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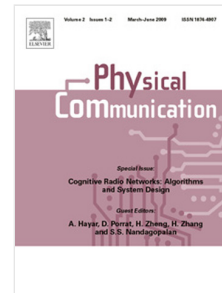
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# Modeling the Lossy Transmission of Correlated Sources in Multiple Access Fading Channels

Antonios Argyriou, and Özgü Alay, and Panagiotis Palantas

## Abstract

In this paper, we develop accurate distortion models for the lossy transmission of two correlated sources in a multiple access Rayleigh fading channel. We focus on a class of real-life communication systems, where the source and channel coders have already been designed separately and can only be configured during the system operation. We investigate three different source coding schemes: distributed source coding (DSC), layered source coding, and independent compression through quantization. With the later scheme the sources are jointly decoded with minimum mean square error (MMSE) estimation at the receiver. We also consider two different transmission schemes: Orthogonal transmissions and interfering transmissions decoded with a successive interference cancellation (SIC) decoder. Our final closed-form analytical models are used to determine the optimal combination of source coding and transmission schemes, as well as their optimal configuration. Hence, we exercise joint source and channel coding (JSCC) by optimizing the system configuration. Through simulations, we first validate the analytical model and illustrate the performance of different schemes. Finally, we demonstrate the JSCC gains achieved by our system.

## Index Terms

Correlated data, multiple access channel, interference cancellation, Rayleigh fading, wireless sensor networks, distributed source coding, performance model, optimization.

## I. INTRODUCTION

The most well-known example of correlated data sources are sensors, like video cameras, that collect observations correlated in space and time. The data are typically collected with the help of a wireless sensor network (WSN). To reduce the communication bandwidth in such a system, increase robustness to channel errors, and eventually improve the estimation accuracy of the source signal, all the source and channel coding options should be explored.

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