Editor
Valeri Mladenov

Recent Advances in Electrical Engineering and Computer Science

- **Proceedings of the 8th International Conference on Circuits, Systems and Signals (CSS '15)**
- **Proceedings of the 6th International Conference on Design and Product Development (ICDPD '15)**

  Michigan State University, East Lansing, MI, USA, September 20-22, 2015

- **Proceedings of the 13th International Conference on Electronics, Hardware, Wireless and Optical Communications (EHAC '15)**

  Seoul, South Korea, September 5-7, 2015

Hosted by

Recent Advances in Electrical Engineering and Computer Science

RECENT ADVANCES in ELECTRICAL ENGINEERING and COMPUTER SCIENCE

Proceedings of the 8th International Conference on Circuits, Systems and Signals (CSS '15)
Proceedings of the 6th International Conference on Design and Product Development (ICDPD '15)

Michigan State University, East Lansing, MI, USA
September 20-22, 2015

Proceedings of the 13th International Conference on Electronics, Hardware, Wireless and Optical Communications (EHAC '15)

Seoul, South Korea
September 5-7, 2015

Hosted by

Recent Advances in Electrical Engineering Series | 54

ISSN: 1790-5117
ISBN: 978-1-61804-340-5

RECENT ADVANCES in ELECTRICAL ENGINEERING and COMPUTER SCIENCE

Proceedings of the 8th International Conference on Circuits, Systems and Signals (CSS '15)
Proceedings of the 6th International Conference on Design and Product Development (ICDPD '15)

Michigan State University, East Lansing, MI, USA
September 20-22, 2015

Proceedings of the 13th International Conference on Electronics, Hardware, Wireless and Optical Communications (EHAC '15)

Seoul, South Korea
September 5-7, 2015

Published by WSEAS Press
www.wseas.org

All papers of the present volume were peer reviewed by no less that two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.

ISSN: 1790-5117
ISBN: 978-1-61804-340-5

RECENT ADVANCES in ELECTRICAL ENGINEERING and COMPUTER SCIENCE

Proceedings of the 8th International Conference on Circuits, Systems and Signals (CSS '15)
Proceedings of the 6th International Conference on Design and Product Development (ICDPD '15)

Michigan State University, East Lansing, MI, USA
September 20-22, 2015

Proceedings of the 13th International Conference on Electronics, Hardware, Wireless and Optical Communications (EHAC '15)

Seoul, South Korea
September 5-7, 2015

Table of Contents

Plenary Lecture 1

Improvement of Spectrum Sensing Performance in Cognitive Radio Networks

Professor Vyacheslav Tuzlukov
Department of Information and Communication Technologies
School of Electronics Engineering
College of IT Engineering
Kyungpook National University
South Korea
Email: Tuzlukov@ee.knu.ac.kr

Abstract: The implementation of the generalized detector (GD) constructed based on the generalized approach to signal processing (GASP) in noise in cognitive radio (CR) systems allows us to improve the spectrum sensing performance in co-mparison with employment of the conventional detectors. We analyze the spectrum sensing performance for the uncorrela-ted and spatially correlated receive antenna array elements. We derive the probability of false alarm and detection thresh-old under employment of the GD in CR systems for two scenarios: firstly, the independent antenna array elements, and se-condly, the correlated antenna array elements. The energy detector (ED) and GD spectrum sensing performances are com-pared under the same initial conditions. The simulation results show that implementation of the GD improves the spectrum sensing performance in CR network systems both for independent and correlated antenna array elements. Additionally, we consider a practical case when the noise power at the output of GD linear systems (the preliminary and additional filters) is differed by value. The optimal GD threshold choice based on the minimum total error rate criterion is also discussed. Sim-ulaion results demonstrate superiority of GD implementation in CR network system as spectrum sensor in comparison with the ED, weighted ED (WED), maximum-minimum eigenvalue (MME) detector, and generalized likelihood ratio test (GLRT) detector. Most commonly used spectrum sensing techniques in CR networks such as the ED, matched filter (MF), and others suffer from the noise uncertainty and signal-to-noise ratio (SNR) wall phenomenon. These detectors cannot ach-ieve the required signal detection performance regardless of the sensing time. Additionally, we can employ the GD in CR network based on antenna array with the purpose to alleviate the SNR wall problem and improve the signal detection robu-stness under the low SNR. The simulation results confirm our theoretical issues and effectiveness of GD implementation in CR networks based on antenna array. The weighted GD (WGD) and the generalized likelihood ratio test for GD (GLRT-GD) are proposed to be used for spectrum sensing when the noise power is known and unknown, respectively. The GD op-timal detection threshold is defined based on criterion of the minimum probability of error for different fading channels, namely, the additive white Gaussian noise (AWGN), Nakagami-m, and Rayleigh fading channels. The GD spectrum sens-ing performance is compared with the spectrum sensing performance of the ED, WED, MME detector, generalized likeli-hood ratio test for ED (GLRT-ED), MF, and arithmetic to geometric mean (AGM) detector. The simulation results demon-strate superiority in the spectrum sensing performance of any GD form in comparison with the above mentioned detectors. The GD implementation in CR networks allows us to achieve a considerable spectrum sensing performance improvement both for the uncorrelated and independent and correlated antenna array elements.

Brief Biography of the Speaker: Dr. Vyacheslav Tuzlukov received the M.Sc. and PhD degrees in radiophysics from the Belarussian State University, Minsk, Belarus in 1976 and 1990, respectively. From 2000 to 2002 he was a Visiting Professor at the University of Aizu, Japan and from 2003 to 2007 served as an Invited Professor at the Ajou University, Suwon, South Korea, within the Department of Electrical and Computer Engineering. Since March 2008 to February 2009 he joined as Full Professor at the Yeungnam University, Gyeonsang, South Korea within the School of Electronic Engine-ering, Communication Engineering, and Computer Science. From Mach 2009 he is a Full Professor and Director of Signal Processing Lab at the Department of Communication and Information Technologies, School of Electronics Engineering, College of IT Engineering, Kyungpook National University, Daegu, South Korea. His research emphasis is on signal pro-cessing in radar, wireless communications, wireless sensor networks, remote sensing, sonar, satellite communications, mo-bile communications, and other signal processing systems. He is the author over 250 journal and conference papers, 16 bo-oks in signal processing published by Springer-Verlag, CRC Press, and Nova Science Publishers, Inc, USA. Some of them are Signal Detection Theory (2001), Signal Processing Noise (2002), Signal and Image Processing in Navigational Syst-ems (2005), Signal Processing in Radar Systems

(2012), Editor of the book Communication Systems: New Research (2013), Nova Science Publishers, Inc, USA, and has also contributed the following book chapters “Underwater Acoustical Signal Processing” and “Satellite Communications Systems: Applications” to Electrical Engineering Handbook: 3rd Editi-on, 2005, CRC Press; “Generalized Approach to Signal Processing in Wireless Communications: The Main Aspects and Some Examples” to Wireless Communications and Networks: Recent Advances, INTECH, Croatia 2012; “Wireless Com-munications: Generalized Approach to Signal Processing” and “Radio Resource Management and Femtocell Employment in LTE Networks”, to Communication Systems: New Research, Nova Science Publishers, Inc., USA, 2013; “Radar Sensor Detectors for Vehicle Safety Systems” to Autonomous Vehicles: Intelligent Transport Systems and Automotive Technolo-gies, Publishing House, University of Pitesti, Romania, 2013; “Radar Sensor Detectors for Vehicle Safety Systems” to Au-tonomous Vehicles: Intelligent Transport Systems and Smart Technologies, Nova Science Publishers, Inc., New York, 2014; “Signal Processing by Generalized Receiver in DS-CDMA Wireless Communication Systems” to Contemporary Is-sues in Wireless Communications, INTECH, Croatia, 2014; “Detection of Spatially Distributed Signals by Generalized Re-ceiver Using Radar Sensor Arrays in Wireless Communications,” to Advances in Communications and Media Research, Nova Science Publishers, Inc., New York, 2015 (in press).

Dr. Tuzlukov serves as the Editor-in-Chief of SOP Transactions on Signal Processing and American Journal of Sensor Technology; Associate Editor of International Journal on Communications; WSEAS Transactions on Communications; Editor of Journal of Wireless Communications and Networks; International Journal of Wireless Communications and Mo-bile Computing; International Journal of Research Studies in Science, Engineering and Technology; Member of Editorial Board of the Azerbaijan Journal of Physics “Fizika ”; International Journal on Computer Technology and Application; In-ternational Journal on Research Studies in Science, Engineer-ing and Technology; International Journal of Modern Scien-ces and Engineering Technologies; International Journal on Advances in Signal Processing; SOP Transactions on Signal Processing; SOP Transactions on Wireless Communications. He participates as Keynote Speaker, Plenary Lecturer, Chair of Sessions, Tutorial Instructor and organizes Special Sections at the major International Conferences and Symposia in Si-gnal Processing area.

Dr. Tuzlukov was highly recommended by U.S. experts of Defence Research and Engineering (DDR& E) of the United States Department of Defence as a recognized expert in the field of humanitarian demining and minefield sensing techno-logies and had been awarded by Special Prize of the United States Department of Defence in 1999 Dr. Tuzlukov is distin-guished as one of the leading achievers from around the world by Marquis Who’s Who and his name and biography have been included in the Who’s Who in the World, 2006-2013; Who’s Who in World, 25th Silver Anniversary Edition, 2008, Marquis Publisher, NJ, USA; Who’s Who in Science and Engineering, 2006-2012 and Who’s Who in Science and Engine-ering, 10th Anniversary Edition, 2008-2009, Marquis Publisher, NJ, USA; 2009-2010 Princeton Premier Business Lead-ers and Professionals Honours Edition, Princeton Premier Publisher, NY, USA; 2009 Strathmore’s Who’s Who Edition, Strathmore’s Who’s Who Publisher, NY, USA; 2009 Presidental Who’s Who Edition, Presidental Who’s Who Publisher, NY, USA; Who’s Who among Executives and Professionals, 2010 Edition, Marquis Publisher, NJ, USA; Who’s Who in Asia 2012, 2nd Edition, Marquis Publisher, NJ, USA; Top 100 Executives of 2013 Magazine, Super Network Publisher, New York, USA, 2013; 2013/2014 Edition of the Global Professional Network, Business Network Publisher, New York, USA, 2013; 2013/2014 Edition of the Who’s Who Network Online, Business Network Publisher, New York, USA, 2014; On-line Professional Gateway, 2014 Edition, Business Network Publisher, New York, USA, 2014; 2014 Worldwide Who's Who, Marquis Publisher, NJ, USA; 2014 Strathmore Professional Biographies, Strathmore’s Who’s Who Publisher, NY, USA; 2015 Strathmore Professional Biographies, Strathmore’s Who’s Who Publisher, NY, USA; Who’s Who in World, 2015, Marquis Publisher, NJ, USA

Plenary Lecture 2

The Design of Sensor Networks for Detection of Faults in Smart Power Grids

Professor Demetrios Kazakos
Texas Southern University
USA
E-mail: demetrios114@yahoo.com

Abstract: The development of secure and dependable Smart Grids in Power Systems is an important design goal. The design of a dedicated sensor network that will monitor the secure and dependable, failure resistant, operation of a Smart Grid is a major objective of our research in such systems. The main thrust of our effort is to advance the use of statistical methodology to model the failure of a link or group of links or of a subsystem of a Smart Grid. We propose and study methods for failure detection in a Smart Grid by viewing such failures as the cause creating abrupt changes in the traffic patterns of the power flow. Such approaches have been effective in monitoring the reliability of Communication Networks. In our current work, we expand the same approach for monitoring the secure and dependable operation of Smart Power Grids. The main idea is that a sudden fault of a link, groups of links or of a subsystem will cause an abrupt change in the energy or current flow patterns. In this talk we discuss the use and advances of the novel approach of using statistical tools of decentralized fastest change detection as a building tool of a theoretical and practically implementable change detection and an associated fault detection system. There is a need to advance the state of the art, making the current approaches more sophisticated and flexible to respond to changing, dynamic failure patterns. It is expected that the resulting algorithms and monitoring sensor network systems will improve the reliability and dependability of Smart Power Grids. This research has been conducted at Texas Southern University during the past 3-4 years.

Brief Biography of the Speaker: Dr Demetrios Kazakos received his Diploma in Electrical and Mechanical Engineering from the National Polytechnic University of Greece. He then started graduate his graduate studies in the United States. He received a Master of Arts degree in Electrical Engineering from Princeton University and a Doctor of Philosophy degree from the University of Southern California, specializing in Statistical Communication Theory. In 1980, he joined the Electrical Engineering Department of the University of Virginia,where he stayed until 1993.
In 1992, he was elevated to the grade of Fellow of IEEE, for his research in two areas: Enhanced Algorithms for Multiuser Multiaccess Networks and Statistical Pattern Recognition. In 2009, he was elevated to the grade of IEEE Life Fellow.
In 1993 he accepted the position of Head of the Electrical and Computer Engineering of the University of Southwestern Louisiana. At the same time he has always been a very active participant in IEEE conference organizing and editorial activities. He was Editor of the IEEE Transactions on Communications for 5 years, Technical Program Chair for two major IEEE Conferences, and member of the Technical Program Committee for several IEEE and other conferences.
In 1983 he started a new company named HITEC, INC, which undertook several Research and Development projects in Information Technology, funded by the U.S. Department of Defense and the European Community.
In 2001, he undertook the position of Professor and Chair of the Electrical Engineering and Computer Science Department at the University of Toledo. In 2004, he moved to the University of Idaho, as Professor and Chair of the Electrical and Computer Engineering Department.
From 2006 to 2008, he was Dean of the College of Science and Technology at Texas Southern University. From September 2009 to September 2011, he was at the National Science Foundation in the position of
Program Director responsible for the Program: “Centers of Research Excellence in Science and Technology”.
Overall, he has published about 165 refereed journal papers, book chapters and conference proceeding papers, as well as two books.