Introduction to Simulink

Bruno Korst - bkf@comm.utoronto.ca, David Ding - davidy.ding@mail.utoronto.ca

• Name:	Lab Date:	
• Student No.:	Day of the week:	Time:
• Name:	TA Signature:	
• Student No.:	Grade:	

1. Matlab Exercises

1.1 Creating and Plotting a Sinusoid

a. *Re-write the program to plot three periods of your 1KHz sine wave.* (0.5pt)

```
T=1;
Fs = 48000;
N = T*Fs;
t = 0 : 1/Fs : T;
Fn = 1000;
y = sin(Fn*2*pi*t);
plot(t,y);
axis([0 3*48/48000 -1 1])
```

1.2 Listening to a Sine Wave

a. *Play the program and hear the 1KHz sine wave.*

```
T=1;
Fs = 48000;
N = T*Fs;
t = 0 : 1/Fs : T;
Fn = 1000;
y = sin(Fn*2*pi*t);
sound(2*y,Fs);
%db change = 20log(v2/v1) = 6.02
```

b. *Change the frequency to 500Hz and play it again.*

c. *Now change it to hear 2KHz and play it again.*

d. *Now change back to 10KHz and explain what you have observed/heard.* (1.0pts)

Very shrill sound.

e. *As you doubled the voltage, what is the change in dB of the signal as measured at the load? Note that the dB you are calculating does not represent sound pressure; you are only comparing voltages.* (0.5pts)

Db change = 20log(v2/v1) = 6.02

1.3 Audio Signal Processing

a. *What is the duration of the guitar signal in seconds?* (1.0pts)

length guitar = 4593084
fs = 44100
duration = number of samples / sampling frequency =
4593084/44100 =
104.2 sec = 1min 44 sec

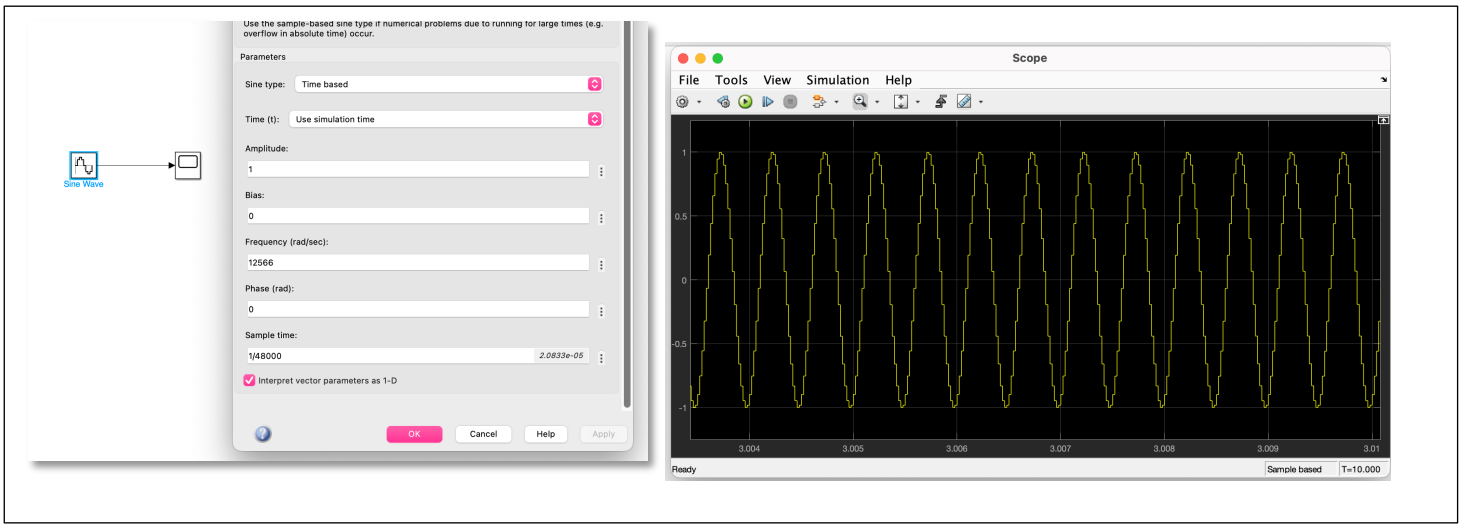
b. *Play the combined bass, drums, and guitar sound and have TA sign below* (1.0pts)

c. *Synthesize gradual increase of guitar volume with bass and drums volume staying constant, and have TA sign below* (1.0pts)

2. Simulink

2.1 First Simulink Model

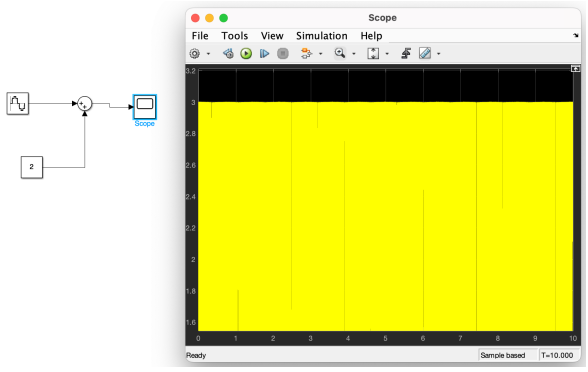
a. *Show the TA a clear 1KHz sine wave with 1/48000 sampling time displayed on your* Simulink *scope.* (1.0pts)



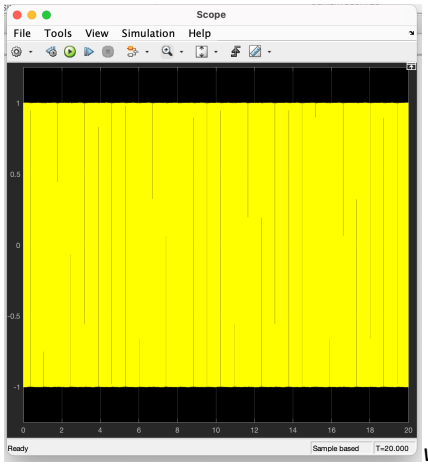
2.2 The Four Operations

2.2.1 Adding and Subtracting a Constant to/from Sinusoid

a. *Show the TA a positive DC shift of 2 on your* Simulink *scope.* (1.0pt)



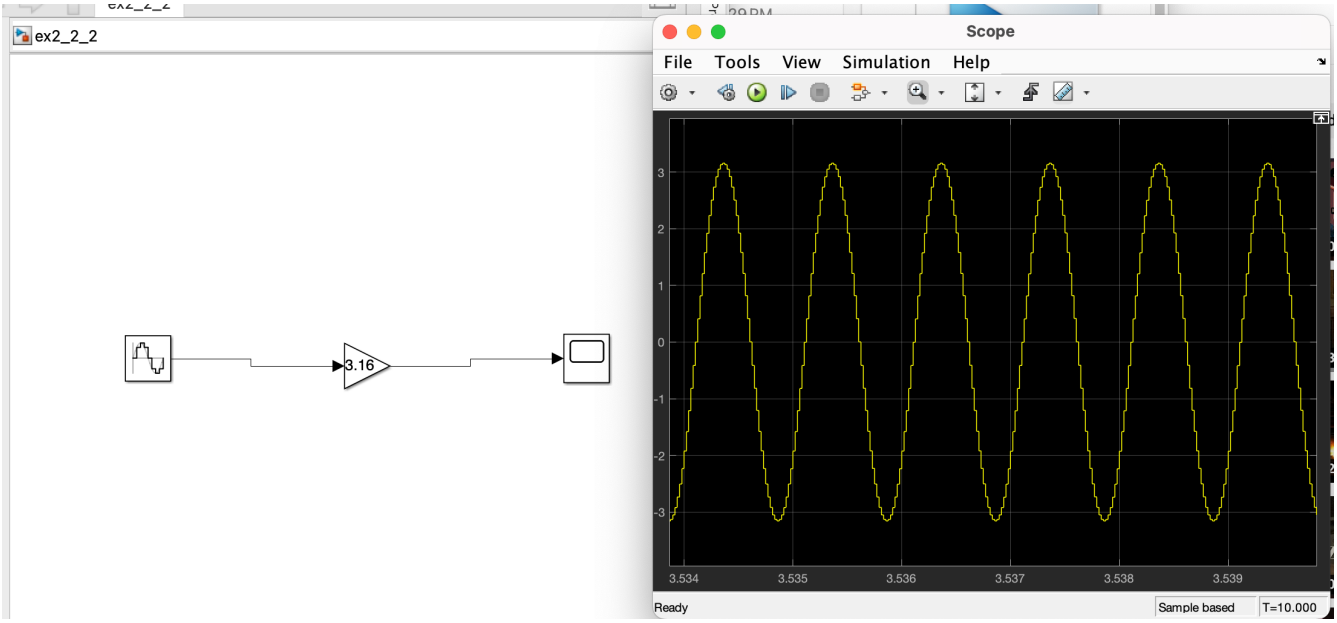
w/shift



w/ no shift

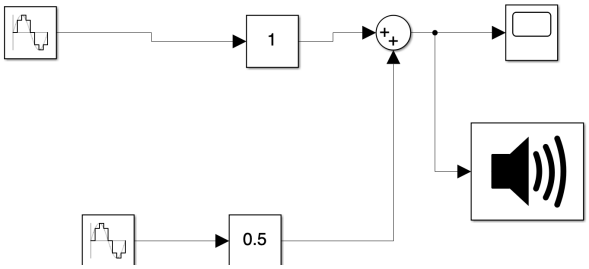
2.2.2 Gain

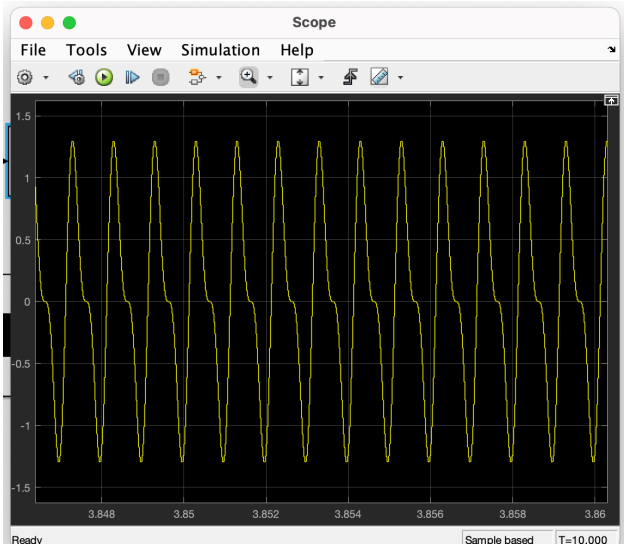
a. *Apply a 10dB gain to your sine wave and show it to the TA on the* Simulink *scope.* (1.0pt)



2.2.4 Operating on Two Sines

a. *Show to the TA on your* Simulink *scope the resulting addition of 2 sinusoids: a 1Vp, 1KHz and a* $\frac{1}{2}$*Vp, 2KHz. Use the slider gain blocks to assign the magnitudes for the 2 sinusoids.* (1.0pt)





2.2.5 Multiplying Two Sines

a. *Show to the TA your working (and sounding) model that multiplies two sinusoids: a 31.25Hz and a 500Hz, both with amplitude 1.* (1.0pt)