

## DSPIRA GnuRadio Lessons

### Lesson 2: Multiple Signal Sources

In this activity you will construct a program that is a signal generator comprised of multiple sine waveforms with the ability to control their amplitudes and frequencies. These are added together to create a more complex output.

#### Build a Two Waveform Signal Generator

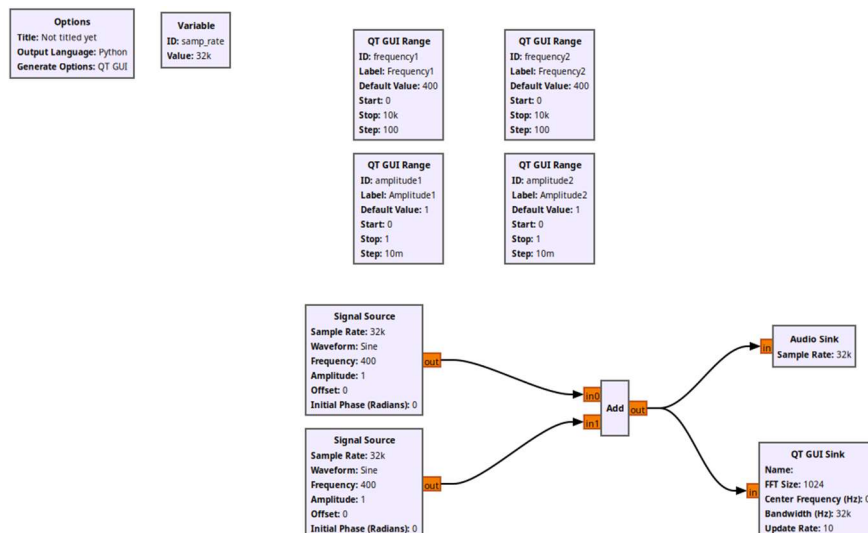
- Open your signal source frequency file from Lesson 1.
- **Save as . . .** using a new file name.

We will be working with sine waveforms.

- In the **Signal Source** block, change the *Waveform* type to "Sine". Also change the name of *Frequency* to "frequency1" and *Amplitude* to "amplitude1".
- In the **QT GUI Range** block for "frequency", change the *ID* to "frequency1", and in the **QT GUI Range** block for "amplitude", change the *ID* to "amplitude1".
- Add a second signal source by completing the following:
  - Copy the frequency1 **QT GUI Range** block, and paste it on the canvas. Then change the *ID* to "frequency2".
  - Copy the amplitude1 **QT GUI Range** block, and paste it on the canvas. Open this block, and change *ID* to "amplitude2".
  - Click on the **Signal Source** block and copy it (right-click Copy, or ctrl-c) and paste it on the canvas. [Alternately, import a **Signal Source** block from the library on the right. Be sure to change the *Waveform* type to "Sine".]

In this new **Signal Source** block change the *Frequency* to "frequency2" and *Amplitude* to "amplitude2".

- Delete the connections from the original **Signal Source** block. (Highlight and hit "Delete".)
- Add an **Add** block to the canvas. Make sure its *IO Type* is set to "float".
- Connect both **Signal Source** blocks to the inputs of the **Add** block, one to each input.
- Connect the output of the **Add** block to the **Audio Sink** and **QT GUI Sink**.
- Your canvas should look similar to the following:



- Run the program.
- Explore the graphical displays and audio output while changing the frequencies and amplitudes.

### **Build a Three Waveform Signal Generator**

- Add a third signal source:
  - Repeat the steps above to add a third ***Signal Source***. Be sure to add the appropriate frequency and amplitude variables by adding additional ***QT GUI Range*** blocks.
  - Change the ***Num Inputs*** in the ***Add*** block to "3".
  - Run the program and explore the output audio and the displays by the changing the frequencies and amplitudes of each input.

### **Build a six Waveform Signal Generator**

- Add 3 more signal sources to make a signal generator comprised of 6 sine waveforms.
- We will be using this in Lessons 3 and 4.