Successive-Relaying-Aided Decode-and-Forward Coherent Versus Noncoherent Cooperative Multicarrier Space–Time Shift Keying

Publisher: IEEE Cite This PDF

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Abstract

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Abstract:
Successive-relaying-aided (SR) cooperative multicarrier (MC) space-time shift keying (STSK) is proposed for frequency-selective channels. We invoke SR to mitigate the typical 50% throughput loss of conventional half-duplex relaying schemes and MC code-division multiple access (MC-CDMA) to circumvent the dispersive effects of wireless channels and to reduce the SR-induced interference. The distributed relay terminals form two virtual antenna arrays (VAAs), and the source node (SN) successively transmits frequency-domain (FD) spread signals to one of the VAAs, in addition to directly transmitting to the destination node (DN). The constituent relay nodes (RNs) of each VAA activate cyclic-redundancy-checking-based (CRC) selective decode-and-forward (DF) relaying. The DN can jointly detect the signals received via the SN-to-DN and VAA-to-DN links using a low-complexity single-stream-based joint maximum-likelihood (ML) detector. We also propose a differentially encoded cooperative MC-CDMA STSK scheme to facilitate communications over hostile dispersive channels without requiring channel estimation (CE). Dispensing with CE is important since the relays cannot be expected to altruistically estimate the SN-to-RN links for simply supporting the source. Furthermore, we propose soft-decision-aided serially concatenated recursive systematic convolutional (RSC) and unity-rate-coded (URC) cooperative MC STSK and investigate its performance in both coherent and noncoherent scenarios.

Published in: IEEE Transactions on Vehicular Technology (Volume: 62 , Issue: 6, July 2013)

Page(s): 2544 - 2557

DOI: 10.1109/TVT.2013.2246800

Date of Publication: 12 February 2013

Publisher: IEEE

ISSN Information:

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