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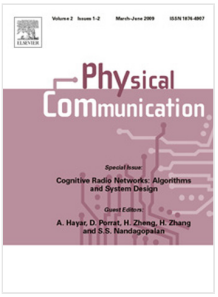

Computation of information rates by means of discrete states density recursion

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Computation of Information Rates by means of Discrete States Density Recursion

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Abstract

Starting from the existing works on the computation of information rates of channels with memory, we present a modification of these methods that can be used for continuous-state space models. The principle used for developing this alternative method is based on the partitioning of the continuous-state space into sub-sets, each one representing a state of a trellis, and the association between the states and the probability density functions built and updated on such sub-sets. The paper discusses the cases in which the method provides a computational advantage and it presents numerical results regarding the relevant example of the Wiener phase noise model.

Keywords: Information rate, Continuous-state channels with memory, Kalman filtering, MIMO channels.

1. Introduction

In this paper we consider the problem of computing the information rate between the input process $X = (X_1, X_2, \cdots)$ and the output process $Y = (Y_1, Y_2, \cdots)$ of a time-invariant discrete-time channel with memory that satisfies, through an ergodic auxiliary state process $S = (S_0, S_1, S_2 \cdots)$, the Markov property

$$p(x_1^n, y_1^n, s_0^n) = p(s_0) \prod_{k=1}^{n} p(x_k, y_k, s_k | s_{k-1}), \tag{1}$$

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