Vedha Krishna Yarasuri
EE24MTECH14022

Fixed Point Convolution.

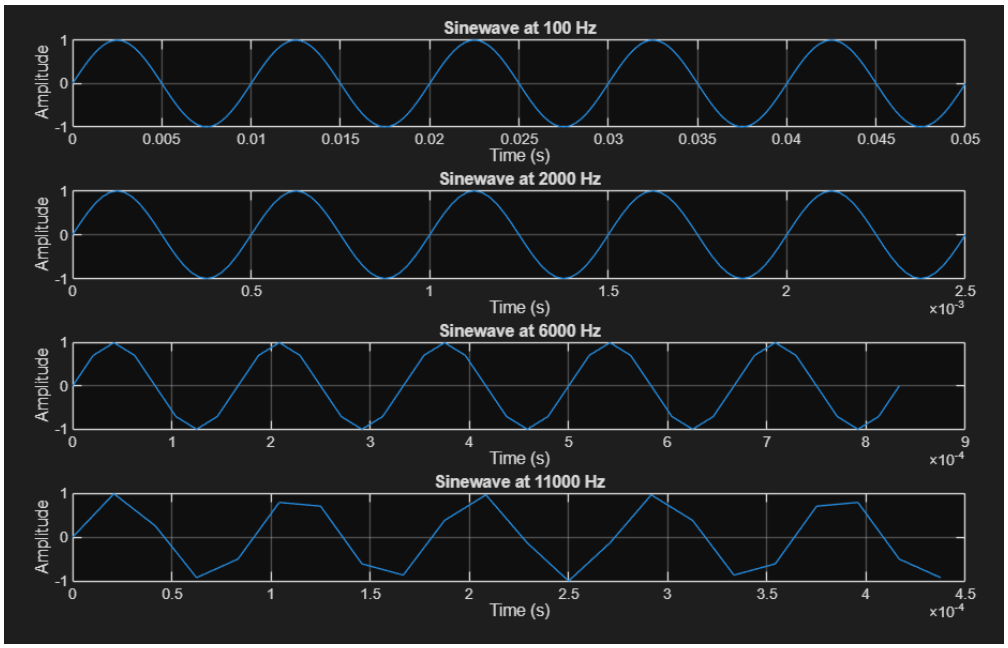
Initially I Computed bandpass filter coefficients using the matlab inbuilt filterDesigner tool and selected the following options:

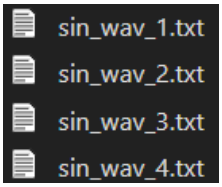
a. bandpass
b. FilterOrder = Minimum
c. Density factor = 20
d. Frequency spec : Sampling freq = 48000, fstop1 = 500, fpass1 = 1500, fpass2 = 8000 ; fstop2 = 9000

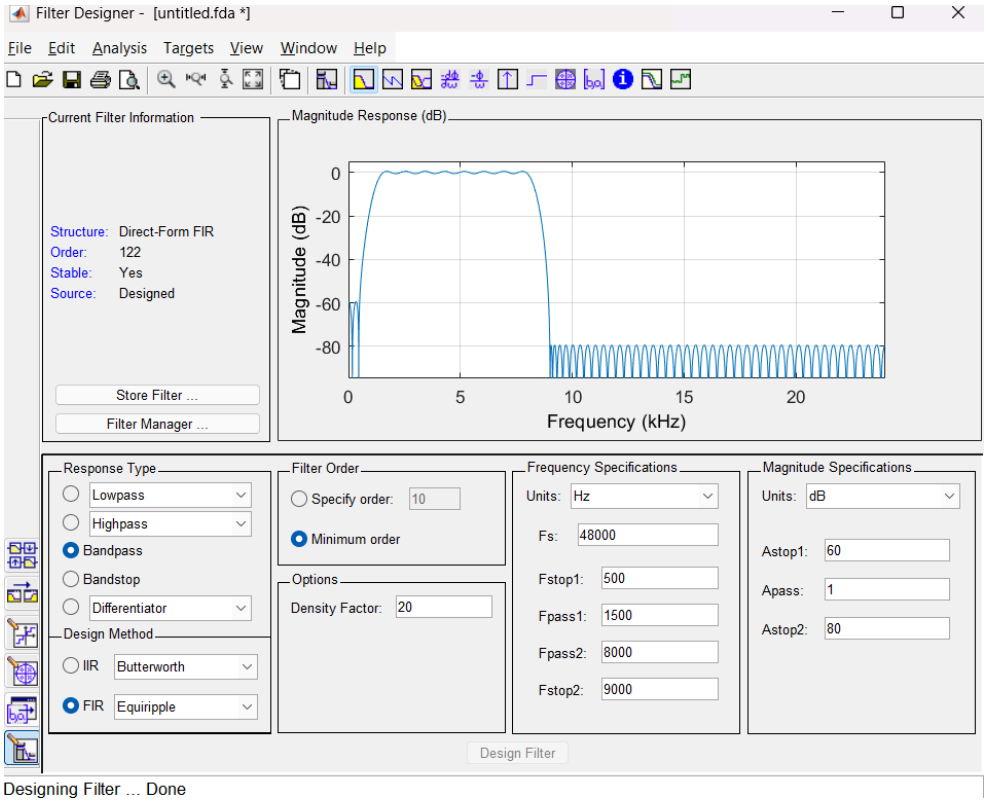
Now I generated 4 sine wave of different frequencies starting from 100Hz, 2000Hz, 6000Hz, 11000Hz with sampling frequency of 48000Hz and calculated convolution using Matlab. The computed result is stored for later use.

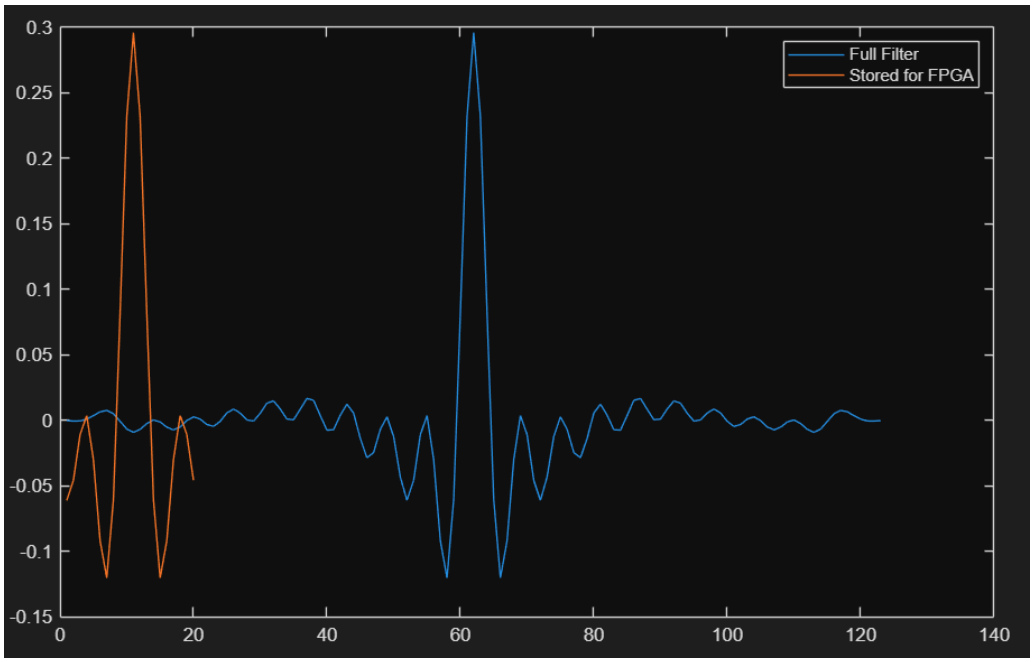
The filter coefficients are total of 123 and I took middle 20 values and converted the filter coefficients to the fixed point representation. Here I took Q(2, 14) representation for the representation. I took 5 cycles of sine waves, converted them to Q(2, 14) fixed formats, and saved the binary values in a text file.

Now I have loaded them into Verilog as a 2D array in the test bench. Now 2D arrays can't be passed directly to the design module, I have flattened the 2D array to a 1D array and then sent it as input to the design module and unwrapped it in the module. Later I performed convolution between the filter and the sin values and stored the result in a text file. This text file is then read in Matlab and converted into decimal values for comparison with the Matlab convolution result.









My Verilog Code couldn't produce proper results for this input and filter, I have tried giving test input ones(1,5) and filter = ones(1,3) Later I tried with more points. My verilog code produced proper results with test input but failed for sin inputs and sinc filter.