جامعة بيرزيت

BIRZEIT UNIVERSITY

ENEE3309, COMMUNICATION SYSTEMS

Department: ENEE, Electrical Engineering

ABSTRACT

In this project, we will see how to plot a message signal on MATLAB, plot the demodulated signal over two cycles of the message and finally plot the mean squared error and Am waveform and envelope detector output...

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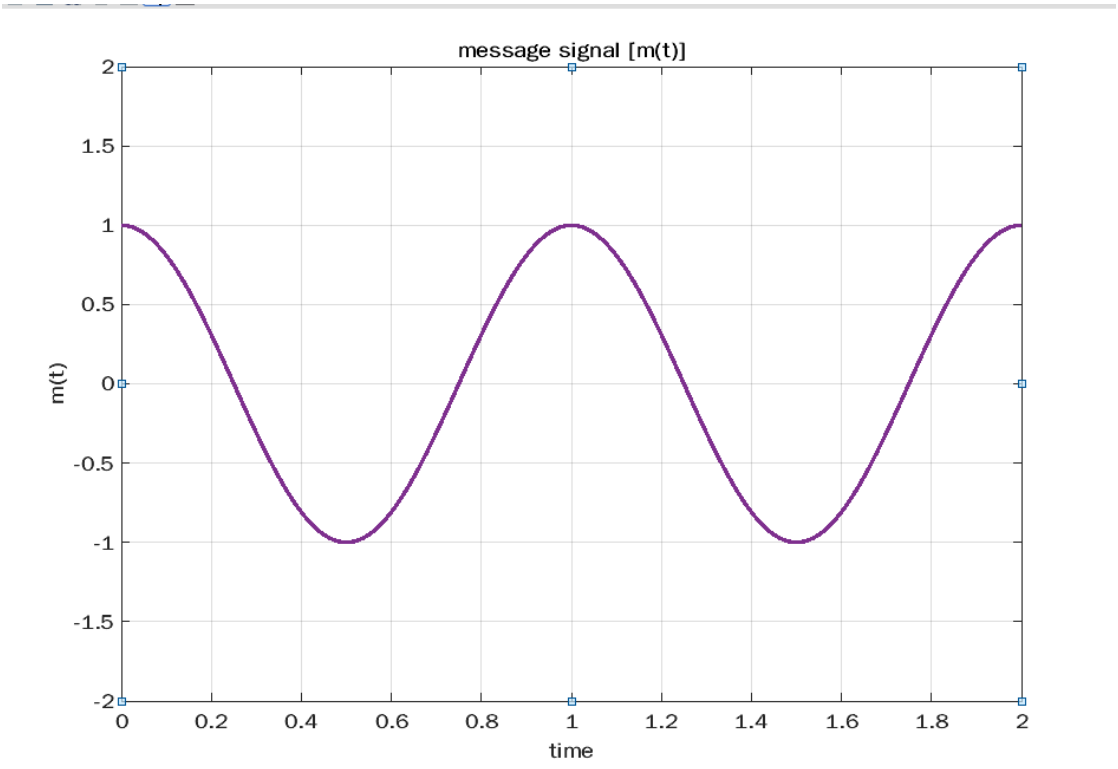
```
clear all
close all
clc
u=0.25;
Ac=1;
fm=1;
fc=25;
t=0:0.01:10;
```

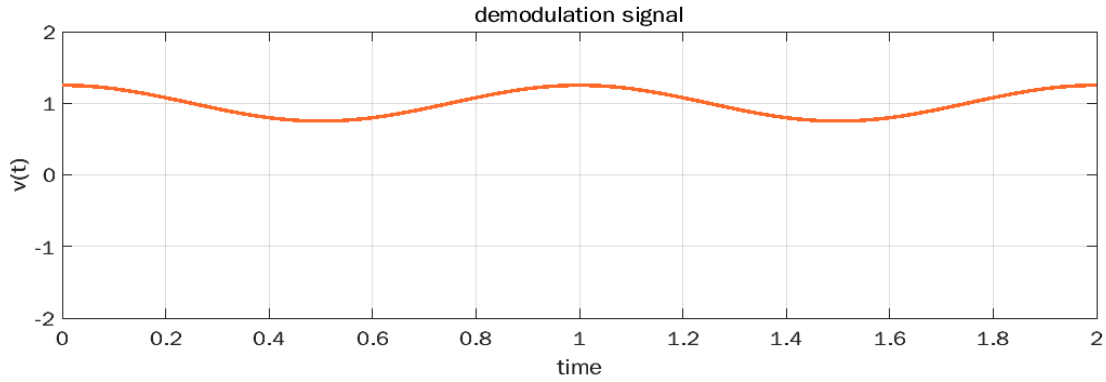
(a)

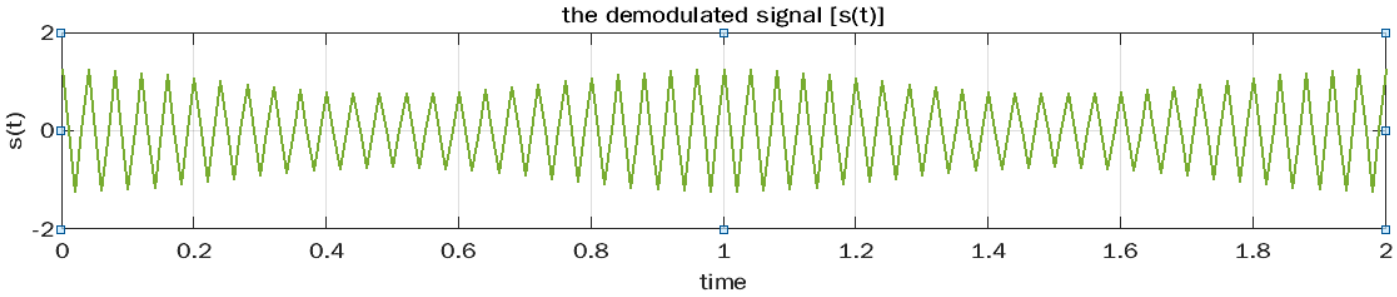
```
m=cos(2*pi*fm*t);
subplot(111)
plot(t,m)
axis([0 2 -2 2]);
title('message signal [m(t)]')
xlabel('time')
ylabel("m(t)")
grid on
envelope=abs(Ac*(1+u*cos(2*pi*fm*t)));
subplot(211)
plot(t,envelope)
axis([0 2 -2 2]);
title('demodulation signal')
xlabel('time')
ylabel("v(t)")
grid on
```

(b)

```
s=Ac*(1+u*cos(2*pi*fm*t)).*cos(2*pi*fc*t);
subplot(311)
plot(t,s)
axis([0 2 -2 2]);
title('the demodulated signal [s(t)]')
xlabel('time')
ylabel("s(t)")
grid on
```



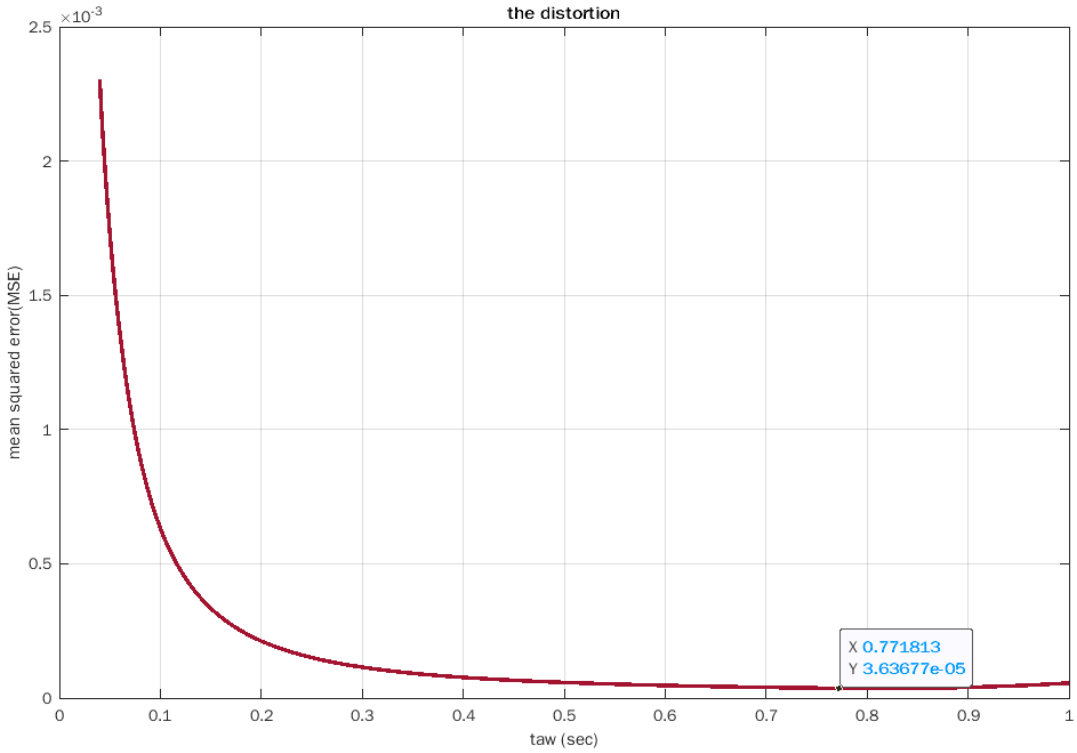

demodulation signal
v(t)
time
2
1
0
-1
-2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

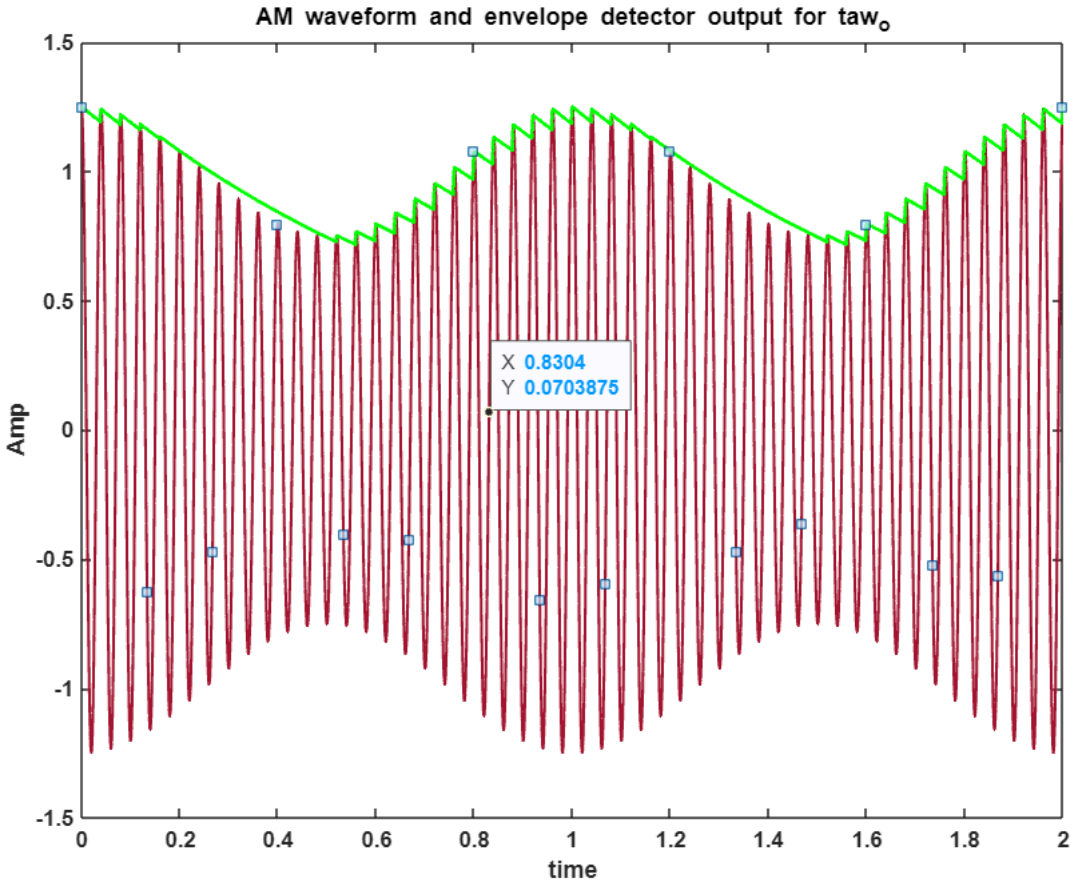

the demodulated signal [s(t)]
s(t)
time
2
0
-2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2

(3)

```
clear all
close all
clc
u=0.25;
Ac=1;
fm=1;
fc=25;
minimumtaw =1/fc;
maximumtaw =1/fm;
tc =10^(-6);
taw = minimumtaw:tc:maximumtaw;
```

```
numberoftaw=length(taw);
Ts=minimumtaw/100;
t = 0:Ts:2*maximumtaw;
nb=length(t);
envelope =1+u.*cos(2*pi*fm*t);
modulated =(envelope).*cos(2*pi*fc*t);
for i=1:numberoftaw
    out(1,1)=1+u;     %array means first raw &first column equals:
    for n=1:nb-1
        if out(1,n)<modulated(1,n)
            out(1,n+1)= modulated(1,n);
        else
            out(1,n+1)=out(1,n)*exp(-Ts/taw(1,i));             %this part do charging and discharging for the capacitor
        end
    end
    %mse is the mean squared error
    mse(1,i)=(norm((out-envelope).^2))/nb;
end
[~,TawOp]=min(mse);
out(1,1)=1+u;
for n=1:nb-1
    if out(1,n)<modulated(1,n)
        out(1,n+1)=modulated(1,n+1);
    else
        out(1,n+1)=out(1,n)*exp(-Ts/taw(1,TawOp));
    end
end
plot(taw,mse);
grid on;
xlabel('taw (sec)');
ylabel('mean squared error(MSE)');
title('the distortion');
figure;
plot(t,modulated);
hold on
plot(t,out,'g','linewidth',2.0);
title('AM waveform and envelope detector output for taw_o')
xlabel('time');ylabel('Amp');
```


the distortion
×10^-3
mean squared error(MSE)
taw (sec)
X 0.771813
Y 3.63677e-05


AM waveform and envelope detector output for taw_o
Amp
time
X 0.8304
Y 0.0703875