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PERSONAL INFORMATION

Sumit Kumar

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https://scholar.google.co.in/citations?user=-qjjN2sAAAAJ&hl=en

EDUCATION AND TRAINING

04/01/2016–Present

Ph.D. in Wireless Communications

University Pierre and Marie CURIE (UPMC), Paris (France)

Ph.D. Thesis: Simultaneous multi-standard SDR platform

Advisor: Dr. Florian Kaltenberger, Eurecom, France

Abstract: Software Defined Radio (SDR) has been a promising concept for many years. Finding its use mostly in military applications, it is getting closer every day to consumer devices, for example NVIDIA® i500 LTE modem and NVIDIA® Tegra 4i processor with integrated i500 modem. Motivated by the capabilities of SDR, in this ongoing work, our objective is implementation of a Multi-standard Simultaneous SDR (MS-SDR) platform capable of transmitting and receiving different radio standards simultaneously. MS-SDR will use single RF front-end and COTS hardware. We address several associated challenges such as cross technology co-channel interference, finite ADC bit-width, channelization etc. We are developing an Ingredient-plus Recipe based approach for MS-SDR platform. Our approach provides generic signal processing toolboxes (ingredients) and a decision tree (recipe) to choose the ingredients and configure them according to the recipe when homogeneous or heterogeneous wireless standards have to be transmitted/received using a single RF frontend.

01/08/2010–28/10/2014

MS by Research in Electronics and Communication Engineering

International Institute of Information Technology, Hyderabad (India)

MS Thesis : Efficient Spectrum Sensing & Testbed Development for Cognitive Radio Based Wireless Sensor Networks
Advisor: Dr. Garimella Rama Murthy, IIIT Hyderabad.

Abstract: The goal of my research work was development and analysis of efficient spectrum sensing and spectrum monitoring methods for Cognitive Wireless Sensor Network (CRWSN). I proposed an energy efficient doubly cognitive architecture (DCA) for spectrum sensing. This spectrum sensing architecture is cognitive with respect to time and space. This architecture is efficient in reducing spectrum sensing time and improving the lifetime of CRWSN. We also proposed a novel method for spectrum monitoring which is capable of detecting reappearance of licensed users in real time. Additionally, we developed a CRWSN testbed which is first of its kind to the best of our knowledge. The testbed is equipped with significant features such as user access to realize re-configurability, dynamic spectrum access, user mobility and cooperation between CRWSN nodes.

01/07/2004–30/06/2008

B. Tech in Electronics and Communication Engineering

Gurukula Kangri University, Haridwar (India)

B-Tech Thesis : Modules for Software Defined Radio
Advisor: Dr. Vipul Sharma, FET, GKV, Haridwar.

Abstract: The goal of this work was study and simulation of various modules of Software Defined Radio and benchmark their performance in a dynamically varying radio environment. Multiple LOS and NLOS channel models were simulated and accordingly appropriate modulation and coding scheme was choosen by the cognitive engine in order to minimize the BER. The simulation was performed in baseband using MATLAB 6.0 and C++.

WORK EXPERIENCE

30/10/2014–30/11/2015

Research Associate

Signal Processing and Communication Research Center, International Institute of Information Technology, Hyderabad (India)

- Development and analysis of efficient spectrum sensing and spectrum monitoring schemes for Cognitive Radio based Wireless Sensor Networks(CRWSN).
- Development of CRWSN testbed on SDR platform.

01/08/2012–30/12/2012 **Teaching Assistant for Information Theory and Coding**
International Institute of Information Technology, Hyderabad (India)

01/01/2012–30/04/2012 **Teaching Assistant for Wireless Communications**
International Institute of Information Technology, Hyderabad (India)

01/08/2011–30/12/2011 **Teaching Assistant for Information Theory and Coding**
International Institute of Information Technology, Hyderabad (India)

PERSONAL SKILLS

Mother tongue(s): Hindi

Foreign language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C2	C2	C2	C2	C2
French	A1	A1	A1	A1	A1

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user
Common European Framework of Reference for Languages

Job-related skills

Courses:
- Wireless Communication(Expert)
- Adaptive Signal processing(Intermediate)
- Machine Learning(Intermediate)

Software:
- Programming Languages: C, C++,and Python.
- Scientific Packages: MATLAB, GNU Radio, UHD, Openairinterface, Visual Studio, Code Composer Studio

Hardware:
- Universal Software Radio Peripheral Version 1 & 2, N210, E100, B210

ADDITIONAL INFORMATION

Publications

Patent

- A system for Implementation of Doubly Cognitive Wireless Sensor Networks, India Patent Application 3779/CHE/2011. Granted (2011-2031). Inventors: SumitKumar, Garimella Rammurthy.

Journals

- Doubly Cognitive Architecture Based Cognitive Wireless Sensor Network. Authors: Sumit Kumar, Deepti Singhal, Garimella Ramamurthy, International Journal of Wireless Networks and Broadband Technologies (IJWNBT) Vol. 1, Issue 2 June 2011.
- SDR implementation of a Robust OFDM Receiver under multiple co-channel interference. Submitted to Special Issue on "Systems and Networks for 5G Implementation" of the EURASIP Journal on Wireless Communications and Networking 2018.

Conference Papers

- Kumar Sumit, Kaltenberger Florian, Kloiber Bernhard, Ramirez Alejandro, A WiFi SIC receiver in the presence of LTE-LAA for indoor deployment, submitted to IEEE Wireless Communications and Networking Conference, WCNC 2019.
- Kumar Sumit, Kaltenberger Florian, Kloiber Bernhard, Ramirez Alejandro, Robust OFDM Diversity Receiver Under Co-channel Narrowband Interference, in the 14th IEEE International Conference on Wireless and Mobile Computing, Networking and Communications, WiMOB 2018, Cyprus.
- Kumar Sumit, Kaltenberger Florian, Kloiber Bernhard, Ramirez Alejandro, A Robust Decoding Method for OFDM Systems Under Multiple Co-channel Narrowband Interferers, in the 27th European Conference on Networks and Communications, EuCNC 2018, Slovenia.
- Efficient Spectrum Sensing/Monitoring Methods and Test bed Development for Cognitive Radio based WSN in 2014 Wireless Innovation Forum Conference on Communications Technologies and Software Defined Radio (SDR-WInnComm 2014), Authors: Sumit Kumar, Garimella Ramamurthy
- Machine Learning Based Cooperative Relay Selection in Virtual MIMO in Wireless Technical Symposium April 2015, Authors: Kunal Sankhe, Chandan Pradhan, Sumit Kumar, Garimella Ramamurthy
- Full Duplex eNodeB and UE Design for 5G networks in Wireless Technical Symposium April 2015, Authors: Chandan Pradhan, Kunal Sankhe, Sumit Kumar, Garimella Ramamurthy
- Revamp of eNodeB for 5G Networks: Detracting Spectrum Scarcity in IEEE Consumer Communication and Networking Conference: IEEE CCNC December 2014 Authors: Chandan Pradhan, Kunal Sankhe, Sumit Kumar, Garimella Ramamurthy
- Cognitive Base Station Design for Efficient Spectrum Utilization in Cellular Network in Eleventh International Conference on Wireless and Optical Communications Networks WOCN2014 June 2014, Authors: Kunal Sankhe, Chandan Pradhan, Sumit Kumar, Garimella Ramamurthy
- Cost Effective Restoration of Wireless Connectivity in Disaster Hit Areas using OpenBTS in INDICON December 2014, Authors: Chandan Pradhan, Kunal Sankhe, Sumit Kumar, Garimella Ramamurthy

Demonstrations

- Mitigating Multiple Narrowband Interferers in SDR IEEE 802.11g Diversity Receiver in the 24th Annual Conference on Mobile Computing and Networking, ACM MobiCom 2018, New Delhi, India. Sumit Kumar, Florian Kaltenberger.
- SDR Implementation of Narrow-Band Interference Mitigation in Wide-band OFDM Systems in the 19th IEEE International Workshop on Signal Processing Advances on Signal Processing Advances in Wireless Communications, SPAWC 2018, Kalamata, Greece. Sumit Kumar, Florian Kaltenberger.

Book Chapters

- Cognitive Radio based mobile and static Wireless Sensor networks in Intelligent Wireless sensor networks. Authors: Sumit Kumar, Deepti Singhal, and Garimella Rama Murthy. Publisher: Taylor & Francis LLC, CRC Press, December 2012
- Mobile Wireless sensor networks: A Cognitive Approach in Wireless Sensor Networks : From Theory to Applications. Authors: Sujeeth Nanda, Sumit Kumar, and Garimella Rama Murthy. Publisher: Taylor and Francis LLC, CRC Press December 2013
- Cooperative Mesh Networks in Wireless Technologies: 3G and Beyond. Authors: Sumit Kumar, Dr. Garimella Rama Murthy, Dr. Naveen Chilamkurti. Publisher: Springer May 2013

Research Projects

- **SDR Implementation of narrowband interference mitigation in 802.11g receivers.**

This work includes development of real time single antenna WiFi receiver capable of mitigating co-channel narrowband zigbee interference to Wi-Fi. A combination of GNU Radio and Openairinterface was used along with Ettus USRP B210.

- **SDR Implementation of Soft Bit Maximal Ratio Combiner for 802.11g receivers.**

This work includes implementation of real time Soft Bit Maximal Ratio Combiner for multi-antenna WiFi receivers. A combination of GNU Radio and Openairinterface was used along with Ettus USRP

B210.

- **Mobile and Static Cognitive Wireless Sensor Networks(Funded by DIETY, Govt of India)**

Development and analysis of efficient spectrum sensing and real time spectrum monitoring scheme for CRWSN. OFDM spectrum sculpting and development of SDR based CRWSN testbed.

- **Testbed for Cognitive Radio based WSN**

Development of CRWSN testbed with USRP SDR in the range 2.4-2.5GHz. Functions such as spectrum sensing, spectrum monitoring, cooperative spectrum sensing, cooperative relaying(multi-hop off-frequency) etc were implemented.

- **Implementation of spectrum sculpting in OFDM with Universal Software Radio Peripheral(USRP) & GNU Radio**

Development of non-contiguous OFDM (NC-OFDM) on GNU Radio and over the air transmission with USRP SDR. Later the module was used for CRWSN testbed.

Technical Blogs and Screencasts

I maintain my screencast and blog on GNU Radio and USRP. Both of them are on the official tutorial listing of GNU Radio (Sumit's Screencast and Sumit's Blog)

- **Blog** : http://sumitgnuradio.blogspot.com/
- **Screencast** : https://www.youtube.com/user/2011HPS/