

Proactive Rank Adaptation Method Using Probabilistic Interference Arrival Information

Takayuki Matsumuro, Kazuto Yano, Toshikazu Sakano

Wave Engineering Laboratories, Advanced Telecommunications Research Institute International (ATR)
2-2-2 Hikoridai Seika-cho, Sorakugun, Kyoto 619-0288 Japan

matsumuro@atr.jp, kzyano@atr.jp, t.sakano@atr.jp

Abstract— Rank adaptation for MIMO transmission is important for robust transmission in the presence of arriving interference. However, as traffic patterns become more complex, the arrival of interference can only be predicted probabilistically. This paper proposes a method for effective rank adaptation based on such probabilistic interference arrival information. The method calculates the channel capacity for each event in advance and selects the rank with the maximum expected value. The effectiveness of the proposed method is verified by simulations assuming ideal propagation conditions.

Keyword— MIMO, rank adaptation, MMSE weight, adaptive array, probabilistic interference condition



Takayuki Matsumuro (M'12) received the B.E., M.E., and Ph.D. (Eng.) degrees in electrical engineering from Kyoto University, Kyoto, Japan, in 2012, 2014, and 2017 respectively. He has been a researcher in Wave Engineering Laboratories, Advanced Telecommunication Research Institute International (ATR), since 2022. He was an assistant professor in the Department of Electronics and Informatics, Ryukoku University, from 2017 to 2022. He is the WTC Chair of the IEEE MTT-S Kansai Chapter. He is the secretary of the IEEE Investigating R&D Committee on Innovative Advanced Application Technology of Electromagnetic Waves in the 5G/Beyond 5G Era. He is a committee member of the editorial board of ELEX. He is a committee member of the IEICE Technical Committee on Wireless Power Transfer. He is a director of the Kaiyo Inverse Dam Society (KID-S). He was awarded the Best Presentation Award at Thailand-Japan Microwave Conference in 2013. He has been engaged in research on beamforming for wireless power transmission and wireless communication systems.



Kazuto Yano received the B.E. degree in electrical and electronic engineering, and the M.S. and Ph.D. degrees in communications and computer engineering from Kyoto University in 2000, 2002, and 2005, respectively. He was a research fellow at the Japan Society for the Promotion of Science (JSPS) from 2004 to 2006. In 2006, he joined the Advanced Telecommunications Research Institute International (ATR). Currently, he is the Head of Dept. Wireless Communication Systems at Wave Engineering Laboratories, ATR. His research interests include space-time signal processing for interference suppression, MIMO transmission, and PHY/MAC cross-layer design of wireless communication systems for ISM bands. He received IEICE (the Institute of Electronics, Information and Communication Engineers) Communications Society Best Tutorial Paper Award in 2017, and ICAIIC 2019 Excellent Paper Award in 2019. He is a senior member of IEICE and a member of IEEE.



Toshikazu Sakano received the B.E., the M.E. and Ph.D. degrees in communications engineering from Tohoku University, Sendai, Japan, in 1985, 1987, and 1998, respectively. In 1987, he joined Nippon Telegraph and Telephone Corporation's (NTT) laboratories in Yokosuka, Japan, where he had been active in R&Ds on optical signal processing for high-performance computer systems, super-high-definition imaging systems, photonic network architectures, large-capacity optical transmission systems and resilient ICTs for disaster countermeasure. In 2015, he moved to the Advanced Telecommunications Research Institute International (ATR) where he has engaged in business development of the company and several R&D projects related to wireless communications. Currently, he is director of Wave Engineering Laboratories, ATR. He received IEICE (the Institute of Electronics, Information and Communication Engineers) Young Engineer Award in 1995. He is senior members of IEICE and Optica, and a member of IEEE.