

Problem Statement

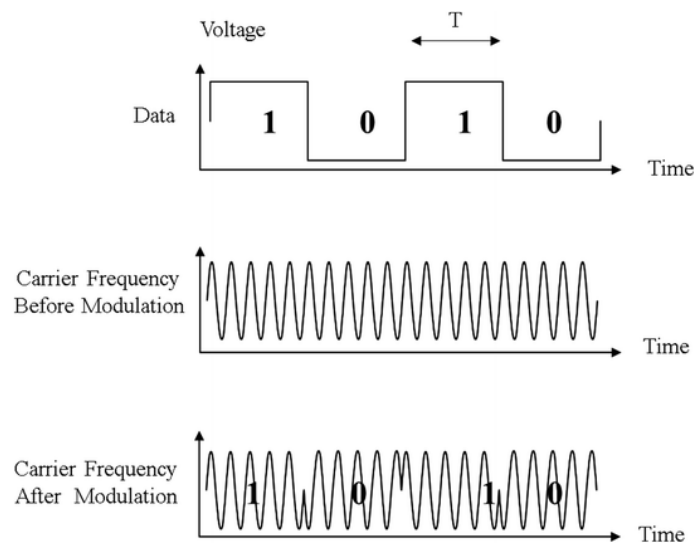
Write a MATLAB script to generate a binary PSK signal for a random base band data of 16 bits.

Assume the carrier frequency f_c as 1000Hz

Phase shift keying (PSK)

PSK is the digital modulation technique in which the phase of the carrier signal is changed by varying the sine and cosine inputs at a particular time.

PSK uses a finite number of phases, each assigned a unique pattern of binary digits. Usually, each phase encodes an equal number of bits. Each pattern of bits forms the symbol that is represented by the particular phase. The demodulator, which is designed specifically for the symbol-set used by the modulator, determines the phase of the received signal and maps it back to the symbol it represents, thus recovering the original data.



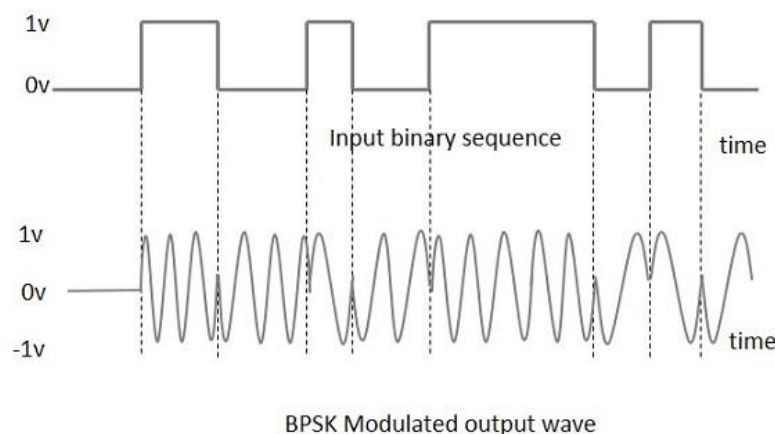
Binary PSK

BPSK is the simplest form of phase shift keying (PSK). It uses two phases which are separated by 180°

This is also called as 2-phase PSK or Phase Reversal Keying. In this technique, the sine wave carrier takes two phase reversals such as 0° and 180° .

It does not particularly matter exactly where the constellation points are positioned, and in this figure they are shown on the real axis, at 0° and 180° .

Therefore, it handles the highest noise level or distortion before the [demodulator](#) reaches an incorrect decision. That makes it the most robust of all the PSKs. It is, however, only able to modulate at 1 bit/symbol and so is unsuitable for high data-rate applications.



MATLAB Simulation

```
clc; clear all; clf;
```

```
nSamplePoints = 1000;
```

```
rN = rand(1, nSamplePoints);
```

```
rBinary = round(rN);
```

```
Fc = 1000;
```

```
Fs = 4;
```

```
nCycles = 6;
```

```
Tb = nCycles/Fc;
```

```
t = 0:1/Fs:(nCycles-1/Fs);
```

```
xC = cos(2*pi*t);
```

```
A = 1;
```

```
Eb = (A^2*Tb)/2;
```

```
Eb_N0dB = 0 : 2 : 14;
```

```
Eb_N0 = 10.^(Eb_N0dB/10);
```

```
nVar = (Eb)./ Eb_N0;
```

```
bitStream = [];  
carrierSignal = [];  
i = 1;  
  
while(i<=nSamplePoints)  
    if(rBinary(i))  
        bitStream = [bitStream ones(1,length(xC))];  
    else  
        bitStream = [bitStream zeros(1,length(xC))];  
    end  
    carrierSignal = [carrierSignal A*xC];  
    i = i+1;  
end  
  
bits = 2*(bitStream-0.5);  
bpskSignal = carrierSignal.*bits;  
plot(bits);  
xlim([0 300]); ylim([-1.2 1.2]);  
  
figure(1);  
subplot(3,1,1); plot(bitStream); title('Digital Signal');
```

```
xlim([0 200]); ylim([-0.2 1.2]);  
subplot(3,1,2); plot(carrierSignal); title('Carrier Signal');  
xlim([0 200]); ylim([-1.2 1.2]);  
subplot(3,1,3); plot(bpskSignal); title('BPSK modulated  
signal');  
xlim([0 200]); ylim([-1.2 1.2]);
```

MATLAB Output

