

ECE4001 DIGITAL COMMUNICATION

Digital assignment-2

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```
VmaxPk = 2;    % Maximum operating voltage
Fi = 2000;    % Sinusoidal frequency of 2 kHz
Fs = 44.1e3;  % Sample rate of 44.1kHz
Tstop = 50e-3; % Duration of sinusoid
t = 0:1/Fs:Tstop; % Input time vector

% Use the maximum allowable voltage of the amplifier
inputVmax = VmaxPk*sin(2*pi*Fi*t);
outputVmax = helperHarmonicDistortionAmplifier(inputVmax);
figure(1)
plot(t, outputVmax)
xlabel('Time')
ylabel('Output Voltage')
axis([0 5e-3 -2.5 2.5])
title('Amplifier output')
figure(2)
stem(t,outputVmax,"color","r"); % plot sampled signal
title('sampled signal');
xlabel('time');
ylabel('amplitude');
axis([0 5e-3 -2.5 2.5])
n1=3;
L=2^n1;
xmax=2;
xmin=-2;
del=(xmax-xmin)/L;
partition=xmin:del:xmax; % definition of decision lines
codebook=xmin-(del/2):del:xmax+del/2; % definition of representation levels
[index,quants]=quantiz(outputVmax,partition,codebook);
figure(3)
stem(t,quants,"color","k");%plot quantized signal
axis([0 5e-3 -2.5 2.5])
title('QUANTIZED SIGNAL');
xlabel('TIME');
ylabel('AMPLITUDE');
```

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inputRamp = -2:0.00001:2;
outputRamp = helperHarmonicDistortionAmplifier(inputRamp);
polyCoeff = polyfit(outputRamp,inputRamp,3)
correctedOutputVmax = polyval(polyCoeff, outputVmax);
% NORMALIZATION
l1=length(index); % to convert 1 to n as 0 to n-1 indices
for i=1:l1
if (index(i)~=0)
index(i)=index(i)-1;
end
end
l2=length(quants);
for i=1:l2 % to convert the end representation levels within the range.
if(quants(i)==xmin-(del/2))
quants(i)=xmin+(del/2);
end
if(quants(i)==xmax+(del/2))
quants(i)=xmax-(del/2);
end
end
% ENCODING
code=de2bi(index,'left-msb'); % DECIMAL TO BINANRY CONV OF
INDICIES
k=1;
for i=1:l1 % converting column vector to row vector
for j=1:n1
coded(k)=code(i,j);
j=j+1;
k=k+1;
end
i=i+1;
end
figure(4);
stairs(coded);
axis([0 190 -2 2])
%plot of digital signal
title('DIGITAL SIGNAL');
xlabel('TIME');
ylabel('AMPLITUDE');
helperPlotPeriodogram([outputVmax; correctedOutputVmax],Fs,'power');
subplot(2,1,1)
title('Uncorrected')

```

```
subplot(2,1,2)  
title('Polynomial Corrected')
```