

WIE Paper Presentation Schedule

Venue: Hotel Radisson Blu, Summit-3, Indore

Time allotted to each paper= 16 min (Presentation) + 4 min. (Questions)

WiE Technical Paper Presentation Session 1 (WIE-1)

Time Slot#1: 09:00 A.M. - 09:40 A.M

Paper #1 Title: Game Theoretic Resource Allocation in Full Duplex Modes: A Comparative Analysis

Authors: Shruti Walekar (SGSITS, India); Anjana Jain (Shri. G. S. Institute of Technology & Science, India); Prakash Vyavahare (S G S Institute of Technology and Science, India).

Abstract: With the exponential growth of mobile communication tele-density, the next generation mobile networks need to have improved network performance. Full duplex technology increases the spectral efficiency of the wireless communication system. Resource allocation is one the biggest challenges in the present generation wireless network. This paper addresses the problem of resource allocation considering self-interference in full-duplex modes. We compare the problem of resource allocation in full duplex modes to jointly maximize the system sum-rate. Simulation results compare the performance two different possible full duplex modes in a single cell network. Furthermore, it is shown that FD-HD mode and FD-FD mode outperforms the HD-HD mode in a single cell network.

Paper #2 Title: Entropy Measures Based Complexity Analysis of Impulse Noise Sources for xDSL/PLC Systems

Authors: Neelima Singh (IIT Delhi, New Delhi, India); Brejesh Lall (Indian Institute of Technology Delhi, India)

Abstract: The main objective of this paper is to do entropy measures based complexity analysis of impulse noises encountered in wireline communication systems. We have demonstrated in this paper that sample entropy, which is an information theory based statistical measure, is able to capture the time-domain complexity (in terms of variability and regularity) of impulse noises arising from most commonly used domestic electronic

appliances. Results show that sample entropy features based analysis of impulse noises may also aid in identifying the primary disturber (active noise source) and thus can be helpful in troubleshooting the performance issues in wireline communication systems.

WiE Technical Paper Presentation Session 2 (WIE-2)

Time Slot#2: 10:00 A.M. - 11:00 A.M

Paper #3 Title: Secure Hierarchical VANETs

Authors: Saumya Bhadauria and Ansuya Bohra (ABV-IIITM Gwalior, India)

Abstract: Routing in Vehicular Ad-hoc Networks (VANETs) is a complex task due to high mobility. In such cases, short lived routes need to be established, without any prior knowledge about the network topology. Approaching routing for the unpredictable traffic conditions of unplanned cities requires quick node discovery and validation. Moreover, geographic routing gives faster relay selection. The proposed approach includes these two features along with a circular search ensuring wider coverage. Proper radio propagation model with more than two rays - need to be implemented for an irregular terrain and to limit the losses due to different elevation of roads. Data redundancy plays a vital role in reducing the losses that might be caused due to misbehaving nodes or failure of a node.

Paper #4 Title: Machine Learning-based Fall Detection in Geriatric Healthcare Systems

Authors: Anita Ramachandran (Birla Institute of Technology and Science, Pilani, India); Adarsh Ramesh (Birla Institute of Science and Technology, Pilani, India); Anupama R (BITS Pilani K K Birla Goa Campus, India); Piyush Pahwa (Birla Institute of Technology & Science, Pilani, India)

Abstract: Intelligent IoT-based ambient assisted living systems (AALS) have been a major research focus area in recent times. According to the studies conducted by National Program for Health Care of the Elderly (NPHCE), elderly population in India will increase to 12% of the national population by 2025 with 8%-10% requiring utmost care. Application of machine learning in areas of AALS such as fall detection, therefore, has the potential to have huge public impact. In this paper, we propose a fall detection system that takes into account not only various wearable sensor node parameter readings for a subject, but also his biological and physiological profile. The profile is used to determine a fall risk category for the subject. We performed machine learning experiments using public datasets for fall detection which included wearable sensor node readings. The algorithms were then retrained by feeding in the risk categorization of the subject, and results from this analyses

are presented. The objective of the experiments was to find out the impact of a subject's risk categorization on the accuracy of fall detection. The algorithms presented here form part of a comprehensive geriatric healthcare system under development, which comprises wearable sensor nodes, coordinator nodes, an indoor localization framework and cloud-hosted application servers. A brief overview of the system capabilities is also presented.

Paper #5 Title: Novel Insights into Probability of Success of Random Access Scheme in 5G Millimeter Wave Cellular Network

Authors: Shilpi Varshney and Shreya Tyagi (BITS Pilani, Rajasthan, India); B. Sainath (BITS Pilani, India)

Abstract: In this paper, we consider a stochastic geometry model to investigate the Random Access CHannel (RACH) probability of success in the Internet of things (IoT) that uses millimeter wave (mmWave) technology. As we progress towards fifth generation (5G) to meet the data rate requirements, it becomes difficult for the conventional cellular networks to provide connectivity in the uplink to a huge number of connected devices, hence the adoption of mmWave technologies will speed the integration of IoT devices into the 5G network. The analysis takes into account various practical aspects like blockages, line-of-sight (LOS) and non-LOS (NLOS) regimes, base station and IoT device modeling using Poisson point process (PPP), directional beamforming, per device fractional power control (FPC). The following three scenarios are considered in our analysis: i) Success probability as a function of the signal power-to-noise ratio (SNR), ii) Success probability as a function of the signal power-to-interference ratio (SIR), and iii) Success probability in terms of signal power-to-interference plus noise ratio (SINR). Furthermore, we approximate the probability of success in LOS region using a simplified ball model for a large number of IoT devices. Using Monte Carlo simulations, the approximation of LOS-ball comes out to be sufficiently accurate with the analytical results for typical IoT and Base station (BS) density.

WiE Technical Paper Presentation Session 3 (WIE-3)

Time Slot#3: 11:30 A.M. - 12:10 P.M

Paper #6 Title: A Business Model for Place Time Capacity based Resource Allocation in an Aerial Radio Architecture

Authors: Purnima Lala (ITM University, India); Ambuj Kumar (Aarhus University, Denmark)

Timings:

Abstract: Aerial Radio Architecture (ARA) is a relatively new concept with a composite framework consisting of both airborne platforms and ground platforms. Recently, an

innovative Self Itinerant Intelligent Aerial Radio Architecture (SIIARA) was proposed that carry the capability to mitigate a unique and ever-nagging problem of any Wireless Communication Network (WCN) that has been defined as the Place Time Capacity (PTC problem). A technology is viable only if it serves any social needs, which can be measured in terms of 'values' it offers to the society. However, every value has some cost associated with it, and therefore, to be able to exercise in an ecosystem thoroughly, a technology must have an explicit business model which maps values with a cost (or profit). As ARA is a still at the research stage, not much of its business aspects have been surfaced so far. In this paper, we devise and discuss an accommodative and dynamic business model framework for SIIARA, with competence to relate its values and costs with a pragmatic formulation for future consideration. This paper also discusses the need and considerations of such a BM framework.

Paper #7 Title: A Framework for Mobile Crowd Sensing and Computing based Systems

Authors: Arpita Ray, Sarbani Roy, Chandreyee Chowdhury, Sakil Mallick, Sukanta Mondal and Soumik Paul (Jadavpur University, India)

Timings:

Abstract: These days mobile phones are having advanced onboard sensors embedded in it which makes connecting and computing much easier. This has led to realizing novel application paradigms such as crowd sensing and crowd computing. Crowd sensing relies on the sensing capabilities of the mobile devices as well as its communication efficiency to send collected sensed data to the cloud for further processing. On the other hand, mobile crowd computing is an amalgamation of the machine and human intelligence to achieve a given set of tasks in a distributed manner. Thus, crowd computing utilizes the computation and communication capability of the devices. Here in our work, we have come up with a novel approach integrating these two paradigms in a framework that have addressed both the issues of mobile sensing and crowd computing at the same time and utilized the ability of the crowd to solve problems without involving cloud servers in the backend. We have implemented our framework using 4 smart handheld devices for a route-finding application. The devices are connected to each other through BLE (Bluetooth Low Energy) technology. The results obtained can be received both online (using machine intelligence) and offline (using human intelligence) when no devices are connected to the internet. The device hence receiving the information, in turn, can itself be a contributor in the crowd for other route-finding queries solicited by another user in the crowd.

WiE Technical Paper Presentation Session 4 (WIE-4)

Time Slot#4: 12:40 P.M. - 01:00 P.M.

Paper #8 Title: A Power efficient DST-based multicarrier and multiple access systems for VLC

Authors: Suseela Vappangi (National Institute of Technology Warangal, India); Mani V V (National Institute of Technology Warangal, India)

Timings:

Abstract: Visible Light Communication (VLC) exploits cost effective light emitting diodes (LEDs) to render 'illumination' and 'communication' contemporaneously and is envisioned to meet the unprecedented growth in mobile data traffic. However, the slow transient response of white phosphorescent LEDs limits the modulation bandwidth. Consequently, orthogonal frequency division multiplexing (OFDM) is utilized to impart high data rate communication at the expense of emergence of high peak to average power ratio (PAPR). Furthermore, the limited dynamic range of LEDs makes this issue more pronounced as it leads to the emergence of detrimental non-linear distortions. This paper proposes discrete sine transform (DST)-based spreading for DC biased optical OFDM (DST-S-DCO-OFDM) to reduce PAPR. Unlike discrete Fourier transform (DFT)-based DCO-OFDM, DST-based DCO-OFDM doesn't require Hermitian symmetry criteria to attain a real signal transmission. Accordingly, there is a reduction in computational complexity as well as increase in spectral efficiency. In addition, single carrier frequency division multiple access (SC-FDMA) is expedited for reducing PAPR. Therefore, this work derives the analytical expressions for DST-based optical interleaved multiple access (DST-OIFDMA) and optical localized frequency division multiple access (DST-OLFDMA). The simulation results evidences that PAPR is decreased drastically by enforcing spreading technique when compared with conventional DST-based DCO-OFDM system. Furthermore, as depicted by the simulation results, the reduction in PAPR is more significant in DST-OIFDMA than DST-OLFDMA. However, DST-OIFDMA and DST-OLFDMA outperforms DST-based optical orthogonal frequency division multiple access (DST-OOFDMA).

WiE Technical Paper Presentation Session 5 (WIE-5)

Time Slot#5: 02:30 P.M. - 03:30 P.M.

Paper #9 Title: Novel Architectures for Efficient RF Usage in Hybrid FSO/RF System

Authors: Soyinka Nath and Shreesh Kumar Shrivastava (Netaji Subhas Institute of Technology, India); Sujata Sengar (Netaji Subhas Institute of Technology & Sector-3, Dwarka, India); Shree Prakash Singh (Netaji Subhas Institute of Technology, India)

Abstract: The availability of Free Space Optical (FSO) links is limited by weather conditions. To improve overall system availability, an RF link is established in parallel to the FSO link forming a "Hybrid FSO/RF" system. In this conventional Hybrid FSO/RF system, the RF link's role is limited to that of a back-up link, thus, the RF resource remains largely underutilized. Since RF resource is scarce, thereby, it is necessary to utilize it to the maximum extent possible. With this aim in mind, we propose and investigate some new system architectures for enhancing utilization of this back-up RF link. Two schemes, namely, "Shared-RF" and "On-Demand" are discussed. These architectures are proposed as some variants of the conventional Hybrid FSO/RF system which help to improve the overall system outage and RF link utilization.

Paper #10 Title: Comprehensive Dynamic Spectrum Allocation in multi-PU multi-SU CRN using Coalition Game Theory

Authors: Rakhi Khedkar (Savirtibai Phule Pune University & College Of Engineering Pune., India); Rajendrakumar Anantrao Patil (College Of Engineering Pune & Indian Institute of Technology Bombay, India)

Abstract: For optimal Dynamic Spectrum Allocation (DSA) in multi-PU (Primary User) multi-SU (Secondary User) Cognitive Radio Network (CRN) it is necessary to study the comprehensive the behaviour of each SU. In this paper, we have designed the database-assisted CRN using Coalition Game Theory (CGT) to enhance the involvement of maximum SUs present in the network. In this model, we have formed the Pareto optimal coalitions considering hidden/mobile/remotely located SUs scenario. To boost the spectrum allocation rate of this CRN we have proposed a DSA technique using an even and odd channel allocation scheme. To this end, we have exploited a comprehensive function of the behaviour of each SU. The simulation results show that compared with the former coalition game SUs payoff, the payoff of each SU is improved and interference-free spectrum allocation is possible using the proposed channel allocation scheme.

Paper #11 Title: Investigation of Transmission Impairment for Dynamic Base Unit Channel Allocation in DWDM Systems

Authors: Yugnanda Malhotra (Bharati Vidyapeeth College of Engineering & Bharati Vidyapeeth's College Of Engineering, India)

Abstract: The traditional approach of Fixed Base Units (FBU) in Unequally Spaced (US) Dense Wavelength Division Multiplexed (DWDM) systems outperforms Equally Spaced (ES)DWDM Systems. Currently in the scenarios of diverse bandwidth requirements for next generation optical communication systems, a novel Dynamic Base Unit (DBU) unequal channel (US) allocation strategy is designed, and the performance benefits are investigated over the traditional existing Fixed Base channel allocations. The proposed algorithm decides the total number of base units covering the optical bandwidth. After the channel allocation in the first base unit $[[BU]]_{(i=0)}$ the current work discusses the case of reducing the number of channels in subsequent Base Unit ($[[BU]]_{(i=1,2 \dots)}$) by a factor of 2. Moreover, the adjacent base units are allotted even and odd frequency slots. Thus, an optimum strategy where maximum non-uniformity is taken care of in channel allocations. This drastically reduces the nonlinear effects of Four Wave Mixing (FWM) prominent in DWDM systems using Dispersion Shifted Fiber. The proposed algorithm is evaluated in terms of the bandwidth occupancy and number of Four Wave Mixing products. Performance up to greater than 34.6% reduction in FWM is observed. Bandwidth occupancy shows 13.7%,6.25% and 7.45% reduction than the popular Unequally Repeated US (URUS), Paired URUS and Alternately Paired RUS (PURUS) schemes respectively. The high improvement factor is observed when using DBU-US . It is concluded that Dynamic Base Unit-Unequally Spaced channel allocation is superior and is considered a suitable candidate for high speed DWDM transmission systems.

WiE Technical Paper Presentation Session 6 (WIE-6)

Time Slot#6: 04:20 P.M. - 05.00 P.M.

Paper #12 Title: REDEAR: Relative Density Aware Routing Algorithm for Energy Efficiency in MANETs

Authors: Shreya Roy (Indian Institute Of Technology, Guwahati, India); Sonali Chouhan (Indian Institute of Technology Guwahati, India)

Abstract: Next generation Mobile Ad-hoc Networks (MANETs) need to deal with high speed, e.g., moving vehicles, unmanned aerial vehicle (UAVs). Typical MANET devices are battery operated and hence energy consumption is a critical issue. MANET requires robust routing protocols because of its dynamic nature. For dynamically changing network topology, reactive routing protocols find routes by broadcasting the control packets. For achieving energy efficiency, our proposed RELative DENSITY Aware Routing (REDEAR) algorithm makes sure that only selected nodes act as packet forwarders based on the relative node density with respect to the neighbors. Eventually the number of redundant Route Request (RREQ) messages is reduced. Moreover, we propose a variant of the proposed algorithm for further improvement in the energy efficiency for the higher node density MANETs. The proposed algorithm works effectively for low to very high speed MANETs. Extensive simulation studies confirm the energy efficiency of the proposal. We obtain an improved energy efficiency of up to 21.8% at low speed and up to 30% at very high speed vis-a-vis AODV reactive protocol. Our proposed algorithm results in better network lifetime and connectivity.

Paper #13 Title: Secure Lightweight Data Transmission Scheme for Vehicular Ad hoc Networks

Authors: Harsha Vasudev (BITS Pilani Goa Campus, Goa, India); Debasis Das (BITS Pilani Goa Campus, India)

Abstract: In this digital era, it is very difficult to think of any situation in our daily life that is not using Information and Communication Technology (ICT). It is the main component and infrastructure that empower modern computing. These improvements offer many useful features in automobiles industry as well. It emphasis on green environment, engines with high performance, secure design, etc. The concept of an intelligent transportation system or smart transport includes a large range of methods and applications. The use of embedded intelligence to connect the vehicles, to the infrastructure and central sites make them smart. Smart transportation achieves smart policy goals in the urban environment, such as increased mobility, better safety, reduced emissions, minimum fuel usage, or economic

competitiveness. The VANET (vehicular ad-hoc network) has the ability to build better solutions for poor road conditions, traffic congestions, weather predictions, driving safety, passenger comfort, and other related applications by exchanging data on the road. However, it is not an easy task to ensure secure data transmission in VANETs due to different challenges such as dynamic topology, different direction, high mobility, etc. In our scheme, we propose a lightweight secure authentication and communication system for VANETs. Our protocol mainly focuses on one of the main application of VANETs, that is warning messages. Analysis and results demonstrates that our protocol outperforms well in different perspectives such as communication, storage and computation cost.

WiE Technical Paper Presentation Session 6 (WIE-6)

Time Slot#7: 05:20 P.M. - 06.40 P.M.

Paper #14 Title: Performance Analysis of Offloading in NOMA-HetNets using Imperfect CSI

Authors: Pragya Swami and Vimal Bhatia (Indian Institute of Technology Indore, India); Satyanarayana Vuppala (United Technologies Research Center, Ireland); Tharmalingam Ratnarajah (The University of Edinburgh, United Kingdom (Great Britain))

Abstract: The increase in number of cellular users had lead to the evolution from the traditional cellular networks to the more efficient heterogeneous cellular networks (HetNet) to handle the traffic. Offloading plays a vital role in handling the traffic from the congested macro base station by handing users to the less congested femto base stations (FBS). Further, non-orthogonal multiple access (NOMA) has proved to be efficient for the future generation networks. In this work, we study the offloading in HetNets, where the FBS tier serves the users using NOMA. Imperfect channel state information (CSI) is considered to analyze the outage probability of offloaded user, since, in practice CSI estimation requires significant system overhead, especially when the number of users are large. Hence, for practical systems, the analyses with imperfect CSI is more relevant. Some important observation regarding offloading to FBS tier with NOMA based on imperfect CSI are drawn. The analytical results are validated using Monte Carlo simulations.

Paper #15 Title: Apache Spark Based Analytics of Squid Proxy Logs

Authors: Deepika Dutta Mishra, Salim Pathan and Csrc Murthy (BARC, India)

Abstract: Internet today is an integral part of an organization's working. It is vital to monitor Internet traffic closely in order to detect threats and malicious activities which may not only impact the reputation of an organization but also lead to data loss. One way of achieving this goal is to monitor the logs of critical applications like proxy server which contains crucial

information related to Internet activity. Log data is often huge and is ever growing. Also, forensic analysis of an event requires not only current data but also historical one. This poses a big problem of efficient and fast storage and retrieval of data. Traditional RDBMS technologies fail in such situations but with the advent of big data technologies like Apache Hadoop and Apache Spark this task has now become feasible. In this paper, we propose a Spark based system for analysis of Squid proxy logs. Using this system we generate statistics like top domains accessed, top users etc for studying traffic behavior within organization and detect malicious activity. We further study the variation in proposed system's performance with increase in data volume and variation in spark parameters like number of executors, number of executor cores and executor memory. From our experimental study we conclude that log analysis with Spark is extremely fast with no significant performance variation observed with increase in data volume. The challenging task, however, is selecting spark parameters for getting optimal performance.

Paper #16 Title: Adaptive Resource Block Allocation for Green 5G Wireless Communication Network

Authors: Pimmy Gandotra (Shri Mata Vaishno Devi University, India)

Abstract: The most precious resource for the mobile network operators (MNOs) is the radio spectrum, cardinal for meeting the quality of service (QoS) requirements of the users. An integral technology of the budding fifth generation (5G) wireless communication networks (WCNs) is device-to-device (D2D) communication. To make use of the gains offered by D2D communication, optimal resource sharing with the cellular users in the network is necessitated. This paper proposes an adaptive resource block (RB) allocation scheme, using Hidden Markov Model (HMM), to assure adequate resource availability to each demanding D2D pair in the network. The adaptive allocation of resources improves the system throughput and energy efficiency (EE), meeting the QoS demands of the D2D pairs and fostering green communication. Since RB sharing is between pairs and cellular users, interference rises. The improvement in performance is achieved by sectoring the cellular coverage region, which diminishes the interference levels. The potency of the proposed adaptive scheme has been verified through simulations

Paper #17 Title: Mechanism of dynamic, impact-aware and context-aware orchestration of cognitive functions in 5G networks

Authors: Ramya Ravichandran, Krishna Moorthy M and Swaminathan Seetharaman (Wipro Ltd, India)

Abstract: As networks grow in size, heterogeneity and complexity, the automated management and orchestration of the network to maintain service SLAs becomes essential. With the advent of 5G, network slicing adds another dimension to this challenge. Cognitive functions play a key role in autonomic orchestration, and as cognitive functions increase in number, variety and are increasingly distributed to play an effective role. In such a scenario, effective end-to-end orchestration of the cognitive functions is vital to reap the full benefits of the available intelligence for automated operation. Existing work in orchestrating cognitive functions have limitations in scope and coverage, and address only certain aspects. We propose a dynamic, context and impact-aware end-to-end orchestration of cognitive functions in the network, resulting in improved overall Service Level Agreements (SLAs) adherence of all services and network slices, and improved operational efficiency by minimizing human intervention.