

Universal Decoding for Gaussian Intersymbol Interference Channels

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Abstract

A universal decoding procedure is proposed for the intersymbol interference (ISI) Gaussian channels. The universality of the proposed decoder is in the sense of being independent of the various channel parameters, and at the same time, attaining the same random coding error exponent as the optimal maximum-likelihood (ML) decoder, which utilizes full knowledge of these unknown parameters. The proposed decoding rule can be regarded as a frequency domain version of the universal maximum mutual information (MMI) decoder. Contrary to previously suggested universal decoders for ISI channels, our proposed decoding metric can easily be evaluated.

Index Terms

Universal decoding, interference intersymbol (ISI), error exponents, maximum-likelihood (ML), random coding, maximum mutual information, Gaussian channels, deterministic interference.

I. INTRODUCTION

In many practical situations encountered in coded communication systems, the specific channel over which transmission is to be carried out is unknown to the receiver. The receiver only knows that the channel belongs to a given family of channels. In such a case, the implementation of the optimum maximum likelihood (ML) decoder is precluded, and thus, universal decoders, independent of the

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