EE 564

Project

Due Monday, April 28, 2014 at 5:00 p.m.

Important Note: This project consists of two parts and is to be an individual effort. You may not consult other students or anyone else except your professor. Your report should be typed and well organized. You should print out a hard copy and hand it in at the beginning of lecture on the due date shown above. You should include in an appendix any source code you write (Matlab, C, C++, etc.).

Part 1. Modulation/Demodulation Performance for BPSK in AWGN.

Suppose we have a BPSK signal of the form

$$s(t) = A\cos(2\pi f_c t + \phi)$$

where the amplitude is $A = 10$ and the frequency $f_c = 1$ MHz. You can assume that the phase ϕ is either 0 or 180 degrees. During transmission the signal is corrupted by AWGN. A maximum-likelihood demodulator is used at the receiver to recover the original information.

Assume that the BPSK signal is used to transmit the following binary data:

1 1 0 0 0 1 0 1

where each bit corresponds to a signal duration of $T = 2$ μsec. Simulate the performance of this binary system and plot your BER vs. E_b/N_0 results. On the same graph plot the expected performance using the known BER formulas for BPSK. Also, plot a 95% confidence interval about your simuluated performance results. Include in your report for this section analytic derivations, simulated performance results and a discussion.

Part 2. Modulation/Demodulation Performance for 8PSK in AWGN.

Suppose we have a 8PSK signal of the form

$$s(t) = A\cos(2\pi f_c t + \phi_k), \quad k =\in \{0, 1, 2, 3, 4, 5, 6, 7\}.$$

where the amplitude is $A = 10$ and the frequency $f_c = 1$ MHz. You can assume that the phase ϕ_k is either 0, 45, 90, 135, 180, 225, 270 or 315 degrees. During transmission the signal is corrupted by AWGN. A maximum-likelihood demodulator is used at the receiver to recover the original information.

Generate random bits in your simulation to serve as the information stream where each symbol (3 bits) corresponds to a signal duration of $T = 2$ μsec. You should assume a gray code mapping of the bits to a constellation point. Simulate the performance of this 8-ary system and plot your SER (symbol error rate) vs. E_b/N_0 and BER vs. E_b/N_0 results. Also, plot a 95% confidence interval about your simuluated performance results. Include in your report for this section analytic derivations, simulated performance results and a discussion.