Tensor-Based MIMO Relaying Communication Systems

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Abstract

In cooperative communication systems, two or more transmitting terminals are combined to increase the diversity and/or the power of the signals arriving at a particular receiver. Therefore, even if the devices do not have more than one antenna, or if a significant propagation loss is present between the two communicating nodes, the various transmitting elements can act as a virtual antenna array, thus obtaining the benefits of the MIMO systems, especially the increase in the capacity. Recently, tensor decompositions have been introduced as an efficient approach for supervised channel estimation in cooperative communications. Aiming to avoid the use of pilot sequences, which limits the overall system spectral efficiency, a few recent works have developed tensor-based techniques for joint symbol and channel estimation in MIMO relaying systems. In this talk, we present some recently proposed tensor-based strategies, including transmission systems and semi-blind receivers, for one-way two-hop MIMO relaying systems. Based on a Khatri-Rao space-time coding at the source and an AF scheme at the relay, two transmission schemes are proposed, namely, PT2-AF and NP-AF, where the received signals at the destination follow respectively a PARATUCK2 and a Nested PARAFAC tensor model. Exploiting uniqueness properties of these tensor models, some semi-blind receivers are derived. Some of these receivers are of iterative form using an ALS algorithm, whereas some other ones have closed-form solutions. Some simulation results are presented to illustrate the performance of the proposed receivers which are compared to some state-of-the-art supervised techniques.