LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah	:	Near Optimum MIMO Decoders for Next Generation Very High Throughput WLAN		
Jumlah Penulis	:	1 orang (**Wahyul Amien Syafei**)		
Status Pengusul	:	Penulis Tunggal		
Identitas Prosiding	:	a. Judul Prosiding	:	The 22nd Asia Pacific Conference on Communication (APCC) 2016
		b. ISBN/ISSN	:	978-1-5090-0676-2
		c. Thn Terbit, Tempat Pelaks.	:	Agustus 2016, Jogjakarta
		d. Penerbit/Organiser	:	IEEE Xplore Digital Library
		e. Alamat Repository/Web	:	https://ieeexplore.ieee.org/document/7581522/
		Alamat Artikel	:	https://doc-pak.undip.ac.id/8004/1/Prosiding_APCC2016.pdf
		f. Terindeks di (jika ada)	:	ScimagoJR dan Scopus

Kategori Publikasi Makalah : [√] *Prosiding* Forum Ilmiah Internasional
(beri ✓pada kategori yang tepat) [ ] *Prosiding* Forum Ilmiah Nasional

Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Reviewer		Nilai Rata-rata
	Reviewer I	Reviewer II	
a. Kelengkapan unsur isi prosiding (10%)	3,00	3,00	3,00
b. Ruang lingkup dan kedalaman pembahasan (30%)	8,00	8,00	8,00
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	8,00	8,00	8,00
d. Kelengkapan unsur dan kualitas terbitan/prosiding(30%)	9,00	8,50	8,75
Total = (100%)	**28,00**	**27,50**	**27,75**
Nilai Pengusul = (100% x 27,75) = 27,75			

Semarang,

Reviewer 2

Dr. Wahyudi, S.T., M.T.
NIP. 196906121994031001
Unit Kerja: Teknik Elektro Fakultas Teknik
Universitas Diponegoro

Reviewer 1

Dr. Iwan Setiawan, ST., MT.
NIP. 197309262000121001
Unit Kerja: Teknik Elektro Fakultas Teknik
Universitas Diponegoro

LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah	:	Near Optimum MIMO Decoders for Next Generation Very High Throughput WLAN		
Jumlah Penulis	:	1 orang (**Wahyul Amien Syafei**)		
Status Pengusul	:	Penulis Tunggal		
Identitas Prosiding	:	a. Judul Prosiding	:	The 22nd Asia Pacific Conference on Communication (APCC) 2016
		b. ISBN/ISSN	:	978-1-5090-0676-2
		c. Thn Terbit, Tempat Pelaks.	:	Agustus 2016, Jogjakarta
		d. Penerbit/Organiser	:	IEEE Xplore Digital Library
		e. Alamat Repository/Web	:	https://ieeexplore.ieee.org/document/7581522/
		Alamat Artikel	:	https://doc-pak.undip.ac.id/8004/1/Prosiding_APCC2016.pdf
		f. Terindeks di (jika ada)	:	ScimagoJR dan Scopus

Kategori Publikasi Makalah (beri ✓pada kategori yang tepat) : [√] *Prosiding* Forum Ilmiah Internasional
[ ] *Prosiding* Forum Ilmiah Nasional

Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Prosiding		Nilai Akhir Yang Diperoleh
	Internasional [30]	Nasional [ ]	
a. Kelengkapan unsur isi prosiding (10%)	3,00		3,00
b. Ruang lingkup dan kedalaman pembahasan (30%)	9,00		8,00
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	9,00		8,00
d. Kelengkapan unsur dan kualitas terbitan/prosiding(30%)	9,00		9,00
Total = (100%)	**30,00**		**28,00**
Nilai Pengusul = (100% x 28,00) = 28,00			

Catatan Penilaian Paper oleh Reviewer :

1. **Kesesuaian dan kelengkapan unsur isi paper:** Isi paper lengkap dan sudah sesuai kaidah karya tulis ilmiah, berisi judul, abstrak, pendahuluan, desain, hasil, kesimpulan dan referensi. (Nilai 3).

2. **Ruang lingkup dan kedalaman pembahasan:** Pembahasan dilakukan dengan sistematis dan dalam, referensi disitasi dengan baik. Dasar teori dan metode yang ada dibahas singkat, metode yang diusulkan dibahas agak detil. Hasil simulasi juga ditampilkan. (Nilai 8).

3. **Kecukupan dan kemutakhiran data/informasi dan metodologi:** Metode near optimum yang diusulkan adalah tergolong mutakhir dan diterapkan pada sistem WLAN terbaru yaitu IEEE 802.11ac. Hasil pengujian menunjukkan kinerja yang baik. Perbandingan dengan metode linear dan optimal juga dilakukan. (Nilai 8)**.**

4. **Kelengkapan unsur dan kualitas terbitan:** Prosiding tersusun lengkap dengan kualitas terbitan berstandar internasional, terindeks di Scimagojr dan Scopus. Tidak ada unsur plagiasi dan paper linear dengan bidang ilmu pengusul. (Nilai 9).

Semarang,
Reviewer 1

Dr. Iwan Setiawan, ST., MT.
NIP. 197309262000121001
Unit Kerja: Teknik Elektro Fakultas Teknik
Universitas Diponegoro

LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU *PEER REVIEW*
KARYA ILMIAH : PROSIDING

Judul Karya Ilmiah	:	Near Optimum MIMO Decoders for Next Generation Very High Throughput WLAN		
Jumlah Penulis	:	1 orang (**Wahyul Amien Syafei**)		
Status Pengusul	:	Penulis Tunggal		
Identitas Prosiding	:	a. Judul Prosiding	:	The 22nd Asia Pacific Conference on Communication (APCC) 2016
		b. ISBN/ISSN	:	978-1-5090-0676-2
		c. Thn Terbit, Tempat Pelaks.	:	Agustus 2016, Jogjakarta
		d. Penerbit/Organiser	:	IEEE Xplore Digital Library
		e. Alamat Repository/Web	:	https://ieeexplore.ieee.org/document/7581522/
		Alamat Artikel	:	https://doc-pak.undip.ac.id/8004/1/Prosiding_APCC2016.pdf
		f. Terindeks di (jika ada)	:	ScimagoJR dan Scopus

Kategori Publikasi Makalah : [√] *Prosiding* Forum Ilmiah Internasional
(beri ✓pada kategori yang tepat) [ ] *Prosiding* Forum Ilmiah Nasional

Hasil Penilaian *Peer Review* :

Komponen Yang Dinilai	Nilai Maksimal Prosiding		Nilai Akhir Yang Diperoleh
	Internasional [30]	Nasional [ ]	
a. Kelengkapan unsur isi prosiding (10%)	3,00		3,00
b. Ruang lingkup dan kedalaman pembahasan (30%)	9,00		8,00
c. Kecukupan dan kemutahiran data/informasi dan metodologi (30%)	9,00		8,00
d. Kelengkapan unsur dan kualitas terbitan/prosiding(30%)	9,00		8,50
Total = (100%)	**30,00**		**27,50**
Nilai Pengusul = (100% x 27,50) = 27,50			

Catatan Penilaian Paper oleh Reviewer :

1. **Kesesuaian dan kelengkapan unsur isi paper:** Paper tergolong lengkap karena memuat judul, abstrak, pendahuluan, desain, hasil, kesimpulan dan referensi. (Nilai 3).

2. **Ruang lingkup dan kedalaman pembahasan:** Pembahasan cukup komprehensif dan runtut. Dimulai pembahasan singkat metode lilier dan optimal kemudian membahs detil metode near optimum yang diusulkan. Sitasi terhadap referens dilakukan dengan baik. (Nilai 8).

3. **Kecukupan dan kemutakhiran data/informasi dan metodologi:** Metode near optimum yang diusulkan adalah cukup terkenal. Metode ini coba diterapkan pada sistem WLAN mutakhir IEEE 802.11ac. Perbandingan dengan metode linear dan optimal dilakukan dengan simulasi. (Nilai 8**).**

4. **Kelengkapan unsur dan kualitas terbitan:** Prosiding tersusun lengkap dengan kualitas terbitan internasional. Terindeks di Scimagojr dan Scopus. Unsur plagiasi tidak ada dan paper sesuai dengan bidang ilmu pengusul. (Nilai 8,5).

Semarang,
Reviewer 2

Dr. Wahyudi, S.T., M.T.
NIP. 196906121994031001
Unit Kerja: Teknik Elektro Fakultas Teknik
Universitas Diponegoro

APCC 2016
Asia-Pacific Conference on Communications

CERTIFICATE

This is to certify that

WAHYUL SYAFEI

Actively participated in
The 22nd Asia-Pacific Conference on Communications
As a *Paper Presenter*

Yogyakarta-Indonesia 25-27 August 2016
Conference Chair

Dr. Wiseto Agung

IEEE ComSoc IEEE COMMUNICATIONS SOCIETY INDONESIA CHAPTER
IEEE INDONESIA SECTION
IEICE Communications Society
中国通信学会 CHINA INSTITUTE OF COMMUNICATIONS
KICS
Telkom University
Gadjah Mada University

Document type
Conference Paper

Source type
Conference Proceedings

ISBN
978-150900676-2

DOI
10.1109/APCC.2016.7581522

View more

Proceedings - Asia-Pacific Conference on Communications, APCC 2016 • Pages 419 - 423 • 3 October 2016 • Article number 7581522 • 22nd Asia-Pacific Conference on Communications, APCC 2016, Yogyakarta, 25 August 2016 - 27 August 2016, 124197

Near optimum MIMO decoders for next generation very high throughput WLAN

Syafei W.A.

Save all to author list

Electrical Engineering Department, Faculty of Engineering, Diponegoro University, Tembalang Campus, Semarang, Indonesia

Abstract

This paper presents our research in developing high performance but low complexity MIMO decoders for the newest WLAN, i.e. 802.11ac. K-best and Trellis methods are proposed to develop the MIMO decoders. Their performances are observed and compared to MIMO decoders which are based on linear and optimal methods, i.e. ZF, MMSE, and ML. Run test of 2×2 MEMO, 64-QAM, Coding rate 3/4, and 40MHz of bandwidth with target BER 10^{-6} is conducted under in-door channel model. The proposed

PROCEEDINGS

ISBN : 978-1-5090-0676-2

Asia-Pacific Conference on Communications

APCC 2016

25 - 27 Agustus 2016
Royal Ambarrukmo Hotel
Yogyakarta, Indonesia

For Detail Information:
www.apcc2016.org

Sponsored by:

IEEE ComSoc
IEEE Communications Society Indonesia Chapter

IEEE
INDONESIA SECTION

Organized by:

Telkom University

Universitas Gadjah Mada

Technical Co-Sponsored by:

IEICE Communications Society

KICS

中国通信学会
CHINA INSTITUTE OF COMMUNICATIONS

Keynote Sessions

Day One: Thursday, 25 August 2016, 09.30 – 12.00, KARATON BALLROOM

Wireless Big Data: Transforming Cognitive Radios to Smart Networks

Ying-Chang Liang
University of Electronic Science and Technology of China

Research Collaboration in 4G/5G Mobile Networks

Kumbesan Sandrasegaran
University of Technology, Sydney, Australia

Optically powered radio-over-fiber system using double-clad fibers

Motoharu Matsuura
University of Electro-Communications, Japan

Day Two: Friday, 26 August 2016, 08.30 – 12.00, KARATON BALLROOM

Innovation on Media & Digital Business

Indra Utoyo
Director of Digital & Strategic Portofolio,
PT.Telkom - Indonesia

5G Access Technologies in Terrestrial and Satellite Communications

Eiji Okamoto
Nagoya Institute of Technology, Japan

Reliability Analysis of the IoT Network.

Jae-Hyun Park
Chung-Ang University, South Korea

Low Complexity Iterative Receiver Design for Sparse Code Multiple Access

Wen Chen
Shanghai Jiao Tong University, China

Block Codes for Two-Dimensional Magnetic Recording

Hiroshi Kamabe
Gifu University, Japan

Research and Innovation Opportunities in Changing Air Transport

Pavel Loskot
Swansea University, UK

Committees

APCC Steering Commitee

Prof. Masahiro UMEHIRA, Ibaraki University
Prof. Daehyoung HONG, Sogang University
Prof. Xinsheng Zhang, CIC
Prof. Qian Mao, Wuhan research institute of Posts & Telecommunications
Prof. Borhanuddin Mohd ALI, University Putra Malaysia
Dr. Yasunori Suzuki, NTT DOCOMO, INC.
Prof. Dong Ku Kim, Yonsei University
Dr. Takashi Shimizu, NTT
Prof. Adnan Al-Anbuky, The Auckland University of Technology
Prof. Youze Cho, Kyungpook National University
Prof. Tomoaki Ohtsuki, Keio University
Prof. Suhono Harso SUPANGKAT, Bandung Institute of Technology
Prof. Hsiao-Hwa Chen, National Cheng Kung University
Prof. Kwang Bok Lee, Seoul National University
Prof. Chi-Chung KO, National University of Singapore
Prof. Tony T. LEE, Chinese University of Hong Kong
Prof. Ping ZHANG, BUPT
Dr. Hiroshi OTA, ITU
Prof. Sawasd TANTARATANA, Sirindhorn International Institute of Technology
Prof. Desmond P. TAYLOR, University of Canterbury
Prof. Apinunt THANACHAYANONT, King Mongkut's Institute of Technology Ladkrabang
Dr. Dennis N. COOPER, CSIRO Telecommunications & Industrial Physics
Dr. Ram Gopal GUPTA, India Ministry of Information Technology

Organizing Committees

General Chair

Dr. Wiseto Agung, Telkom, Indonesia

General Vice Chair

Muhammad Ary Murti, Telkom University, Indonesia
Arief Hamdani Gunawan, Telkom, Indonesia

Publication

Muhammad Nasrun, Telkom University, Indonesia

Treasurer

Rita Magdalena, Telkom University, Indonesia

Publicity

Satriyo Dharmanto, IEEE Indonesia Section
Kuncoro Wastuwibowo, Telkom Indonesia)
Afief Dias Pambudi, Telkom University, Indonesia

Local Arrangement

I Wayan Mustika, Universitas Gajah Mada
Agnes Irwanti, Multikom, Indonesias

Secretary

Ratna Mayasari, Telkom University, Indonesia

Technical Program Committee

Technical Program Committee (TPC) Chair

Dr. Rina Pudji Astuti, IEEE ComSoc Indonesia Chapter

Track Chairs:

Dr. Bambang Setia Nugraha, IEEE ComSoc Indonesia Chapter
Dr. Ida Wahida, Telkom University, Indonesia
Dr. Ali Muayadi, Telkom University, Indonesia

TPC Members:

Prof. Abdelfettah Belghith, King Saud University, Saudi Arabia
Prof. Akihiro Yamamura, Akita University, Japan
Prof. Akimitsu Kanzaki, Shimane University, Japan
Prof. Alexey Vinel, Halmstad University, Sweden
Prof. Ali Miri, Ryerson University, Canada
Prof. Amor Nafkha, CentraleSupelec, France
Prof. Andriyan Suksmono, Bandung Institute of Technology, Indonesia
Prof. Annie Gravey, Institut Mines Telecom - Telecom Bretagne, France
Prof. Antonio Pescapé, University of Napoli Federico II, Italy
Prof. Arun Somani, Iowa State University, USA
Prof. Athanasios Vasilakos, Lulea University of Technology, Sweden
Prof. Augusto Casaca, INESC-ID, Portugal
Prof. Aydin Sezgin, RUB, Germany
Prof. B. Sundar Rajan, Indian Institute of Science, India
Prof. Bang Chul Jung, Chungnam National University, Korea
Prof. Bernhard Walke, RWTH Aachen University, Germany
Prof. Bigomokero Bagula, University of the Western Cape, South Africa
Prof. Bong Jun Choi, The State University of New York (SUNY) Korea, Korea
Prof. Brigitte Jaumard, Concordia University, Canada
Prof. Cailian Chen, Shanghai Jiao Tong University, P.R. China
Prof. Calvin C K Chan, The Chinese University of Hong Kong, Hong Kong
Prof. Carla Raffaelli, University of Bologna, Italy
Prof. Carlos Calafate, Universidad Politécnica de Valencia, Spain
Prof. Carlos Kamienski, Universidade Federal do ABC, Brazil
Prof. Carlos Becker Westphall, Federal University of Santa Catarina, Brazil
Prof. Chan-Byoung Chae, Yonsei University, Korea
Prof. Chengnian Long, Shanghai Jiao Tong University, P.R. China
Prof. Chester Shu, The Chinese University of Hong Kong, Hong Kong
Prof. Chi Chung Ko, National University of Singapore, Singapore
Prof. Ching-Hsien Hsu, Chung Hua University, Taiwan
Prof. Chintha Tellambura, University of Alberta, Canada
Prof. Choong Seon Hong, Kyung Hee University, Korea
Prof. Christina Politi, University of Peloponnese, Greece
Prof. Chung Kang, Korea University, Korea
Prof. Costas Georghiades, Texas A&M University, USA
Prof. Daisuke Umehara, Kyoto Institute of Technology, Japan
Prof. Dang Hai Hoang, Ministry of Information and Communications, Vietnam
Prof. Daniel Benevides da Costa, Federal University of Ceara (UFC), Brazil
Prof. David Lin, National Chiao Tung University, Taiwan
Prof. Defeng Huang, University of Western Australia, Australia
Prof. Demosthenes Vouyioukas, University of the Aegean - Research Unit, Greece
Prof. Dennis Pfisterer, University of Luebeck, Germany
Prof. Deqiang Wang, Shandong University, P.R. China
Prof. Dharma Agrawal, University of Cincinnati, USA
Prof. Dimitra Simeonidou, University of Bristol, United Kingdom
Prof. Dong Geun Jeong, Hankuk University of Foreign Studies, Korea
Prof. Dong Ku Kim, Yonsei University, Korea
Prof. Dong-Joon Shin, Hanyang University, Korea
Prof. Dong-Seong Kim, University of Canterbury, New Zealand
Prof. Duk Kyung Kim, Inha University, Korea
Prof. Eisuke Kudoh, Tohoku Institute of Technology, Japan
Prof. Eko Rahardjo, University of Indonesia, Indonesia
Prof. Emmanuel Boutillon, Université de Bretagne Sud, France
Prof. Errol Lloyd, University of Delaware, USA
Prof. Fan Zhang, Peking University, P.R. China
Prof. Farid Naït-Abdesselam, Paris Descartes University, France
Prof. Fatma Omara, -Cairo University, Egypt
Prof. Fei Ji, South China University of Technology, P.R. China
Prof. Feifei Gao, Tsinghua University, P.R. China
Prof. Feng-Tsun Chien, National Chiao Tung University, Taiwan
Prof. Francesco Verde, University of Napoli Federico II, Italy
Prof. Franco Chiaraluce, Università Politecnica delle Marche, Italy
Prof. Fumio Teraoka, Keio University, Japan
Prof. Fumiyuki Adachi, Tohoku University, Japan
Prof. Gaetano Giunta, University of "Roma TRE", Italy
Prof. Gamantyo Hendrantoro, Institut Teknologi Sepuluh Nopember, Indonesia
Prof. George Michailidis, University of Michigan, USA
Prof. Georgios Ellinas, University of Cyprus, Cyprus
Prof. Georgios Kambourakis, University of the Aegean, Greece
Prof. Georgios Papadimitriou, Aristotle University, Greece
Prof. Gerard Parr, University of Ulster, United Kingdom
Prof. Gerhard Wunder, FU Berlin, Heisenberg Communications and Information Theory Group, Germany
Prof. Gia Khanh Tran, Tokyo Institute of Technology, Japan
Prof. Giacomo Verticale, Politecnico di Milano, Italy
Prof. Grzegorz Danilewicz, Poznan University of Technology, Poland
Prof. Guanglin Zhang, Donghua University, P.R. China
Prof. Guido Dietl, University of Applied Sciences Landshut, Germany
Prof. Guilu Long, Tsinghua University, P.R. China
Prof. Guowang Miao, KTH Royal Institute of Technology, Sweden
Prof. Guoxing Jiang, Huazhong University of Science and Technology, P.R. China
Prof. Guy Pujolle, University Pierre et Marie Curie - Paris 6, France
Prof. Haitao Zhao, National University of Defense Technology, P.R. China
Prof. Haixia Zhang, Shandong University, P.R. China
Prof. Hakima Chaouchi, Telecom Sud Paris-Institut Mines Telecom, France
Prof. Han-You Jeong, Pusan National University, Korea
Prof. Hanli Wang, Tongji University, Shanghai, P.R. China
Prof. Hans van den Berg, University of Twente, The Netherlands
Prof. Hans-Juergen Zepernick, Blekinge Institute of Technology, Sweden
Prof. Harry Skianis, University of the Aegean, Greece
Prof. Hichan Moon, Hanyang University, Korea
Prof. Hidekazu Murata, Kyoto University, Japan
Prof. Hideki Ochiai, Yokohama National University, Japan
Prof. Hidenori Nakazato, Waseda University, Japan
Prof. Hiroaki Morino, Shibaura Institute of Technology, Japan
Prof. Hiromi Ueda, Tokyo University of Technology, Japan
Prof. Hiroyuki Morikawa, The University of Tokyo, Japan
Prof. Hirozumi Yamaguchi, Osaka University, Japan
Prof. Hisaya Hadama, National Defence Academy, Japan
Prof. Hong-Yeop Song, Yonsei University, Korea
Prof. Hongkai Xiong, Shanghai Jiao Tong University, P.R. China
Prof. Houbing Song, West Virginia University, USA
Prof. Hsiao-Chun Wu, Louisiana State University, USA
Prof. Hwangnam Kim, Korea University, Korea
Prof. Hwee Pink Tan, Singapore Management University, Singapore
Prof. Hyun-Ho Choi, Hankyong National University, Korea
Prof. Hyung-Jin Choi, SungKyunKwan University, Korea
Prof. Ichihiko Toyoda, Saga University, Japan
Prof. Igor Kotenko, SPIIRAS, Russia
Prof. Iickho Song, Korea Advanced Institute of Science and Technology, Korea
Prof. Ikmo Park, Ajou University, Korea
Prof. Ioanis Nikolaidis, University of Alberta, Canada
Prof. Ioannis Chatzigiannakis, Sapienza University of Rome, Italy
Prof. Ioannis Tomkos, Athens Information Technology, Greece
Prof. Jae Sung Lim, Ajou University, Korea
Prof. Jae-Hyun Kim, Ajou University, South Korea, Korea
Prof. Jae-Hyun Park, Chung-Ang University, Korea
Prof. Jaime Lloret, Universidad Politecnica de Valencia, Spain
Prof. Jalel Ben-Othman, University of Paris 13, France
Prof. Jamil Khan, The University of Newcastle, Australia
Prof. Jan Seedorf, HFT Stuttgart, Germany
Prof. Jari Veijalainen, University of Jyvaskyla, Finland
Prof. Jason Jue, University of Texas at Dallas, USA
Prof. Jean-Marie Gorce, INSA-Lyon, France
Prof. Jeonghoon Mo, Yonsei University, Korea
Prof. Jeongseok Ha, KAIST, Korea
Prof. Jia Hou, Soochow University, P.R. China
Prof. Jialu Fan, Northeastern University, P.R. China
Prof. Jianhua Zhang, Beijing University of Posts and Telecommunications, P.R. China
Prof. Jiankun Hu, University of New South Wales, Australia
Prof. Jiann-Liang Chen, National Taiwan University of Science and Technology, Taiwan
Prof. Jingon Joung, Chung-Ang University, Korea
Prof. Jiro Katto, Waseda University, Japan
Prof. Joel Rodrigues, Instituto de Telecomunicações, University of Beira Interior, Portugal
Prof. Jonathon Chambers, Newcastle University, United Kingdom
Prof. Jong-Dug Shin, Soongsil University, Korea
Prof. Jong-Seok Lee, Yonsei University, Korea
Prof. JongWon Kim, GIST (Gwangju Institute of Science & Technology), Korea
Prof. Jozef Wozniak, Gdansk University of Technology, Poland
Prof. Jun Cai, University of Manitoba, Canada
Prof. June-Koo Kevin Rhee, KAIST, Korea
Prof. Jungwoo Lee, Seoul National University, Korea
Prof. Junhui Zhao, Beijing Jiaotong University, P.R. China
Prof. Kan Zheng, Beijing University of Posts&Telecommunications, P.R. China
Prof. Karim Djouani, University Paris Est Créteil (UPEC), South Africa
Prof. Kasturi Vasudevan, Indian Institute of Technology Kanpur, India
Prof. Katsuyoshi Iida, Tokyo Institute of Technology, Japan
Prof. Kazuo Mori, Mie University, Japan
Prof. Kenichi Higuchi, Tokyo University of Science, Japan
Prof. Kenji Ishida, Hiroshima City University, Japan
Prof. Keqiu Li, Dalian University of Technology, P.R. China
Prof. Kevin Sowerby, The University of Auckland, New Zealand
Prof. Klaus David, University of Kassel, Germany
Prof. Klaus Moessner, University of Surrey, United Kingdom
Prof. Koichi Asatani, Nankai University, Japan
Prof. Kostas Berberidis, University of Patras, Greece
Prof. Kumbesan Sandrasegaran, University of Technology, Sydney, Australia
Prof. Kunio Sakakibara, Nagoya Institute of Technology, Japan
Prof. Kyu-Sung Hwang, Kyungil University, Korea
Prof. KyungHi Chang, Inha University, Korea
Prof. Lacra Pavel, University of Toronto, Canada
Prof. Lars Dittmann, Technical University of Denmark, Denmark
Prof. Lei Shu, Guangdong University of Petrochemical Technology, P.R. China
Prof. Li Song, Shanghai Jiao Tong University, P.R. China
Prof. Lin Chen, The University of Paris-Sud, France
Prof. Liza A. Latiff, University Technology Malaysia, Malaysia
Prof. Ljiljana Trajković, Simon Fraser University, Canada
Prof. Lorenzo Favalli, University of Pavia, Italy
Prof. Luc Deneire, University of Nice, France
Prof. Makoto Tsubokawa, Waseda University, Japan
Prof. Mamoru Sawahashi, Tokyo City University, Japan
Prof. Marco Listanti, University of Rome "La Sapienza", Italy
Prof. Marco Roccetti, University of Bologna, Italy
Prof. Mário Alves, CISTER/INESC-TEC, ISEP, Politécnico do Porto, Portugal
Prof. Maryline Chetto, Universite de Nantes, France
Prof. Masahiro Umehira, Ibaraki University, Japan
Prof. Masato Tsuru, Kyushu Institute of Technology, Japan
Prof. Mathias Fischer, University Muenster, Germany
Prof. Maurice Gagnaire, Telecom Paristech, France
Prof. Mesut Günes, University of Münster, Germany
Prof. Mikael Gidlund, Mid Sweden University, Sweden
Prof. Miki Yamamoto, Kansai University, Japan
Prof. Min Young Chung, Sungkyunkwan University, Korea
Prof. Mohammad Matin, Institut Teknologi Brunei, Brunei Darussalam
Prof. Motoharu Matsuura, University of Electro-Communications, Japan
Prof. Mu-Song Chen, Electrical Engineering, Da-Yeh University, Taiwan
Prof. Mugen Peng, Beijing University of posts & Telecommunications, P.R. China
Prof. Myung-Sup Kim, Korea University, Korea
Prof. Nail Akar, Bilkent University, Turkey
Prof. Nan Chi, Fudan University, P.R. China
Prof. Nazim Agoulmine, University of Evry Val d'Essonne, USA
Prof. Neeli Prasad, Center for TeleInFrastructure (CTIF), USA
Prof. Neeraj Mittal, The University of Texas at Dallas, USA

TABLE OF PAPERS

Near Optimum MIMO Decoders for Next Generation Very High Throughput WLAN

Wahyul Amien Syafei
Electrical Engineering Department
Faculty of Engineering, Diponegoro University
Tembalang Campus, Semarang, Indonesia
wasyafei@undip.ac.id

Abstract— **This paper presents our research in developing high performance but low complexity MIMO decoders for the newest WLAN, i.e. 802.11ac. K-best and Trellis methods are proposed to develop the MIMO decoders. Their performances are observed and compared to MIMO decoders which are based on linear and optimal methods, i.e. ZF, MMSE, and ML. Run test of 2x2 MIMO, 64-QAM, Coding rate 3/4 , and 40MHz of bandwidth with target BER 10^{-6} is conducted under in-door channel model. The proposed near optimum methods demonstrate superior performance compared to the linear ones and the complexity are significantly lower than MLD**

***Keywords*—WLAN 802.11ac, MIMO, OFDM, MLD, Trellis, K-best**

I. INTRODUCTION

MIMO and OFDM are the keys of technology to provide next generation high throughput and high performance wireless communications. Started in 1993 when OFDM is implemented in WLAN 802.11a and 802.11g to provide 54Mbps of throughput with 20MHz of bandwidth in 5GHz and 2,4 GHz frequency band, respectively [1, 2]. As an extension of previous WLAN with MIMO technique, 802.11n promises more robust and higher throughput. [3]. Within the same 20 MHz of bandwidth, it offers five times throughput and by ocupying 40MHz of bandwidth it rises ten times of throughput than 802.11a/g. Therefore 802.11n is called high throughput (HT) WLAN. [4].

High demand of wireless multimedia communication has forced IEEE 802.11 standard association to define the next generation WLAN named a very high throughput (VHT) WLAN 802.11ac which shall provide at least Gigabit order of throughput. To attain such very high throughput while maintaining the performance, it exploits the combination of MIMO, OFDM, and high-order modulation, i.e. 256-QAM [5].

MIMO decoder is the most important part of VHT WLAN 802.11ac. Its function is to obtain the transmitted information by decoding the signals form all of the interference signals and noise which come along. The most common MIMO decoders are based on linear method, i.e Zero Forcing (ZF) and Minimum Mean Square Error (MMSE). Both of them require less computation but provide low performance. On the other hand, the well known method called Maximum Likelihood (ML) offers an optimum performance. It calculates the distance between the received signal to all possible symbol candidates. However ML requires very high complexity and the complexity grows exponentially with the number of transmit antennas and the chosen modulation [6].

Implementation of ML-based MIMO Decoder for 802.11n 20 MHz with 2x2 configurations which provides throughput 270 Mbps is discussed in [7], while for 40 MHz of bandwidth with 4x4 configurations is reported in [8]. Further, the very high complexity of ML is reduced using K-best and Trellis method in 802.11n system are presented in [9] and [10].

Through this paper, we want to share our research in developing high performance but low complexity MIMO decoders for the newest WLAN, i.e. 802.11ac. K-best and Trellis as near optimum methods are proposed to develop the MIMO decoders. Their performances are observed and compared to MIMO decoders which are based on linear and optimal methods, i.e. ZF, MMSE, and MLD.

Run test of 2x2 MIMO, 64-QAM, coding rate of ¾, and 20/40 MHz of bandwidth with target BER of 10^{-6} is conducted under in-door channel model. This configuration is known as a modulation coding scheme (MCS) no 14 of 802.11n or equal to MCS 6 of 802.11ac. The proposed near optimum methods demonstrate superior performance compared to the linear ones and the complexity are significantly lower than MLD.

II. MIMO SYSTEM

A. *MIMO Channel Model*

MIMO is one of diversity technique which is used to suppress fading and interference from other user, and to raise data rate without additional bandwidth. There are two MIMO schemes widely used, Space Time Block Code (STBC) and Spatial Division Multiplexing (SDM).

SDM means several independent data streams transmitted over different transmit antennas in the same bandwidth. On SDM system, the minimum number of transmit antennas equals to the number of receive antennas. MIMO configuration with four transmit and receive antennas is shown in fig. 1.

978-1-5090-0676-2/16/$31.00 ©2016 IEEE

Aware-D : Voice Recognition-based Driving Awareness Detection

Yudi Andrean Phanama[1], Cécile Duthoit[1 2], Riri Fitri Sari[1]
email: yudi.andrean@ui.ac.id, duthoit@etud.insa-toulouse.fr, riri@ui.ac.id

[1]Department of Electrical Engineering,
Faculty of Engineering
University of Indonesia

[2]Department of Networks and Telecommunications
INSA Toulouse
Toulouse, France

***Abstract*—Driving needs the driver to be in a proper condition, aware enough of the road to ensure safety. Driving under the influence of alcohol has been one of the worst cause of traffic accidents worldwide. In this paper, we propose a novel system to detect the awareness of car drivers when driving, which is related to driving under alcohol (drunk driving). The system will be installed in Android smartphones and evaluate driver's awareness by questioning the drivers with Android's text-to-speech and evaluating the answers with voice recognition before and during driving. The system calculates the percentage of correctly answered and wrongly answered questions. Once the system detects abnormal awareness of the driver, the system will alert the driver and notify a chosen contact with SMS containing the location of the driver.**

Keywords—mobile application, awareness detection, driving behavior, android

I. INTRODUCTION

In this fast paced world, mobility of people is very important and transportation is a very essential element to support the mobility of people. One of the most used transportation in the world are cars. Cars, or private cars are used by people to travel quickly from a place to another through the roads, which not seldom take a long time in roads and traffic. There are an estimated number of 1.2 Billion cars active in the roads worldwide, and will grow to 2 billion in 2035, showing the importance and demand increase of cars.

Driving a car demands the driver to be in a proper condition and aware of the road to ensure safety. In many countries, driving a car is restricted to rules limiting the activities done in the car while driving, and the condition of the driver. Drivers in a not proper condition (drunk, sleepy, on drugs, etc.) can cause harm to the other traffic user, in form of a potential to incite accidents on the roads. According to the National Highway Traffic Safety Administration (NHTSA) 33,561 people died in traffic crashes in 2012 in the United States (latest figures available), including an estimated 10,322 people who died in drunk driving crashes, accounting for 31% of all traffic deaths that year.

Works had been done in using technology to help drivers to drive properly, but many of them demand the users to have additional hardware, or using algorithms with high computing power running on mobile devices, thus reducing battery life.

In this paper, we present Aware-D, a novel approach using voice recognition to enable a questions-answers based method to detect unaware driving condition. It is implemented in an Android package which tries an approach of human-computer interaction, made to help the driver and the families (or relatives) of the driver to ensure the driver's condition while driving. With this app, the driver will be provided easy, not distracting questions in form of voice, and the driver must answer the questions with voice. The application will then compare the answers of the driver with the preallocated answers in the database of the application to determine if the driver is alert or not. The application can then notify the selected person the condition of the driver. With Aware-D, our target is to help reduce the accidents rate because of loss of awareness problem (from tiredness, alcohol, drugs, etc) without needing the user to use additional hardware in the car, and use the commonly used smartphone instead.

The rest of this paper is as follows: Section II will introduce the related works in the past literatures. In Section III, we present Aware-D design in details, and how we implemented it. In Section IV, we deliver our analysis and results on the application's testing. In Section V, we open a further discussions in the topic and finally in Section VI we conclude our work.

II. RELATED WORKS

The safety problem as the result of unsafe driving behavior is a daily issue that concerns everyone, as far as they use roads as car driver, rider, pedestrian, etc. This must be a reason why there are so many papers about how to help drivers to have a better driving behavior, and so many mobile phone applications developed for this purpose, such as applications to detect Stops, despite their small size, the lack of lighting or

978-1-5090-0676-2/16/$31.00 ©2016 IEEE

Loss-tolerant Large-scale MU-MIMO System with Rateless Space Time Block Code

Ali H. Alqahtani*, Ahmed Iyanda Sulyman**, *Senior Member IEEE*, and Abdulhameed Alsanie**.
**Department of Electrical Engineering, King Saud University, P.O. Box 800, Riyadh 11421, Saudi Arabia.
*College of Telecommunication and Information (CTI), P.O. Box 86384, Riyadh 11622, Saudi Arabia.
Emails: aqahtani@cti.edu.sa, {asulyman, sanie}@ksu.edu.sa

***Abstract*—In this paper, we study the performance of loss-tolerant multiuser large-scale multiple-input multiple-output (LS-MIMO) system with rateless space time block code (RSTBC). Since large number of low-power antenna elements are deployed in LS-MIMO systems, there is always a possibility of transmission losses, which may degrade the system performance significantly. In such cases, packets may get lost or not decodable at the receiver resulting in wireless erasure channels. Hence, RSTBC is introduced in LS-MIMO downlink transmission to tackle this problem. Performance analysis and simulation results are provided to demonstrate the feasibility of the proposed scheme in such cases. It has been shown that RSTBC guarantees the reliability of lossy LS-MIMO system with low overhead and complexity.**

***Index Terms*—MIMO, Massive MIMO, STBC, Rateless Code**

I. Introduction

LS-MIMO systems (also known as massive MIMO systems) have been targeted for deployment in the fifth generation (5G) cellular standards, to fundamentally enhance the wireless capacity and communication reliability [1]. In LS-MIMO system, a large number of antennas, possibly hundreds or even thousands, work together to deliver big data to the end users. Despite the significant enhancement in capacity and/or link quality offered by MIMO systems and space time codes (STCs) ([2], [3]), it has been shown recently that LS-MIMO can even improve the performance of MIMO systems dramatically. This has prompted a lot of research works on LS-MIMO systems lately.

However, the deployments of LS-MIMO schemes in various wireless communication systems may come with new problems arising from the difficulty of deploying a very large number of co-located antenna elements and keeping coherently all of them in synchronized operating conditions. This is an important practical deployment issue that has not yet been examined. There may arise situations at which the data fed to the system may get lost in the wireless transmission medium. This problem is of important significant, because the transmission of big data promised by LS-MIMO systems will be significantly affected, especially, for applications that require fast and real-time responses. These loss-tolerant situations can be considered as lossy channels and modeled in many interesting systems such as the Alternating Bit Protocol (ABP) [4] and High-Level Data Link Control (HDLC) [5]. Another scenarios that may cause high losses are antenna elements failure in a space platform or a remote military equipment as well as similar cases that may occur to the communicating devices during disasters. In such conditions, the replacement of faulty antenna elements of the array is not possible. Therefore, there is a need for a fast and efficient compensation scheme with the capability to preserve the reliability of the system in such scenarios.

One approach to solve this problem is rateless coding. Unlike the conventional channel code, rateless code does not have a fixed rate before transmission, but rather produces an unlimited number of encoded packets. A rateless code can operate universally over classes of channels, and adapt its rate according to the specific channel realization. The notion of rateless coding is conceptually similar to the hybrid automatic repeat request (HARQ) schemes [6], but the difference is mainly in the code construction where rateless codes can be considered as a continuous version of the HARQ [7].

Majority of the existing work in the literature of rateless coding is an extension of the fountain codes over the erasure channels [8]. In such a class of channels, the receiver will simply drop the corrupted packet and consider it as if it has never been received. The first practical class of rateless codes is Luby Transform (LT) code, which was developed to the well-known Raptor code [9]. For wireless channels, rateless code paradigm was addressed in many works such as [7], [10], [11], [12]. Furthermore, [13] presents a novel framework of opportunistic beamforming employing rateless code in multiuser MIMO downlink to provide faster, higher and stronger wireless services. For the case of LS-MIMO systems, we are not aware of published work yet examining the combination of rateless STC with LS-MIMO schemes.

In this work, the use of RSTBC is proposed to tackle the link losses and guarantee the reliability of multiuser LS-MIMO systems where a large number of antennas are employed at a base station (BS) or an access point (AP) to serve a certain number of users. In [14], we have discussed the basis of RSTBC, however, in this paper, we address further issues. First, larger number of antennas and users are assumed. Second, instead of assuming perfect channel state information (CSI), as in [14], we estimate both the small-scale and large-scale wireless channel parameters and use them in the data transmission in order to obtain more realistic results. Finally, we consider higher frequency (28 GHz). We illustrate the ability of this code to combat the phenomenon of losses and

978-1-5090-0676-2/16/$31.00 ©2016 IEEE

Study on Protocol and Required Bandwidth for 5G Mobile Fronthaul in C-RAN Architecture with MAC-PHY Split

Susumu Nishihara, Shigeru Kuwano, Kenji Miyamoto, Jun Terada, and Akihiro Ootaka
NTT Access Network Service Systems Laboratories, NTT Corporation
1-1 Hikarinooka, Yokosuka, Kanagawa 239-0847, Japan
Email: nishihara.susumu@lab.ntt.co.jp

***Abstract*—We propose the use of Small Cell Forum application program interface mapped over Radio over Ethernet frames to realize a transport interface for mobile fronthaul where the function of the base stations is split between MAC and PHY layers for 5G mobile with a centralized radio access network configuration. We confirmed that this approach successfully reduced the bandwidth required for the fronthaul to less than 10 Gbit/s by numerical simulation when the wireless system bandwidth was 600 Mbit/s for 16 streams per access point, owing to the statistical multiplexing effect described in our proposal.**

***Index Terms*—5G mobile, fronthaul, function split, Radio over Ethernet, Small Cell Forum API**

I. Introduction

With the widespread use of many attractive digital devices such as smartphones and tablet computers, digital environment represented by social networking services including short-message exchange with graphics and video chat using a handset, and watching videos has now become part of our daily lives. From the end-users' perspective, such devices and services are based on the wireless communications infrastructure of high-speed cellular and public/private WiFi networks as opposed to conventional wireline networks. For example, it has been reported that mobile traffic data will grow at a constant annual rate of 53% and reach up to 30 exabytes in 2020 [**?**]. Against such a background, many mobile operators are eyeing next-generation mobile systems known as 5G mobile that will support the above-mentioned, ever-increasing user traffic demand [**?**], [**?**]. With 5G mobile the carrier frequency will be in a high frequency region of at least several GHz to realize high-speed communication. One of the key technologies is massive multiple-input and multiple-output (MIMO) antennas at base stations that can utilize the nature of the higher-frequency band where both attenuation and directivity are high. When using a massive MIMO system with antenna elements of more than one hundred, a precise beam forming technique should be employed to compensate for the high directivity, i.e. low coherency while utilizing the high-speed transmission characteristics. Recent cellular systems adopt a centralized/cloud radio access network (C-RAN) where the function of the baseband unit (BBU) is aggregated, and many remote radio heads (RRHs) are connected with the BBU by optical fibers to configure a cost-effective point-to-multipoint topology as shown in Fig. 1.

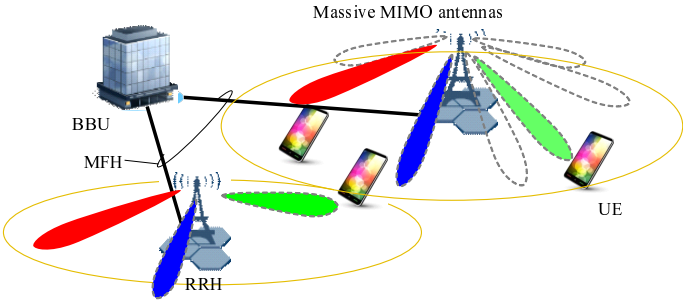

Fig. 1. Network configuration for C-RAN.

This type of optical network for cellular systems is called mobile fronthaul (MFH), and a common public radio interface (CPRI) [**?**] has been used as a cost-effective interface for MFH. However, the required optical capacity for MFH will become very large in the 5G mobile era if CPRI is selected as a fronthaul interface the way it used to be, making the fronthaul cost high. In fact, the bit rate specified in CPRI has increased to 24 Gbit/s, but the economic feasibility is currently unclear as regards commercial adoption. As the split layer becomes higher, the fronthaul capacity becomes smaller. For example, splitting the function between the MAC and PHY layers is a desirable option as described later in more detail. In addition, MFH is expected to provide a way of transmitting mobile traffic in a more standard and common manner and thus realize cost-effectiveness and adapt to the characteristics of packetized traffic with dynamic variation in its load according to the actual usage when such a function split is applied. In this paper, we propose using Small Cell Forum application program interface (SCAPI) where the function of the base stations is split between the MAC and PHY layers for 5G mobile. We also propose that the traffic on MFH be carried by using Radio over Ethernet (RoE) frames for cost-effectiveness as well as interface conformity for packetized traffic with the MAC-PHY split applied. We estimated the required optical fronthaul capacity by using numerical simulations, and revealed that our approach can successfully reduce the required fronthaul capacity to about 10 Gbit/s thanks to the statistical multiplexing effect where a cost-effective transport interface

978-1-5090-0676-2/16/$31.00 ©2016 IEEE

Selection Model Based on Multi-Objective Evolutionary Algorithm for Coordinated Multi Point Schemes

Carlos Lozano-Garzon* †, Yezid Donoso* and Pere Vila†
* *Systems and Computing Engineering Department*
Universidad de los Andes, Bogota, Colombia
Email: {ca.lozano968, ydonoso}@uniandes.edu.co
† *Institut d' informàtica i Aplicacions*
Universitat de Girona, Girona, Spain
Email: pere.vila@udg.edu

***Abstract*—The capacity, coverage and interference problems in the infrastructure deployed by mobile operators are increasing due to exponential growth of subscribers and traffic requirements of the new services. In order to solve these problems, 3GPP proposed the Coordinated Multi Point (CoMP) which is a set of cooperative communication techniques between base stations. In this paper we address the decision problem as a multi-objective optimization problem with the aim of improving the user's quality of experience and the load of all base stations involved. We propose an optimization model as well as an evolutionary algorithm based on the SPEA2 Algorithm, to select the best cooperation technique over the download channel. Through simulation over experimental scenarios, we demonstrate that our proposal provides optimal solutions, while being efficient and scalable.**

***Keywords*-Coordinated Multi Point; Dynamic Point Selection; Joint Transmission; Load Balancing; Multi-Objective Evolutionary Algorithm; Quality of Experience.**

I. Introduction

The infrastructure deployed by telecommunications operators must support the growth of traffic caused by the new requirements of that services and/or applications (24.3 Exabyte of monthly traffic expected in 2019 [1]); the growing of users (6.6 billion of mobile subscriptions globaly using 3GPP Systems [2] and 2.9 million users that have access to mobile broadband subscriptions [3]); and transfer rates offered in the access network (download rates up to 3 Gbps are proposed [4]).

The described environment produces capacity, coverage and interference problems; these drawbacks are not independent from one another and occur most frequently in the areas known as high-density urban areas. In order to solve these problems, operators could deploy small cells in the access network (micro, pico, and/or femto cells); however, this alternative requires an investment in the deployment of these new sites, as well as the expansion of the backhaul network.

Looking for ways to solve these problems optimizing the use of infrastructure already deployed, some cooperative communication techniques among base stations have been proposed. These techniques aim to improve the capacity, reliability and/or coverage of cellular mobile networks [5]; however, implementation of these techniques may result in a traffic increase due to the possible redundancy in the transmission of user data [6]. Thus, it is evident that the large amounts of traffic that users can generate along with the additional traffic introduced by the cooperative techniques, introduce new challenges in the planning, management, and maintaining processes, especially at the level of access and backhaul networks.

The implementation of cooperation strategies among base stations has been studied greatly from the lower layers of the Open Systems Interconnection (OSI) reference model. Some studies have focused on the reduction of the load using information theory and signal processing techniques for some specific cooperation strategy, specially in Network Coding [7], [8], and Scheduling [9]. Other studies aimed to solve problems related to the optimization of the selection of elements of cooperation [10], the physical location of these elements [11], the improvement of the equity in the user service [11], [12], and the impact of backhaul network into the cooperation performance [13].

This work seeks to support operators planning and resource allocation processes by helping to define if cooperation is possible and if so, what's the best (optimal) cooperation scheme. Through this study, we want to provide a decision support tool to allow for a better management of the network by allowing cooperation in order to limit costs, traffic overloads, and produce a positive impact on the overall network capacity.

The remainder of this paper is organized as follows: The selection model formulation as a multi objective problem is presented in Section II. The multi objective algorithm proposed to solve the selection model is shown in Section III. Section IV presents the experimental results about the performance of our proposal. Finally, concluding remarks and directions for further work are presented in Section V.

II. Selection Model for Coordinated Multi Point (CoMP) Schemes

The 3rd Generation Partnership Project (3GPP) [14] introduced the concept of Coordinated Multi Point (CoMP) as a new tool to improve coverage at high data rates, to improve the performance at the cell edge, and to increase overall system performance. CoMP involves the coordination between multiple, geographically separated, points for transmission and reception on the downlink and

978-1-5090-0676-2/16/$31.00 ©2016 IEEE