reference adaptive cruise control systems will be investigated in term of design, modeling and simulation. The physical system structure will be modeled based on one car and two cars, following and preceding (host and leading). Conventional system and adaptive system will be simulated and designed to improve the system performance characteristics. The objective of this work will be focusing on: construct the basic model of conventional and adaptive cruise systems as well as their transfer functions, analyze the systems

S43: Ad-hoc Network



Room: AL DANA 3

Chair: Salman A Khan

S43.1 13:30 *An enhanced Multipath Strategy in Mobile Ad hoc Routing Protocols*

[Zeyad Alfawaer](#) and [Belgaum Mohammad Riyaz](#)

The various routing protocols in Mobile Ad hoc Networks follow different strategies to send the information from one node to another. The nodes in the network are non static and they move randomly and are prone to link failure which makes always to find new routes to the destination. This research mainly focused on the study of the characteristics of multipath routing protocols in MANETS. Two of the multipath routing protocols were investigated and a comparative study along with simulation using NS2 was done between DSR and AODV to propose an enhanced approach to reach the destination maintaining the QoS. A possible optimization to the DSR and AODV routing protocols was proposed to make no node to be overburdened by distributing the load after finding the alternate multipath routes which were discovered in the Route discovery process. The simulation shows that the differences in the protocol highlighted major differences with the protocol performance. These differences have been analyzed with various network size, mobility, and network load. A new search table named Search of Next Node Enquiry Table (SONNET) was proposed to find the best neighbor node. Using SONNET the node selects the neighbor which can be reached in less number of hops and with less time delay and maintaining the QoS.

S43.2 13:51 *Performance Analysis of Popular MANET Protocols*

[Muawia Abdelmagid Elsadig](#), [Yahia Fadlalla](#) and [Abdelrahman Altigani](#)

Mobile Ad Hoc Networks (MANETs) are rapidly advanced and popularly accepted. They play a vital role in different applications and consequently receive a great deal of attention. However, since a MANET has no infrastructure due to its dynamic topology and mobility, routing is still a challenging issue. This paper investigates the performance of three popular routing protocols in MANET systems: DSR, AODV, and DSDV. To measure these MANET protocols' performance metrics (throughput, end to end delay, and data packet ratio); a simulation is conducted for each one using the most popular simulator NS-2 for topologies of 10, 20, 30, 40, and 50 nodes. The simulation results clearly showed that DSR performed best in terms of throughput and data packet delivery ratio. But, DSDV's performance superseded that of the other two by achieving the least amount of delay.

S43.3 14:12 *Unicast Backtracking Route Recovery in ODMRP*

[Mushtaq Ahmed](#), [Mohammed Yaseen Husain](#), [Kunwar Pal](#) and [Pankaj Sharma](#)

The familiarity of Mobile Ad hoc Network (MANET) in the area of networking can be attributed to its ability of wireless communication and the lack of need for any fixed infrastructure. Hence, it can be deployed anywhere quickly. But achieving better transmission rate in MANET with mobile nodes is a challenging task so, several routing techniques have been given to increase the transmission rate. In the existing approaches, when the packet delivery is increased the overhead also increases in the network. The focus of our approach is to reduce the overhead and increase the packet delivery ratio. The proposed approach uses unicast backtracking link detection method to detect the link breakage and thus induces very less route recovery packets in the network. We compared our result with On Demand Multicast Routing Protocol (ODMRP), patch-ODMRP and resilient ODMRP. The parameters used for comparison are packet delivery ratio, jitter, and packet overhead. The simulation is done on Exata/Cyber 2.0 simulation tool. The analysis of results confirms that our approach retains the data transmission rate equivalent to patch-ODMRP with very less overhead.

S43.4 14:33 *Performance Evaluation of IPv6 VPN Provider Edge Router*

[Sami Hassan Omer Salih](#), [AlAmeen Eltoum Mohamed Abdalrahman](#) and [Kamal Elsharif](#)

The IPv6 VPN Provider Edge Router (6VPE) is used as a solution to overcome the security holes in its predecessor (6PE). Both methods allow ISPs to provide end-to-end IPv6 connectivity over the legacy MPLS core networks. The former establishes tunnels between edge routers to carry IPv6 packet via the MPLS core routers. The later adds the feature of creating VPN for each customer so that the private customer traffic is not disseminated. However, as the MPLS replace the IP header with the labels the overall system performance is questionable in terms of connectivity and data security. Thus, the trade-off between these performance metrics will be evaluated in this paper using Monte Carlo methodology.

S43.5 14:54 *Implementation of Virtual Firewall Function in SDN (Software Defined Networks)*

[Mohammad Saad Waheed](#), [Mohammad Al-Mufarrej](#), [Mohammed Sobhie](#), [Abdulrahman Al-Barrak](#), [Adeel Baig](#) and [Abdulaziz Al Mazyad](#)

With the overhauls and increase in network size, it becomes harder to practice maintainability along with security. In recent years, software-defined networking (SDN) has evolved to replace the traditional design of the current network, and with such evolution, raises issues in the firewall. Firewalls are one of the most important components used in networks, and new challenges have been driven by the software-defined networks in implementing firewalls. The main issue of the firewall is its speed. The speed of the firewall is a hindrance; often firewall's link speeds are slower than the supported network interface and can cause the traffic burst from the host to be buffered until packets are processed. To overcome these issues, the aim of our project is to solve by implementing duplicate instances of the firewall. By designing two topologies, a single and multiple controllers, and implementing them in a simulated environment the resulting studies show that multiple controllers in a network environment tend to show an improved performance in the network than in a single controller network.

S44: Advanced Teaching & Learning Technologies



S44.1 13:30 Design and Development of a Hybrid Fire and Heat Detector through Narrowing of Alternatives

[Mohammad Saad Alzahrani](#), [Abdulrahman Bintalib](#) and [Irfan Manarvi](#)

Fire safety is being considered of paramount importance in high civil structures and various industries from aerospace to manufacturing of utilities. International standards make it mandatory for all companies for installation of fire and heat sensors in their premises and work places from commercial to domestic use building. These sensors are to be installed in large numbers and increase cost based on unit prices of components as well as complex networks. Fire and heating alarm systems are abundantly available in the market as standalone systems. Few may have both features of detecting heat and fire in the same product but the literature on those is very limited. This research was carried out to review the existing similar products in the market as well as design and develop a unique product with both features in the same unit. An exhaustive product design and development process was followed to arrive at concept design alternatives. Features of these alternatives were compared against a set criteria based on customer requirements. A criteria based on international standards and products available in market was made to arrive at required technical specifications of alternatives. Forced choice procedure was used to find weight-age of each criteria element. A total of 10 design alternatives were investigated and analyzed against the selected criteria. Finally best two were selected for further studies. A virtual 3D geometric model of the top rank alternative was developed along with anticipated bill of materials. It was expected that making a hybrid of both fire and heat alarm in one unit will substantially reduce the cost of its installation for industrial, commercial and domestic applications. It will also increase safety for buildings and structure through an early warning because of its integration WiFi warning systems.

S44.2 13:47 Design and Development of a Praying Chair for Disabled Persons affording convenience to others

[Anas Dawalibi](#), [Asim Sabatto](#) and [Irfan Manarvi](#)

Offering prayer in a mosque is a regular practice observed by the Muslims all over the world especially in the Middle east and South East Asia. They stand in horizontal lines behind a leader. A large number of people with special needs also join the prayers, however they normally use chairs to sit on instead of standing in the same line as normal people. These are regular chairs placed on the lines for their use during the prayer. However, it becomes extremely inconvenient when a person with physical disability is sitting or standing next to chair, while there may be people on his side as well as behind. It creates obstruction for people standing in right, left and especially behind of such a person due to large space occupied by the chair itself. The chairs come in a variety of designs and shapes. A literature survey of praying chairs available in the market as well as the its designs available in published research was conducted. It showed that all of these have some element of inconvenience for the user as well as others due to their geometric design. Therefore; present research was focused to design a new chair that could provide a solution to obstruction faced by the fellows and inconvenience faced by the user while standing in line with others during prayer.

S44.3 14:05 Design and Development of a Study Chair for Both Left and Right Handed People

[Wael Alzeer](#), [Irfan Manarvi](#) and [Abdullah Bahmaid](#)

People are usually right handed but presence of left handed people cannot be ignored at a workplace and especially in examinations halls where a large body of students/ professional may be appearing for academic or professional qualification examinations. Absence of a desk for left handed people usually becomes a source of discomfort for such users as well as an embarrassment for examination organizing bodies/institutions. This research is being conducted to design and develop a unique desk which can be used by both right and left handed personnel in any workplace or examination situation. It is expected to have all the facilities of setting up a computer and few accessories required during the testing process. A concept design and prototype shall be developed

S44.4 14:22 Raising Awareness on Hydroponics via an Educational Video Game using an Indirect Teaching Method

[Abdulmonem Ali](#), [Vasileios Paliktzoglou](#), [Christos Gatzoulis](#) and [Osama Alabedallat](#)

Agricultural science has significantly evolved in the last years. Innovative greenhouse systems -such as hydroponics and aquaponics- that improve both efficiency and effectiveness are being used in the cultivation of crops. However, those systems are mostly utilised by large production companies as they are the ones who have the technical knowledge and awareness of their use and benefit. In a modern society, and in order to promote agriculture activities to the public, traditional ways (such as leaflets, websites etc.) to promote systems such as hydroponics are not very effective as it would be expected and desired. We propose to promote hydroponics using a game-based learning approach, with the implementation of a game that educates users in an engaging way about hydroponics systems and ways that they can be developed and operate. To raise awareness on hydroponics, we developed an educational game that promotes and delivers educational material through exciting gameplay and intriguing story-telling, as opposed to direct teaching and information dissemination. Initial testing results show that players - regardless of their interest in hydroponics - enjoy the overall experience of the developed game, and are open to learning about hydroponics through this medium. A broader testing process is set for future work.

S44.5 14:40 Using Weblogs in Teaching Writing Skills in BUC EFL Classrooms: A Case Study

[Yahia Alkhoudary](#), YA

This study explores the extent to which integrating Weblogs in teaching affect freshman students' writing performance at Buraimi University College in Oman (BUC, hereafter). Moreover, this study intends to investigate the impact of using Weblogs on teaching the writing skills. The approach of this study is based on a combination of quantitative and qualitative. Therefore, sixty Omani EFL female students at the Foundation Level who are planning to major in English Literature are divided into two groups: Ex. G. 30 and Cont. G. 30. Besides, 30 EFL teachers (15 males and 15 females) were selected randomly to participate in this study. Pre and posttests were assigned to both groups before and after the application of using weblog. Moreover, a questionnaire was administered to the treatment group and interviews were conducted with teachers and students in EX.G to examine their attitude towards the new technique. The students in EX.G were engaged in using weblog following process approach. The findings of statistical analysis reveal that incorporating Weblog in EFL/ESL writing classrooms can increase students' motivation, cooperation, confidence and creativity. Also, it finds out that students in EX.G outperform students' writing achievement in Con. G and both teachers and students show positive attitude towards posting writing in Weblogs. Except for lack of permanent connection to the internet; using technology in the classroom will bring successful learning outcomes.

S44.6 14:57 Contextual Data Mining for Higher Educational Institutions (HEIs)

[Subhashini Bhaskaran](#)

Literature study and actual observation of student performance in HEIs showed that time to degree(total number of semesters taken to graduate) and GPA of students can be enhanced using Knowledge Discovery and Data Mining (KDDM)process by finding course taking patterns from student dataset characterized by contextual knowledge. However current KDDM processes do not

enable contextual knowledge processing and hence may not be useful for implementation in HEIs unless modified to include contextual knowledge processing. Further investigation showed that ways can be developed to modify KDDM processes to include context-aware processing stage. Further it has been examined in this research taking the case of CRISP-DM process and ways have been suggested to discover course taking pattern as well as its association to time to degree and GPA characterized by contextual knowledge using the modified process.

S45: Power Systems & Renewable Energy



Room: AL MURJAN 1

Chair: Amin El Meligi

S45.1 13:30 Management of Power Systems Interconnection to Realize Technical and Economical Potentials

[Abdullah Shaalan](#)

This work aims at exploring the effects of the interconnection between isolated electric power systems upon some important aspects such as enhancing reliability levels as well as reducing installation and operation costs. For this study to become meaningful and rewarding, the developed methodology has been applied to three existing power systems in the northern region of the Kingdom of Saudi Arabia presently within the concession domain of the Saudi Electric Company (SEC). These systems have been established to meet the present loads and withstand future electrical demands for a period of time before any additional generation and transmission facilities are needed. In this work, reliability measures have been utilized in order to know the period that these systems can withstand the present and future loads without affecting the reliability levels and the threshold that an additional capacity should be added in order to maintain those required reliability levels. In application to the reliability criteria, technical, operational and economic advantages can be realized, i.e., higher reliability levels and lower installation and operation cost after the proposed interconnection between these selected isolated power systems under study takes place.

S45.2 13:47 Secondary Voltage and Frequency Restoration Control of Droop-Controlled Inverter-Based Microgrids

[Allal El Moubarek Bouzid](#), [Pierre Sicard](#), [Simon Abourida](#) and [Jean-Nicolas Paquin](#)

Though microgrid technology has many advantages, stable operation with paralleled distributed generation must be ensured with proper controls. Droop control ensures distributed loading of DGs, but it has some limitations. Namely, a largest frequency deviation may occur if a large load demands reactive power sharing; the errors due to disproportional line impedance...etc. In order, correct the voltage and frequency steady-state deviations of controlled inverter-based micro-grid, the secondary control is needed. This paper proposes a primary and secondary control for islanded microgrid (MG) based on the P-V/Q-f droop control strategy. Based on the droop control method and the inverter's double-loop control, the primary control of hierarchical structure controls the distributed generations and loads, while secondary control allows restoration and improvement the quality for frequency and voltage magnitude after each load change. In this work, the virtual impedance is proposed in order improved the power sharing performance, by redesign the converters' equivalent output impedance as pure resistance. An islanded MG test system consisting of four DGs is built in MATLAB and RT-EVENTS of OPAL-RT technologies to illustrate our design approach. The effectiveness of the proposed control methodology is verified by the offline simulation

S45.3 14:05 Simulation of Distance Protection for Parallel Transmission Lines

[Abdelsalam Elhaffar](#), [Mohammed AL-Mahrooqi](#), [Haitham Alghafri](#), [Muhnnad ALyaqoubi](#), [Mohammed ALSadi](#) and [Hisham Soliman](#)

Adjacent parallel transmission lines raise more challenges to distance relaying because of mutual coupling effect between lines. This paper aims to study the distance protection influencing quantities because of parallel line connection. The benefit of this study is to recommend protection setting of electricity network distance protection strategy. Simulation is carried out using "DigSailent PowerFactory" program. As a special case, the effect of parallel line is taken into account the effect of mutual coupling of the parallel line has been modeled and simulated with current and voltage signals available from one end.

S45.4 14:22 Renewables demand a fundamental reassessment of the way we approach the design, construction and operation of grids

[Adrian Timbus](#) and [Georg Schett](#)

Renewables demand a fundamental reassessment of the way we approach the design, construction and operation of grids. Initially, there was a belief that renewables were simply an extension of the existing energy mix that we could integrate seamlessly without fundamental changes. Nothing could be further from the truth. Renewables have become one of the largest subsectors of power generation in many countries, with further, accelerated growth expected as the costs of these technologies fall. As a result, we are experiencing substantial challenges in maintaining the stability and reliability of grids. It is becoming clear that the main task is not simply to connect wind farms into existing systems, but to develop new, effective systems capable of incorporating ever-larger amounts of renewable energy. In most of the developed world, transmission and distribution grids were built based on the concept of large, centralized generation plants based on fossil fuels or nuclear energy. And it is a job they have performed very well and served reliably the end users. Furthermore, these plants are usually relatively close to the population and industrial centers that consume the power. That is changing, because renewable energy is strongly linked to location; wind turbines need to be installed where the wind blows — in remote countryside or far out to sea — which means production is often distant from the point of consumption. In many cases, we are aiming to feed large amounts of energy into the grid at its extreme fringes, a function it was never designed to handle, and where it may lack the required strength and capacity. There is also major growth in distributed generation, mainly solar, and combined heat and power, so distribution grids need the flexibility and smart capability to handle large numbers of small embedded generation units. The volatility and rapid ramp rates of wind and solar also lead to faster, larger, relatively unpredictable supply-side fluctuations in grids that were designed to handle predictable baseload generation, supported by peak-load plant. These challenges have technical implications in all aspects of the supply, transmission, distribution and use of electricity. This paper describes three particularly noteworthy developments: the growing importance of long-range, high-performance transmission networks; the development of smart power-management systems; and the integration of highly distributed elements, both in production and the smart management of consumption. In addition, the paper outlines existing technologies and their application in real-life projects to overcome the challenge of electrical transmission and distribution. Large-scale renewable generation, especially offshore wind, is driving the development of long-distance networks, especially those based on high-voltage direct-current (HVDC) technology. These networks have a key role to play in bringing wind energy produced far out to sea and integrating it into the onshore grid. They also enable the creation of interconnectors that allow the two-way transfer of energy between countries and regions, providing an effective method of compensating for the production peaks and troughs of different primary energy sources. An excellent example is the 1.7GW Skagerrak transmission system, comprising several HVDC links, which helps balance the loads between Norway's hydro-based system and Denmark's wind- and thermal-based generation. HVDC converters can also play an

important part in maintaining grid stability by providing vital support for grid frequency and voltage. The next steps will be the creation of long-distance, international, meshed, multi-terminal high-voltage grids that may even include offshore elements. With the introduction of our DC circuit-breaker in 2012, ABB removed the last main technical hurdle to achieving this with HVDC technology. In terms of smart power management, wind and other renewables can have a vital role in supporting system stability and reliability. They can also participate in ancillary markets through intraday markets and virtual power plants. The technology is already available, including the capability to integrate wind turbine controls with smart control systems and forecasting. For this to become reality, we need the energy-market reforms being prepared in Europe and expected in China. Of all the changes ahead, the continuing shift to highly distributed, variable generation will probably have the most far-reaching effects. Since a lot of the new generating capacity is being connected at the distribution level, there are much greater demands on system management. Furthermore, in the case of solar, the pronounced in-feed peaks call for congestion management. This demands a new kind of distribution grid. One that enables control protection schemes and new technology such as energy storage to ensure safety, continuity and quality of supply. One that offers a seamless integration of operational technology with information technology. And one that enables grid operators to deal with local issues, while taking the bigger picture into account. Renewable and grid management are also well covered in this paper demonstrating how wind and solar have become a reality in today's energy mix.

S45.5 14:40 MEC Based Scaling Laws for a Tape-Wound Transformer with Voltage Regulation and Core Loss included

[Ahmed A Tahir](#), [Abdelsalam Elhaffar](#), [Scott Sudhoff](#) and [Steven Pekarek](#)

In the system level design such as the design of distributed energy resources, it is required to perform system-level optimization. To achieve that without computational burden, the concept of scaling laws is considered. In this paper, an MEC based scaling technique is derived in which transformer size/mass is predicted based upon rated power, specified current density, and frequency. Curve-fitting techniques are used to derive a meta-model for scaled mass and power loss. The meta-model is compared to designs obtained using detailed design code. A strong agreement between the results from the detailed design code and that predicted by the meta-model is achieved.

S45.6 14:57 Dynamic Analysis of Turbine Rotor

[Gautham Rajeshwaran](#), [Sibi Chacko](#) and [Prashant Kumar Soori](#)

The paper presents the study for obtaining the time history response of a turbine rotor for random and harmonic excitations. Rotors are being used in many industries and constitute critical components of a complex dynamic system due to which they undergo various issues of extra energy consumption. This paper is analyzing a turbine rotor for harmonic and randomly fluctuating loads to obtain the responses. Fluctuation of natural frequencies of the system due to variation in rotational speed is analyzed. Modal, Harmonic and Random Vibrations Analyses tools are used in this work to study the dynamic characteristics of a rotor. The Mode shapes of the rotor are obtained for different rotational speeds. The critical speed and the whirl orbit of the rotor are also calculated from a Campbell Plot. The effect of fluctuating forces on the rotor is also analyzed. In case of random loading applied spectral density is white noise and response spectrum is obtained. These analyses are useful in predicting the rotor behavior before they are put into use. In this study, initially a simple single disc rotor is analyzed and its natural frequencies, mode shapes, unbalanced reaction due to forces, critical speeds, forward and backward whirls and the gyroscopic effects are determined for validation. Further study is extensively carried on an eight-disc industrial rotor

Thursday, May 11, 15:15 - 17:15

CLS: Closing Session

