Abstracts

Performance of an adaptive rate modem using quasi-analytic simulation techniques

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The symbol error probability (SEP) of a digital signal processor implemented /spl pi//M M-ary differentially coherent phase-shift keying (MDPSK) modem, using quasi-analytical (QA) simulation techniques, is the subject of this investigation. We study M values of 4, 8, 16, 32, and 64 for use in a fast adaptive data rate mobile radio communication system. The proposed modulation scheme /spl pi//M-MDPSK, is a generalization of /spl pi//4 differentially coherent quadrature phase-shift keying, which is used in the North American time-division multiple-access wireless standard. A QA simulation approach is developed so that real system impairments can be studied without having to resort to lengthy Monte Carlo simulation. In particular, it is found that implementation losses, most notable at M=32 and 64, which result from practical transmit and receive filtering, and symbol timing error, can be largely overcome by using a fixed equalization filter and increased accuracy of symbol timing recovery. We focus on an additive white Gaussian noise channel since, in a fast adaptive rate system, the Doppler spread mobile channel is approximately Gaussian on short time intervals. However, the quasi-analytic technique developed here is directly extendable to a fast Rayleigh fading channel. Specifically, we find that for M=64, the inclusion of a fixed seven-tap zero forcing equalizer at the matched filter output, decreases the SEP degradation at P/sub e/=10/sup -4/ from 7.5 dB down to 0.24 dB. The symbol timing error using a finite-precision interpolator is held to within 1/64 symbol period.

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