Lab No. 10
Communication Systems

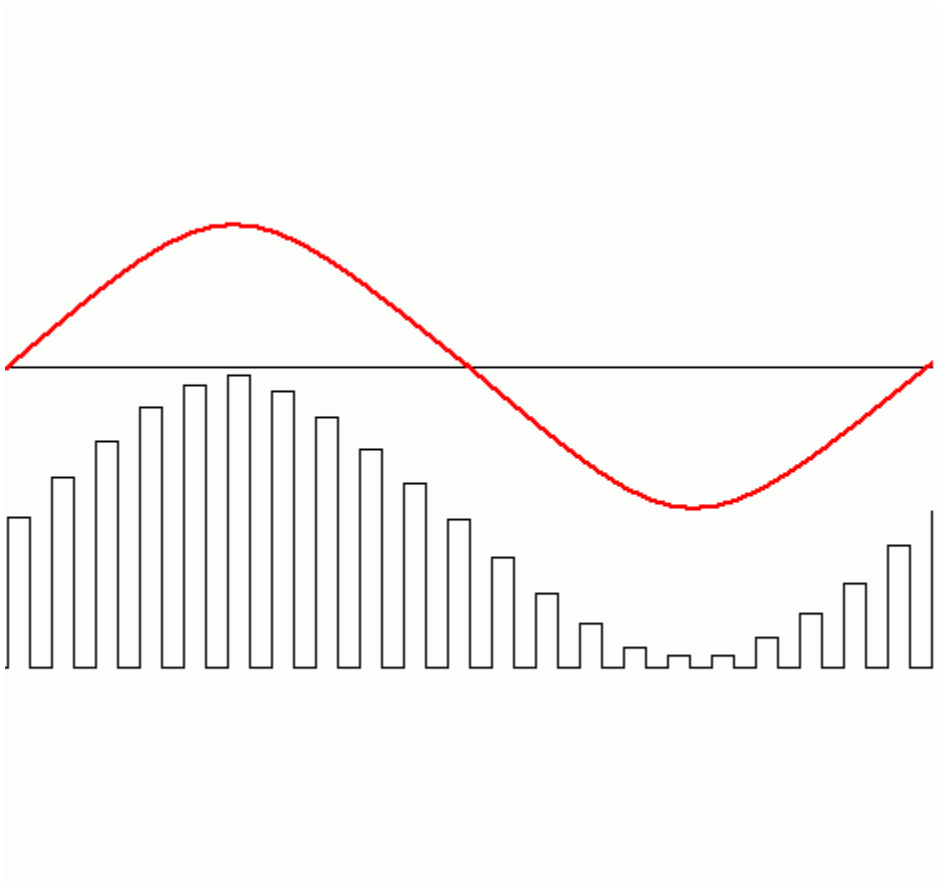
Pulse Amplitude Modulation

What is Pulse Modulation?

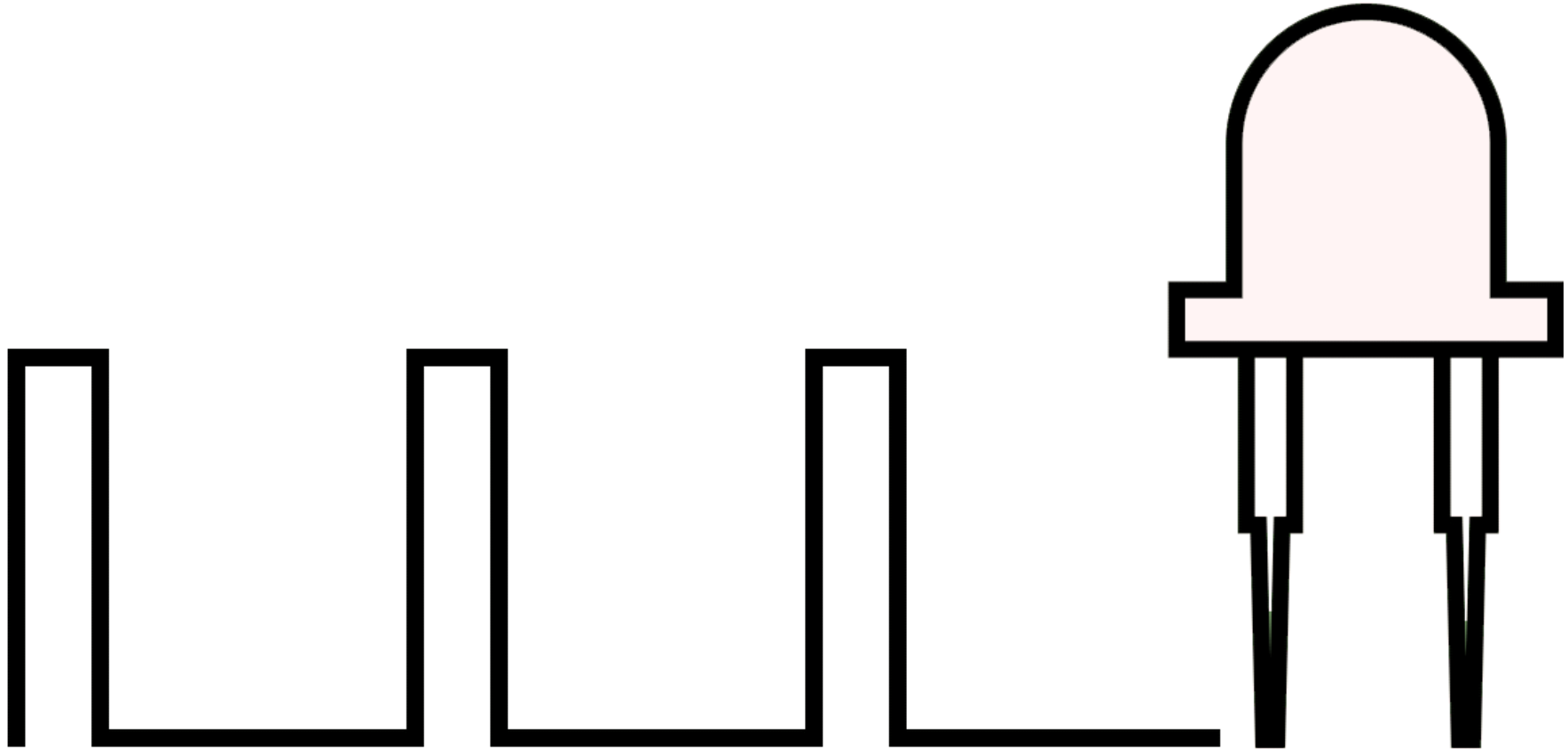
- A modulation scheme where the carrier wave is a pulse wave.

- Types when the message signal is Analog:
  - Pulse Amplitude Modulation (PAM)
  - Pulse Width Modulation (PWM)
  - Pulse Position Modulation (PPM)

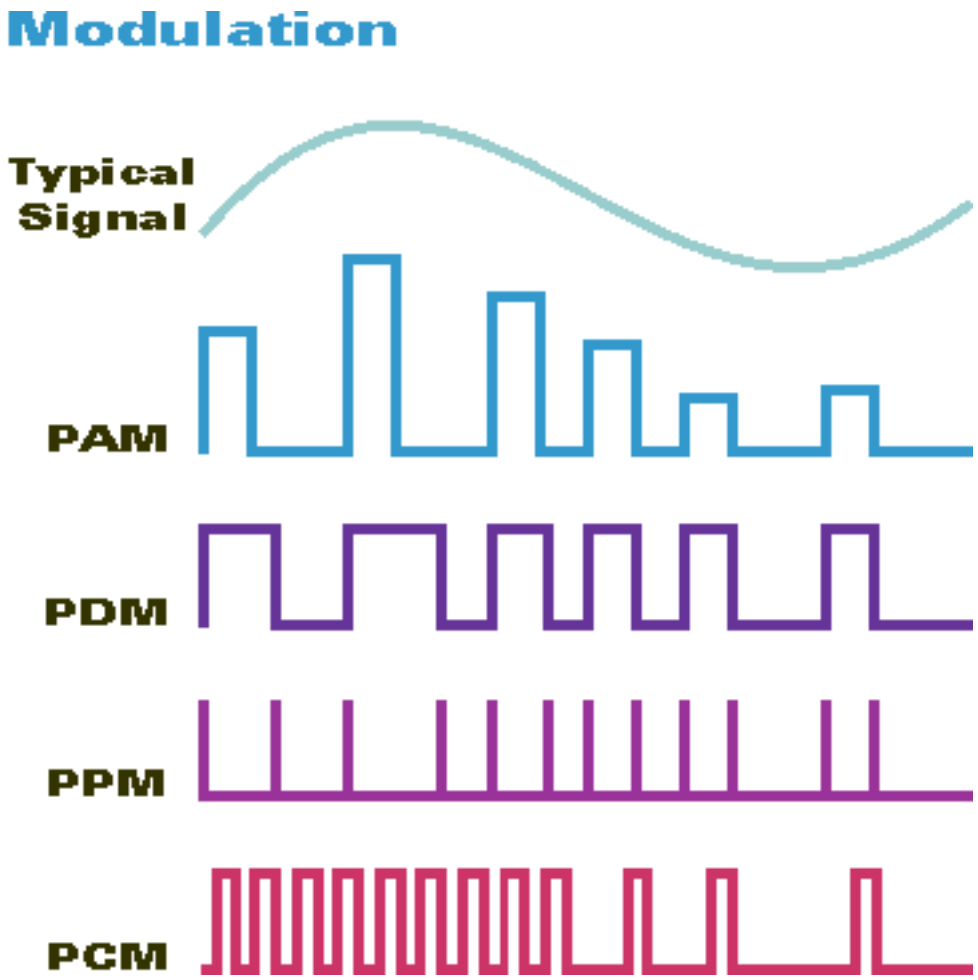
PAM



PWM



PPM

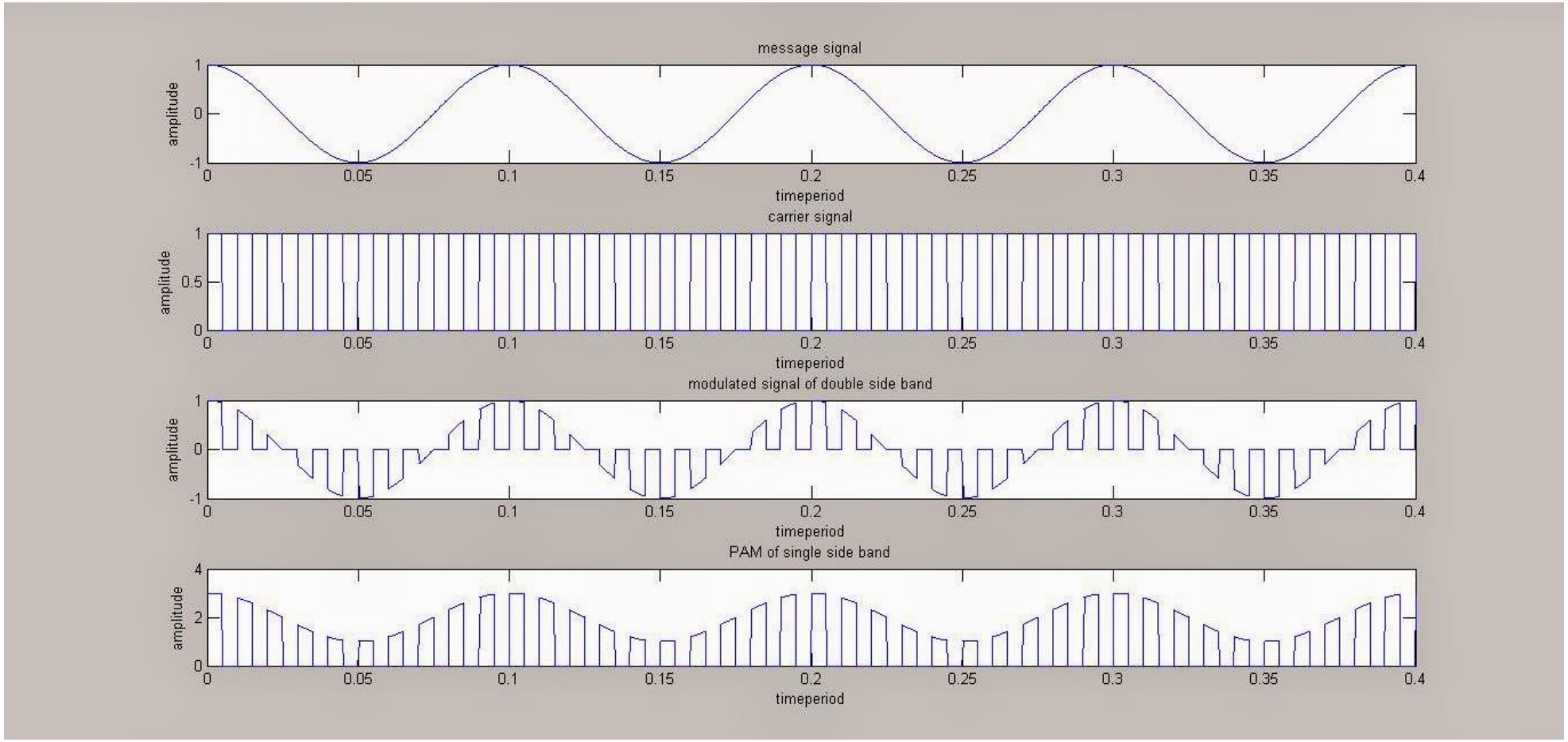


MATLAB code for PAM

- **clc;**
  clear all;
  close all;
  fc=100;
  fm=fc/10;
  fs=100*fc;
  t=0:1/fs:4/fm;
  mt=cos(2*pi*fm*t);
  ct=0.5*square(2*pi*fc*t)+0.5;
  st=mt.*ct;
  tt=[ ];
  %single sided PAM
  for i=1:length(st);
  if st(i)==0;
  tt=[tt,st(i)];
  else
  tt=[tt,st(i)+2];
  end
  end

```
figure(1)
subplot(4,1,1);
plot(t,mt);
title('message signal');
xlabel('timeperiod');
ylabel('amplitude');
subplot(4,1,2);
plot(t,ct);
title('carrier signal');
xlabel('timeperiod');
ylabel('amplitude');
subplot(4,1,3);
plot(t,st);
title('modulated signal of double side band');
xlabel('timeperiod');
ylabel('amplitude');
subplot(4,1,4);
plot(t,tt);
title('PAM of single side band');
xlabel('timeperiod');
ylabel('amplitude');
```

Results


message signal
amplitude
timeperiod
carrier signal
amplitude
timeperiod
modulated signal of double side band
amplitude
timeperiod
PAM of single side band
amplitude
timeperiod

Lab Task

- Perform Pulse Amplitude Demodulation using MATLAB.
- Use matlab function pammod to perform PAM.
- Use matlab function pamdemod to perform Pulse Amplitude Demodulation.