Recent Advances in Electronics, Hardware, Wireless & Optical Communications

Proceedings of the 9th WSEAS International Conference on Electronics, Hardware, Wireless and Optical Communications (EHAC '10)

University of Cambridge, UK, February 20-22, 2010

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Preface
This year the 9th WSEAS International Conference on ELECTRONICS, HARDWARE, WIRELESS and OPTICAL COMMUNICATIONS (EHAC '10) was held at the University of Cambridge, UK, February 20-22, 2010. The conference remains faithful to its original idea of providing a platform to discuss electronics, hardware engineering, wireless and optical communications, wireless networks, broadband access networks, optical networks, service aspects, network technologies and architectures, microwaves, antennas, radar systems etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

A Conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors
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Plenary Lecture 2

Signal Processing in DS-CDMA Downlink Wireless Communication Systems with Fading Channel Employing the Generalized Detector

Professor Vyacheslav Tuzlukov
School of Electrical Engineering and Computer Science
Kyunghook National University
1370 Sankyuk-dong, Buk-gu, Daegu 702-701
SOUTH KOREA
E-mail: tuzlukov@ee.knu.ac.kr

Abstract: Generalized receiver (GR) constructed in accordance with the generalized approach to signal processing (GASP) in noise is employed in direct-sequence code-division multiple access (DS-CDMA) downlink wireless communication system with frequency-selective channels. We consider four avenues: linear equalization (LE) with finite impulse re-sponse (FIR) beamforming filters; channel estimation and spatially correlation; optimal combining; and partial cancelation. We investigate the GR with simple LE and FIR beamforming filters. Numerical results and simulation show that the GR with FIR beamforming filters surpasses in performance the optimum infinite impulse response be-amrforming filters with conventional receivers. It can closely approach the performance of GR with infinite impulse response beamforming filters. Channel estimation errors are taken into consideration in order to DS-CDMA wire-less communication system performance will be not degraded under practical channel estimation. GR takes an esti-mation error of maximum likelihood (ML) multiple-input multiple-output (MIMO) channel estimation and GR spa-tially correlation into account in computation of minimum mean square error (MMSE) and log-likelihood ratio (LLR) of each coded bit. Symbol-error rate (SER) performance of DS-CDMA employing GR with quadrature sub-branch hybrid selection/maximal-ratio combining (HS/MRC) scheme for 1-D modulations in Rayleigh fading is obtained and compared with that of the conventional HS/MRC receivers. Procedure of selecting a partial cancellation factor (PCF) for the first stage of a hard-decision partial parallel interference cancellation (PPIC) of the GR employing in DS-CDMA wireless communication system is proposed. A range of the optimal PCFs is derived based on the Fri-cé’s theorem. Computer simulation results show superiority in bit error rate (BER) performance that is very close to the potentially achieved and surpasses the BER performance of the real PCF for DS-CDMA systems discussed in litera-ture.

A transmitted signaling technique using orthogonal unified complex Hadamard transform spreading sequences is in-vestigated when the GR is employed in DS-CDMA downlink wireless communication system to maintain the ortho-gonality between users and reduce the effect of multipath fading and interference from other users. A general multi-path-fading model is assumed. System performance is evaluated by means of signal-to-interference-plus-noise ratio (SINR) at the GR output. It is shown that the SINR of the DS-CDMA downlink wireless communication system employing the orthogonal unified complex Hadamard transform spreading sequences and the GR is independent of the phase offsets between different paths, while the SINR of the same system using the Walsh-Hadamard (WH) spreading sequences is related to the squared cosine of path phase offsets. As a result, the bit-error ratio (BER) performance of the DS-CDMA downlink wireless communication system employing the GR is better than that of the system with the WH spreading sequences at high SINRs. Comparative analysis of BER performances of DS-CDMA down-link wireless communication systems using the GR and Rake receiver, which consists of a bank of correlation recei-vers, with each individual receiver correlating with a different arriving multipath component, shows a superiority of the GR over the Rake receiver both at high SINRs and at low SINRs.

Brief Biography of the Speaker:
Vyacheslav Tuzlukov is currently a Full Professor of the School of Electrical Engineering and Computer Science at the Kyungpook National University, Daegu, South Korea. His research emphasis is on signal processing in wireless communications, wireless sensor networks, radar/sonar, remote sensing, satellite communications, mobile communications, and underwater signal processing, and so on. Prior to this, he was Full Professor of the School of Electronic Engineering, Communications Engineering and Computer Science at the Yeungnam University, Gyeongsan, South Korea (2007-2008) and invited Full Professor of the Electrical and Computer Engineering Department of Ajou University, Suwon, South Korea (2003-2007), where he managed research teams in the area of...

Dr. Tuzukov was highly recommended by U.S. experts of Defense Research and Engineering (DDR&E) of the United States Department of Defense as a recognized expert in the field of humanitarian demining and minefield sensing technologies and had been awarded by Special Prize of the United States Department of Defense in 1999. Dr. Tuzukov is distinguished as one of the leading achievers from around the world by Marquis Who’s Who and listed in the Who’s Who in the World, 2006-2010 and Who’s Who in Science and Engineering, 2006-2009, Marquis Publisher, NJ, USA.