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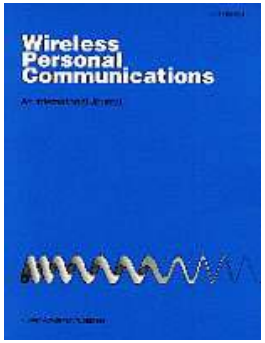

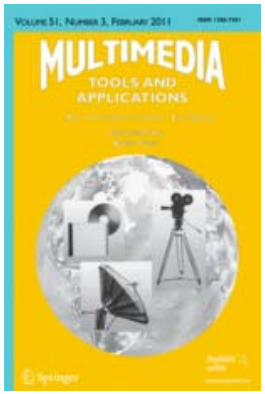

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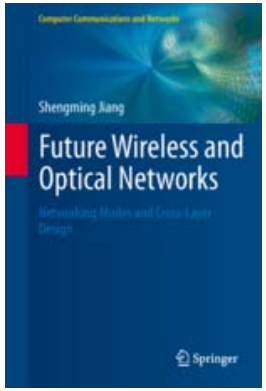

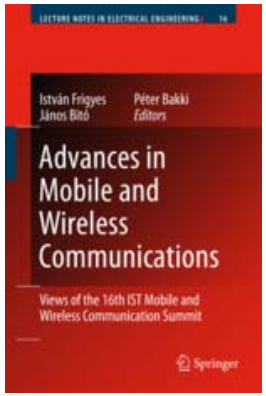

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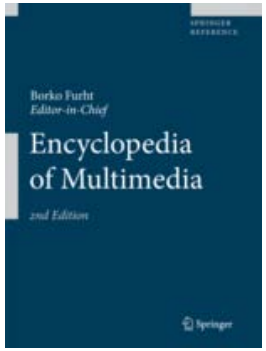

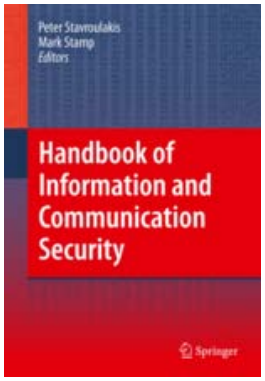

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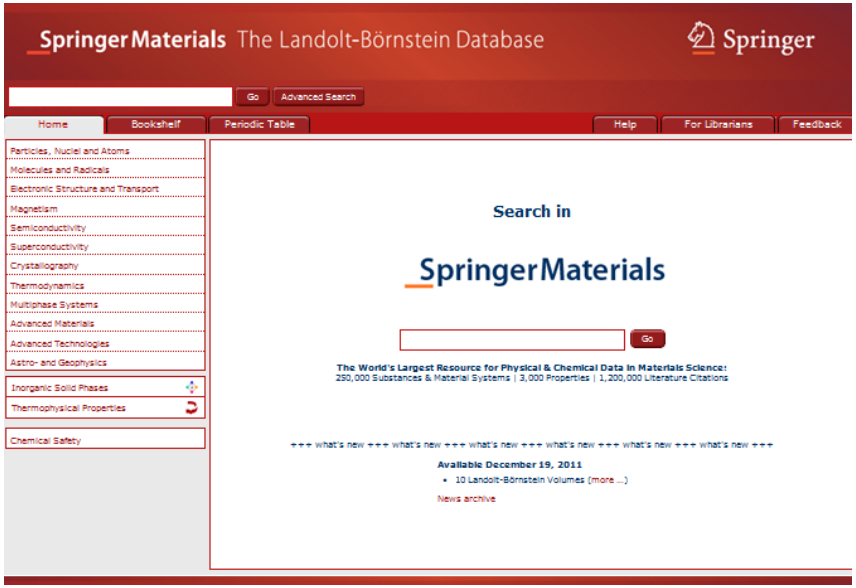

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Cellular Downlink Performance with Covariance-CSIT-Based MIMO Precoding

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Abstract

The nature of the trade-off between reduced overhead of channel state information (CSI) and resultant performance losses influences the design of frequency-division duplexed practical cellular systems. One candidate for CSI feedback reduction is the use of covariance-matrix-based CSI at the transmitter (CSIT) in conjunction with linear precoding techniques. This paper analyzes the performance of such systems in the downlink for both single-user (SU-) and multiuser (MU-) multiple-input multiple output (MIMO) in comparison to those using optimal perfect-instantaneous-CSIT-based precoding. In addition, the effectiveness of techniques enforcing frequency domain diversity versus those based on the maximal ergodic channel capacity criterion is evaluated. A novel precoding scheme using covariance matrix information that supports spatial multiplexing in both SU- and MU-MIMO is proposed. Simulation results show that the spectral efficiency loss from covariance-CSIT-based techniques from those utilizing perfect, instantaneous CSIT is shown to be about 1 dB in a highly correlated urban channel environment for both SU- and MU-MIMO, whereas for microcell environments it is between 3 and 4 dB.

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