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%  Simulation of digital M-PSK modulation schemes over an AWGN channel
%  November 2004. Robert Morelos-Zaragoza. San Jose State University.
%  Needs the Communications toolbox.

clear
Fd = 1; Fs = 1;
N=500000 ;                                          % Number of simulated points
method='psk';                                       % Phase shift keying
set(1) = 2; set(2) = 4; set(3) = 8;
for j=1:1:3
    M = set(j);
    i=1;
    for esno=0:1:18
        sigma = sqrt(10^(-esno/10)/2);
        x = randint(N,1,M);                         % Original information
symbols (integers)
        y = modmap(x,Fd,Fs,method,M);               % Mapped signal
        ynoisy = y + sigma*randn(N*Fs,2);           % Gaussian noise added
        z = demodmap(ynoisy,Fd,Fs,method,M);        % Demapped noisy signal
        s = symerr(x,z);                            % Number of symbol errors
after demapping
        ber(j,i) = (s/N)/log2(M);                   % Bit error (BER) assuming
Gray mapping
        snr(i) = esno;
        i=i+1;
    end
    j
end
semilogy(snr,ber(1,:),'-b^',snr,ber(2,:),'-bo',snr,ber(3,:),'-bs');
grid on;
ylabel('BER');
xlabel('E/N_0 (dB)');
legend('BPSK', 'QPSK', '8PSK',1);
title('Error performance of M-PSK. SJSU - Fall 2004.');
```