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Exp-4

CS LAB

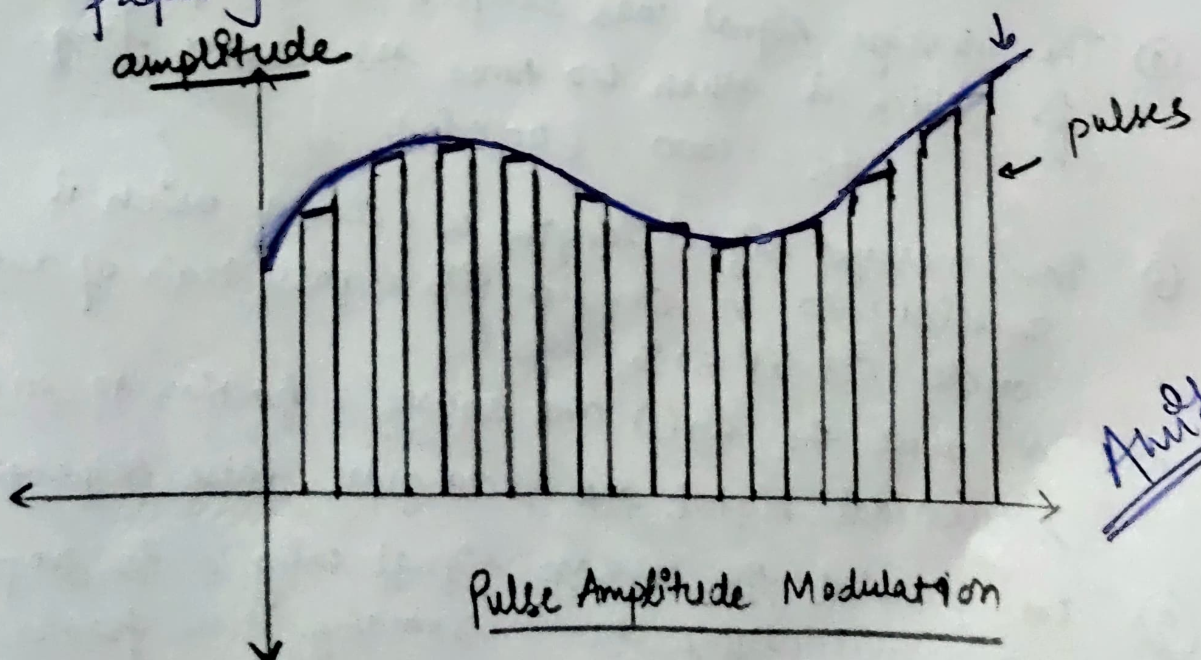
Pulse Amplitude Modulation →

Aim – To develop a MATLAB working code for Pulse Amplitude ~~of~~ Modulation of given message signal.

Tools – MATLAB R2021 b.

Theory – Pulse Amplitude Modulation, also called as analog pulse modulation, is an analog modulating scheme in which the amplitude of the pulse carrier varies proportional to the instantaneous amplitude of the message signal.

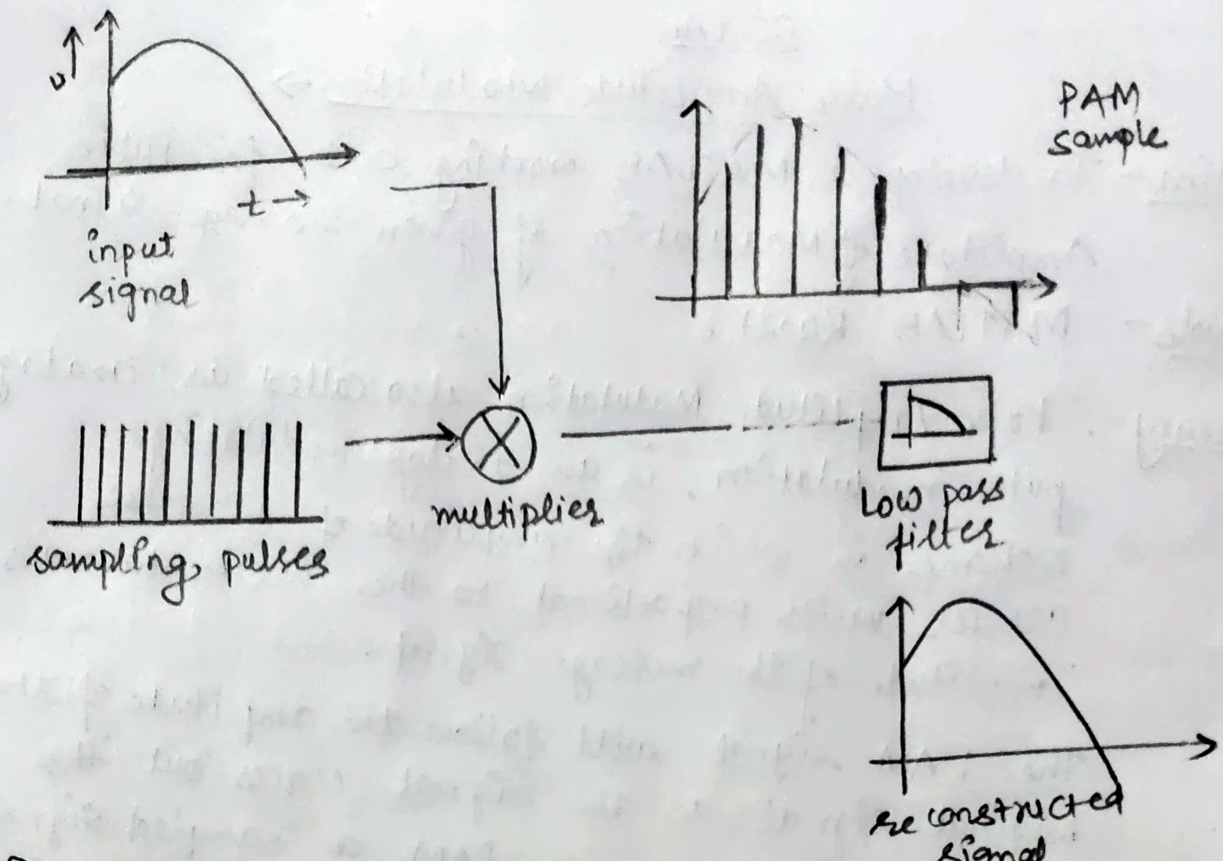
The PAM signal will follow the amplitude of the original signal, as the signal traces out the path of whole wave. In PAM, a sampled signal at the Nyquist Rate is reconstructed by passing it through an low pass frequency with exact cut off frequency.



Pulse Amplitude Modulation

Amit

PAM Block diagram- 194107



Procedure-

① We took a sinusoidal message signal with a freq fm which was modulated with a carrier frequency fc

$fm = 1$, $fc = 25$.

② The message signal was sampled at sampling rate of fs which is taken 40 times the carrier freq.

$fs = 1000$ $(40 \times fc)$.

③ The message signal length is 1 second when is sampled into n samples with a pulse train of duty cycle set at 50%

④ We used the sin() and square() functions to generate sinusoidal signal and rectangular pulse respectively

⑤ We sampled the message signal using a for loop and multiplying the corresponding time frames.

⑥ finally, the orignal and modulated signals were obtained and plotted on graphs.

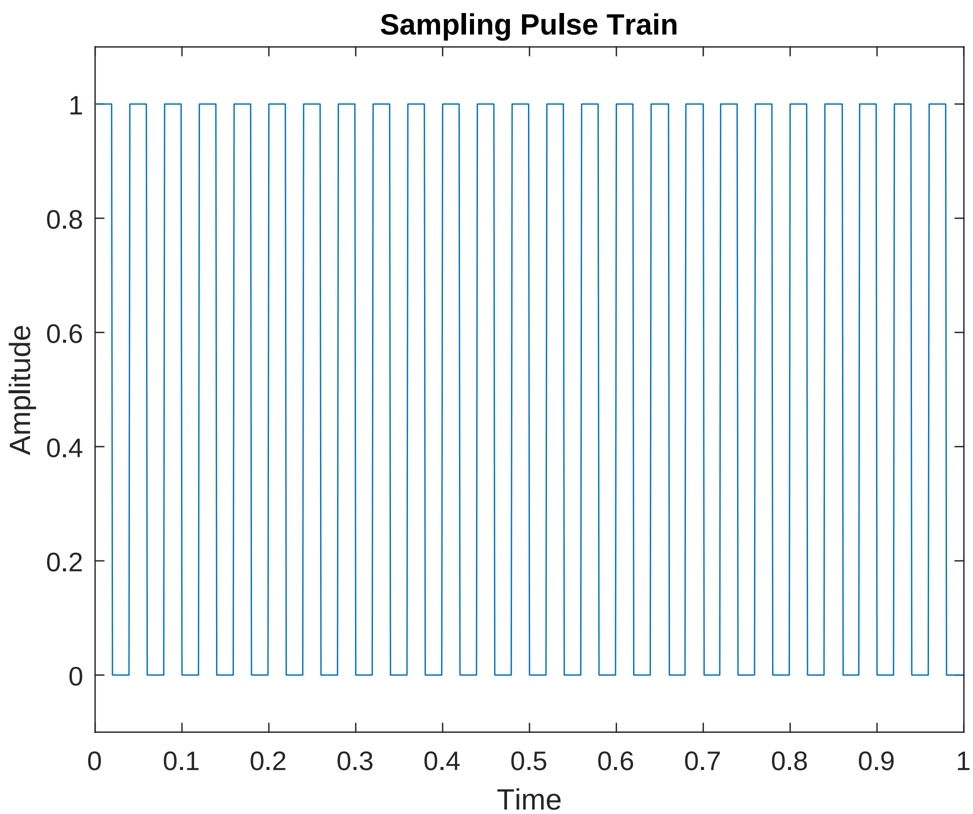
Results →

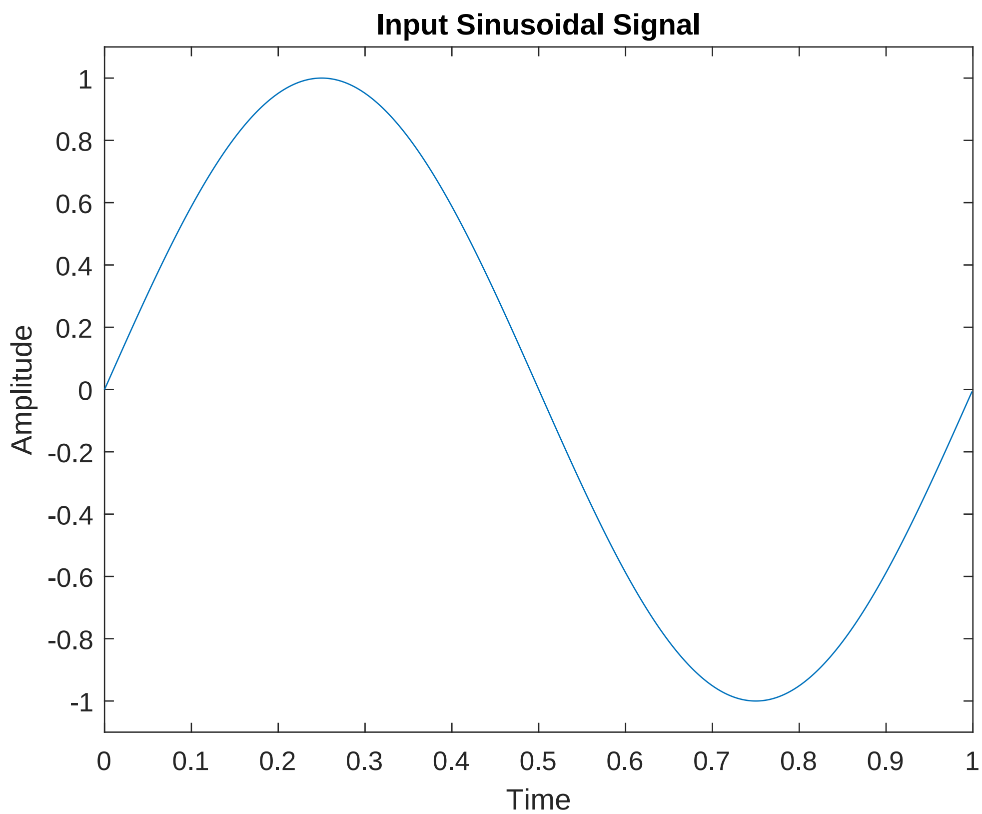
The MATLAB program for pulse amplitude modulation of signal was developed and the plots were obtained sucessfully.

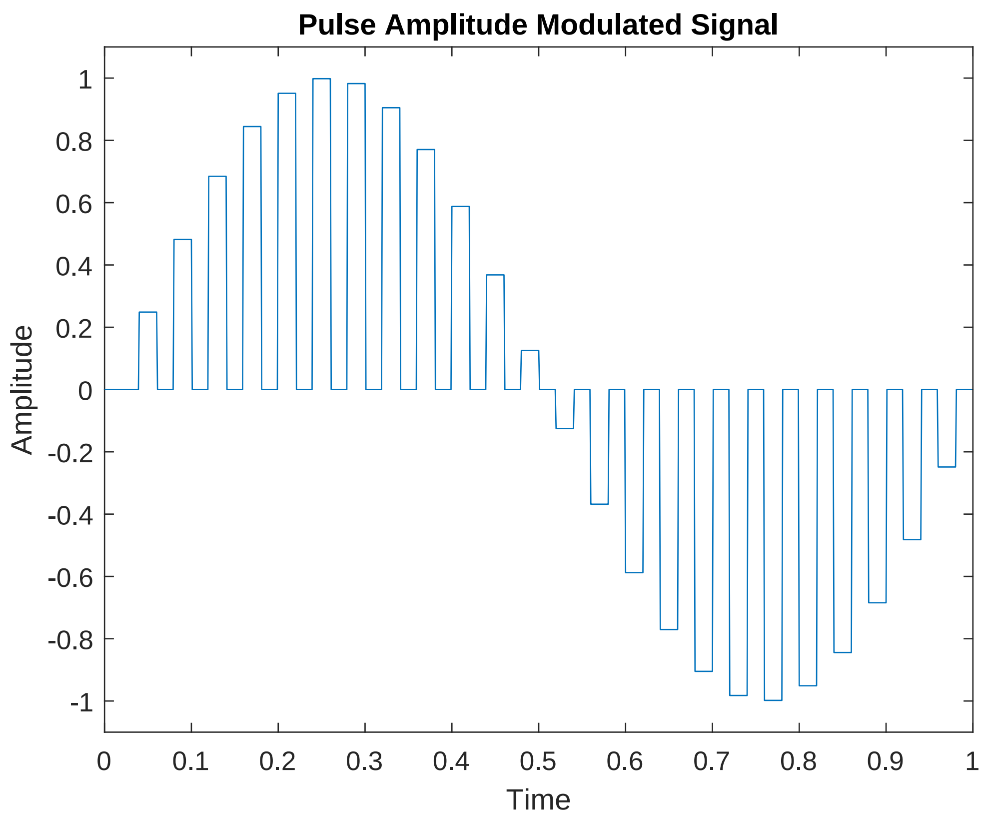
Amit

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Author: Amit Kumar Yadav
% Roll No : 194107 (ECE-A)
% Lab Date : 07-02-2022
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

close all;
clc;

%defining initial values and parameters
fc = 25; % Carrier Frequency
fm =1; % Message Signal Frequency
fs = 1000; % Sampling Frequency
t=1; % time period
n = 0:1/fs:t; % time samples
n = n(1:end-1);
dutycycle = 50; % Duty Cycle of Rectangular Pulse train
s = square(2*pi*fc*n,dutycycle); %sampled signal
s(s<0)=0; %to make it unipolar
m = sin(2*pi*fm*n); % input message signal
period_sam = length(n)/fc; %to find the number of samples in one period
ind = 1:period_sam:length(n); %to find the starting sample index
on_samp = ceil(period_sam * dutycycle/100); %no. of samples in on period of time

pam = zeros(1,length(n));

% Using a for loop for calculating PAM for multiple indexs
for i =1:length(ind)
    pam(ind(i):ind(i)+on_samp) = m(ind(i));
end

% Plot 1 for Sampled Signal
figure(1);
plot(n,s);
ylim([-0.1 1.1]);
title( 'Sampling Pulse Train' );
ylabel( 'Amplitude' );
xlabel( 'Time' );

%Plot 2 for Input Signal
figure(2);
plot(n,m);
ylim([-1.1 1.1]);
title( 'Input Sinusoidal Signal' );
ylabel( 'Amplitude' );
xlabel( 'Time' );

%Plort 3 for Pulse Amplitude Modulated Signal
figure(3);
```

```
plot(n,pam);
ylim([-1.1 1.1]);
title( 'Pulse Amplitude Modulated Signal' );
ylabel( 'Amplitude' );
xlabel( 'Time' );
```


Sampling Pulse Train
Amplitude
0
0.2
0.4
0.6
0.8
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
Time


Input Sinusoidal Signal
Amplitude
Time
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1


Pulse Amplitude Modulated Signal
Amplitude
Time
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1