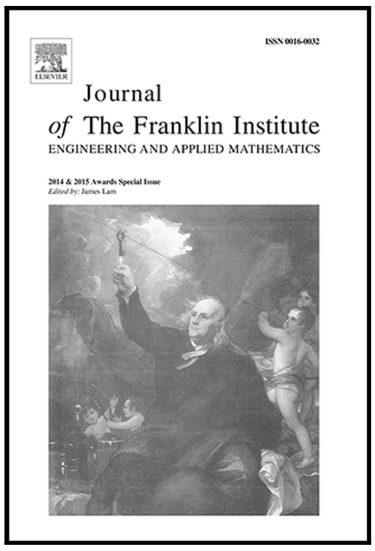

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Exact Expressions for the Bit Error Rate and Channel Capacity of a Dual-hop Cooperative Communication Systems Over Nakagami-m Fading Channels

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Abstract

Cooperative diversity has been widely used in wireless communication systems since they greatly improves and enhances the quality of service as being virtual antennas without physically placing multiple antennas at the transmitter or the receiver sides. In this paper, we consider the amplify and forward (AF) relay-based communication systems under the influence of Nakagami-m multipath fading channels in both channel links. Several performance metrics are considered in this study, including, the bit error rate (BER), the ergodic channel capacity, and the outage capacity. The obtained expressions are in closed-form and can reduce to the Rayleigh channel model, as a special case. Numerical results are also provided for the obtained expressions and some conclusions are drawn.

Index Terms

Relay-based cooperative systems, amplify and forward, average bit error rate (BER), ergodic capacity, outage capacity, and Nakagami-m fading channel.

I. Introduction

Wireless communication systems suffer mainly from destructive fading in the instantaneous signal envelope due to small scale fading. Hence, researchers developed several techniques to overcome these channel impairments by introducing several diversity techniques, such as maximal ratio combining, equal gain combining, switching combining, and selection combining techniques, in order to enhance the transmission and extend the coverage area [1]. In diversity techniques, physical antennas are placed either in the transmitter and/or the receiver sides. However, dual-hop communication system was recently introduced to enhance the transmission and extend the coverage area without physically placing further antennas as in conventional diversity techniques. Moreover, dual

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