Joint Multiuser Detection of Multidimensional Constellations Over Fading Channels

Abstract:

We investigate the error performance of multidimensional constellations in the multiple access and broadcast channels. More specifically, we provide closed-form expressions for the pairwise error probability (PEP) of the joint maximum likelihood detection, for multiuser signaling in the presence of additive white Gaussian noise and Rayleigh fading. Arbitrary numbers of users and multidimensional signal sets are assumed, while the provided formula for the PEP is a function of the dimension-wise distances of the multidimensional constellation. Furthermore, a useful upper bound on the average symbol error probability is also obtained through the union bound. The analysis is applied to the sparse code multiple access systems. The analytical results are validated successfully through simulations, and show their importance in the multidimensional constellation design.