Optimal Multi-Relay Design Using Method Minimum Mean-Square-Error For MIMO Relay Networks

Apriana Toding[1] and Syafruddin Syarif[2]
Dept. Electrical Engineering[1,2]
Universitas Kristen Indonesia Paulus[1] and Hassanuddin University[2]
Makassar, South Sulawesi, Indonesia
Email: aprianatoding@ukipaulus.ac.id[1] and syafruddin.s@eng.unhas.ac.id[2]

Abstrak— Recently, the optimal transceiver design in multi-user multiple-input-multiple-output (MIMO) relay systems has attracted great attention. In this paper, we design the optimal multi-relay matrices for MIMO relay communication systems using the minimum mean-square-error approach. First, the mean-square error (MSE) expression at receiver is derived, and a minimum mean-square error (MMSE)-based optimization problem is formulated. Then, a Bi-step iterative algorithm is developed to search for the optimal numerical solution. Besides, in order to solve the original problem more efficiently, we show that the optimal relay amplifying matrices have a beamforming structure. Using the optimal structure, the relay power-loading algorithm is developed to minimize the MSE of the signal waveform estimation at the destination node. Simulation result demonstrates the effectiveness of the proposed relay-amplifying matrix with multi-relay nodes using approach in the system bit-error-rate performance.

Index Terms—MIMO, multi-relay, non-regenerative relay, minimum mean-square-error