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%%Question 1
% bits = 4;
% min_v = 0;
% max_v = 3.3;
% voltage_range = 0:0.25:3.25;
% bin_range = Voltage2Bin(min_v,max_v,bits,voltage_range);
% binary_bin_range_01 = dec2bin(bin_range);
%
% figure(); hold on; grid on;
% scatter(voltage_range,bin_range);
% xlabel("Voltage (V)");
% ylabel("Bin Number");
% title("Voltage vs. Bin Number (4-bit)");
% hold off;
%
% bits = 8;
% bin_range = Voltage2Bin(min_v,max_v,bits,voltage_range);
% binary_bin_range_02 = dec2bin(bin_range);
% figure(); hold on; grid on;
% scatter(voltage_range,bin_range);
% xlabel("Voltage (V)");
% ylabel("Bin Number");
% title("Voltage vs. Bin Number (8-bit)");
% hold off;
%
% bits = 12;
% bin_range = Voltage2Bin(min_v,max_v,bits,voltage_range);
% binary_bin_range_03 = dec2bin(bin_range);
% figure(); hold on; grid on;
% scatter(voltage_range,bin_range);
% xlabel("Voltage (V)");
% ylabel("Bin Number");
% title("Voltage vs. Bin Number (12-bit)");
% hold off;

%%Question 2
amplitude = 3.3; %min voltage is 0, max is 3.3, b/c (3.3)/2 = 1.65
offset = 1.65;
min_v = (amplitude/2)-offset;
max_v = (amplitude/2)+offset;
bits = 12;
voltage_range = (amplitude/2)*sin(0:(pi/30):(2*pi))+offset;
bin_range = Voltage2Bin(min_v,max_v,bits,voltage_range);
figure(); hold on; grid on;
plot(bin_range);
title("Sinusoidal Bin Number vs. Array Number");
xlabel("Index");
ylabel("Bin Number");
hold off;

function bin = Voltage2Bin(min_v, max_v, bits, voltage)
%INPUTS min_v scalar value of minimum voltage range

```

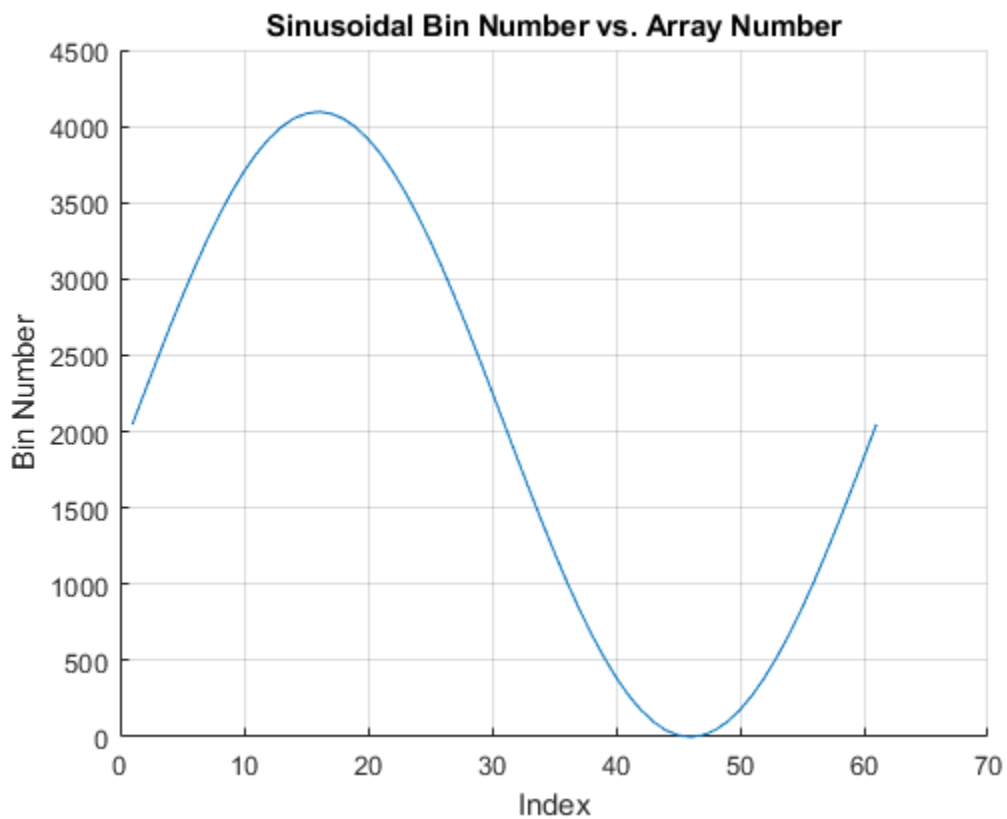
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%           max_v    scalar value of maximum voltage range
%           bits     scalar value of number of bits in range
%           voltage  scalar or vector value of voltage to convert to bins
%
%OUTPUTS    vector of bin numbers that voltage fits into
%
%METHODOLOGY This function takes in a voltage range and number of bits,
%divides that range into bins, and finds which bin the input voltage fits
%into, and outputs that number.
num_bins = 2^bits;
slope = (max_v - min_v)/num_bins;
bin = floor(voltage./slope);
end

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