**For a given 16QAM modulation, build a modulator and demodulator, transfer image file through noiseless channel.**

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clc; %clear all text from command window,results in clear screen.

clear all; %clear all workplace, close all figures and clear command window.

close all; %works same as clc and clear all.

%%To Transmit an image%%

image=imread('Nature.jpg'); %Image to be transmitted. Imread function read the image from "Nature.jpg" and put it in variable "image".

N=numel(image); %Numel function returns the number of array elements in "image" and put it in variable "N".

no\_of\_elements=reshape (image, N,1); %reshape the "image" variable into new array of [N 1] matrix and store it in variable "no\_of\_elements".

bin\_convert=de2bi(no\_of\_elements, ‘left-msb'); %convert decimal numbers into binary form. Set leftmost bits to most significant bits.

N1=numel(bin\_convert); %returns the number of array elements.

im\_tx=reshape(bin\_convert’, N1,1); %reshape "bin\_convert" variable’s array elements into new array of size [N1,1].

len\_image=length(im\_tx); %return the length of array.

%%Add Padding to input to set the image size%%

z=len\_image;

while(rem(z,2) || rem(z,4) || rem(z,6))

z=z+1;

im\_tx(z,1) =0;

end

im\_tx=double(im\_tx);

%%16 QAM modulator to transmit image%%

im\_mod=qammod(im\_tx,16); %qammod will modulate input image "im\_tx" and transmit it to noiseless channel. 16 is modulation Index.

%%16 QAM demodulator to demodulate the modulate image%%

im\_dem=qamdemod(im\_mod,16); %qamdemod will demodulate modulated image "im\_mod". 16 is the modulation index.

convert\_image=uint8(im\_dem); %convert the data type of demodulated image into uint8 (8-bit unsigned integers) type.

convert\_image=convert\_image (1: len\_image); %Array of convert\_image.

%%To Receive demodulated image at receiver end%%

out\_rx=reshape(convert\_image,8,N)'; %reshape "convert\_image" into new array.

dec\_convert=bi2de(out\_rx,'left-msb'); %To convert Binary data into decimal form. "out\_rx" is output of received image. "left-msb" is used to set left most bit as most significant bit.

dec\_convert=dec\_convert(1:N); %Array of dec\_convert.

out\_image=reshape(dec\_convert,size(image,1),size(image,2),

size(image,3)); %reshape the received image into array.

figure; %create the figure window using the default property value.

imshow(out\_image); %display the gray scale image using the output out\_image.

title ('16 QAM Image') %title of output image.