



Cooperative Diversity for Free-Space Optical Communications: Transceiver Design and Performance Analysis

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ABSTRACT

In this work, a static relaying protocol, called Decode or Quantize and Forward (DoQF), is introduced for half duplex single-relay networks, and its performance is studied in the context of communications over slow fading wireless channels. The proposed protocol is inspired by the so-called Compress-and-Forward (CF) but only needs statistical Channel State Information at the Transmitter (CSIT). First, we analyse the behaviour of the outage probability P_{out} of the proposed protocol as the SNR ρ tends to infinity. In this case, we prove that $\rho^2 P_{out}$ converges to a constant ξ . We refer to this constant as the outage probability gain and we derive its closed-form expression for a general class of wireless channels that includes Rayleigh and Rice. We furthermore prove that the DoQF protocol has the best achievable outage gain in the wide class of half-duplex static relaying protocols and we minimize ξ w.r.t the power allocation to the source and the relay and the durations of the slots. Next, we focus on Rayleigh channels to derive the Diversity-Multiplexing Trade off (DMT) of the DoQF. Our results show that the DoQF achieves the 2 by 1 MISO DMT upper-bound for multiplexing gain < 0.25 .