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A novel massive MIMO for 5G systems

The evolution from 4G to 5G wireless systems is driven by the expected huge growth in user bit rates and overall system throughput. This requires a substantial spectral efficiency increase, while maintaining or even improving power efficiency. To accomplish this, one needs new transmission techniques, with the most promising ones being millimeter waves (mm-waves) and massive multiple-input multiple-output (m-MIMO). Moreover, the small wavelength means small antennas, allowing small-sized transmitter and receivers with very high number antenna elements and, therefore, enabling m-MIMO implementations. However, these frequencies present considerable challenges both in terms of propagation (high propagation free-space path losses, small diffraction effects and almost total absorption losses due to obstacles) and implementation difficulties, both at the analog and digital domains design, efficient amplification, signal processing requirements for equalization and user separation, etc., which can be particularly challenging for m-MIMO systems. It is considered the use of m-MIMO combined with single-carrier with frequency-domain equalization (SC-FDE) modulations, which aims to reduce the peak-to-average power ratio, as compared to other block transmission techniques (e.g. OFDM). A low-complexity iterative frequency-domain receiver based on the equal gain combining approach is proposed. This receiver does not require matrix inversions and has excellent performance, which can be very close to the matched filter bound after just a few iterations, even when the number of receiving antennas is not very high.

Biography

Mario Marques da Silva is an Associate Professor and Director of Department of Science and Technology at Universidade Autónoma de Lisboa. He is also a Researcher at Instituto de Telecomunicações, in Lisbon, Portugal. He received his BSc in Electrical Engineering in 1992, MSc and PhD degrees in Electrical and Computers Engineering (Telecommunications), respectively in 1999 and 2005, both at Instituto Superior Técnico, University of Lisbon. He has been involved in multiple networking and telecommunications projects. He is the author of five books published by CRC Press. He has chaired many conference sessions and has been serving in the organizing committee of relevant EURASIP and IEEE conferences.

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