Comment on “Maximum Likelihood Decoding of Uncoded and Coded PSK Signal Sequences Transmitted over Rayleigh Flat-Fading Channels”

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Abstract—This comment points out some papers published before a recently published paper by Vitetta and Taylor. These early papers have dealt with the general problem of maximum-likelihood sequence estimation of coded/uncoded phase-shift keying (PSK) and quadrature amplitude modulation (QAM) signals in correlated Rician and Rayleigh-fading channels. These publications did not assume use of interleaving or use of optimal codes, designed for interleaved systems. The statistical properties of the multiplicative fading process have been included in the design of the receivers which were proposed, analyzed, and evaluated. The research contributions documented in these papers have also shown for the first time in the open literature the link between conventional detection techniques and the maximum-likelihood detection of signals in this type of fading channels.

In THE above paper\textsuperscript{1} which deals with the problem of maximum-likelihood (ML) detection for uncoded and coded $M$-PSK signal sequences in Rayleigh-fading channels, it is stated in Section I that:

In almost all cases of interest, interleaved coded systems [11]–[14] and optimal codes [15], [27] designed for interleaved systems are considered.

We are writing to call to the authors’ and readership’s attention the existence of several earlier papers which have dealt with the general problem of ML sequence estimation of coded/uncoded phase shift keying (PSK) and even quadrature amplitude modulation (QAM) signals in correlated, fast fading Rayleigh and even Rician fading channels without [1], [2] and with diversity [3]. In [1]–[3], the derivation of the ML sequence estimators includes the effects of correlation of the multiplicative fading process and, therefore, does not make use of any interleaver. It also considers the general case where both phase and amplitude of the faded signal could vary significantly and thus cannot be assumed constant over a number of transmitted symbols. To the best of our knowledge, in addition to presenting the fading predictive algorithm for PSK/QAM signals, Makrakis and Mathiopoulos [1] (and subsequently [2], [3]) have shown for the first time in the open technical literature the link between conventional detection techniques (i.e., coherent, differential, and envelope detection) and ML sequence estimation of PSK/QAM signals transmitted over correlated fast Rayleigh/Rician-fading channels. To the best of our knowledge, the research published in [1] has for the first time in the open technical literature analytically established the link between ML sequence estimation and multiple differential detection (MDD)\textsuperscript{2} [4]–[6] in fading channels. It has also shown how the statistics of the fading channel have to be incorporated in the ML sequence estimation.

REFERENCES


\textsuperscript{2}The receiver hardware structure for MDD consists of a combination of more than one distinct differential detectors with elements of time delay equal to progressively increasing multiples of the symbol duration [1]–[6]. In other papers on the same subject which have appeared after the publication of [1], [4], and [5], the equivalent structure is denoted as multiple-symbol differential detection (see, e.g., [7] which deals only with uncoded PSK signals transmitted over the additive white Gaussian noise (AWGN) channel). It should be noted that [4] and [5] also deal with the AWGN channel.