

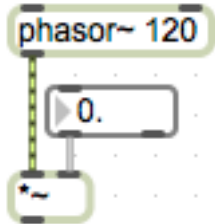
Working with audio

Electronic Music II

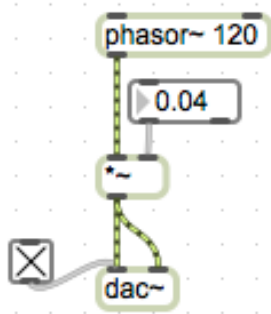
Spring 2013

A. Introducing panning (mono)

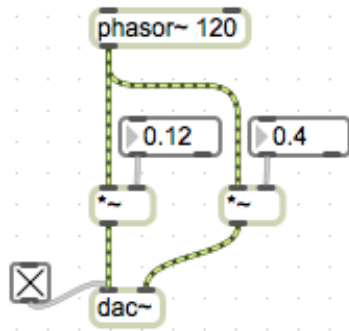
1. To create panning, we will begin with two elements:
 - a. a sound source (a sawtooth oscillator at 120 Hz)
 - b. a volume control (a float box)



2. To avoid creating distortion from turning our source up too high, and to constrain the value to 0 or higher, we adjust the following settings for the float box in the Inspector:
 - a. minimum : set to 0.
 - b. maximum : set to 1.
 - c. Note : remember to add a decimal point after the number (so, 0., 1.). This will make sure that Max handles the object with float values (ie, with decimal places).
3. Create a *dac~* and a toggle object. Connect the outlet of *~ to both inlets of *dac~*.

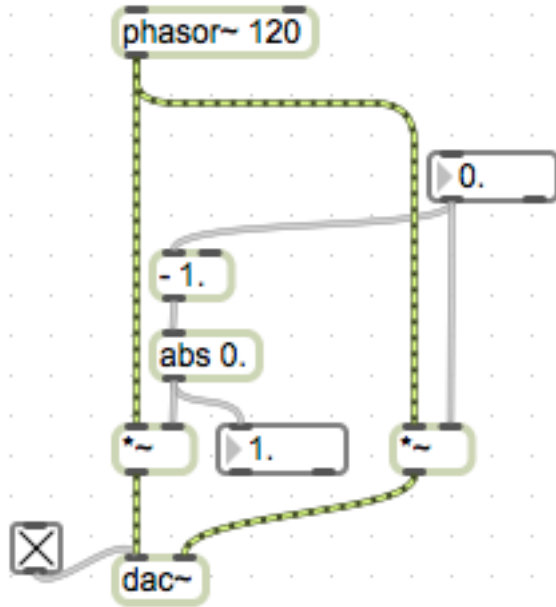


4. We now have a mono source, being controlled in amplitude, and then sent at that amplitude to both stereo channels.
5. In order to **pan** a mono source, we need to have a second volume control.



6. We can now control the amplitude of each channel independently.

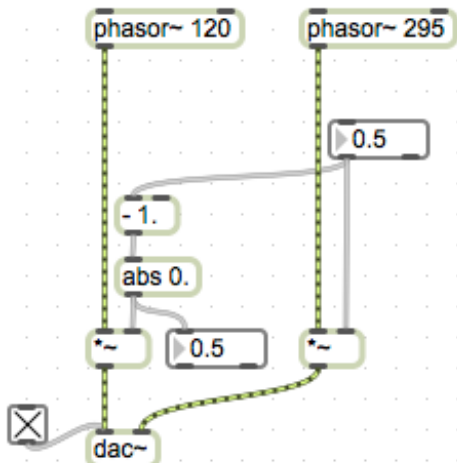
- To more fully recreate panning in the style of a mixing board, we need to link the value of the two volume controls. We can do this with some basic math objects.



- Some notes about this new setup:
 - I have introduced the `-` object and the `abs` object. `-` performs subtraction, and `abs` returns the absolute value of anything passed to its inlet.
 - Notice that I have added an argument for `-`, and that it has a decimal following it. This causes the calculation to be done with decimal places. Likewise, for `abs` I have added an argument to enable decimal places.
 - I have arranged the new objects so that the **right** channel is being adjusted from 0 – 1, and the **left** channel will mirror this adjustment. When the right channel amplitude = 1, the left channel will = 0, in other words the signal will be panned 100% to the right. Setting the amplitude to 0.5 will pan the signal center.

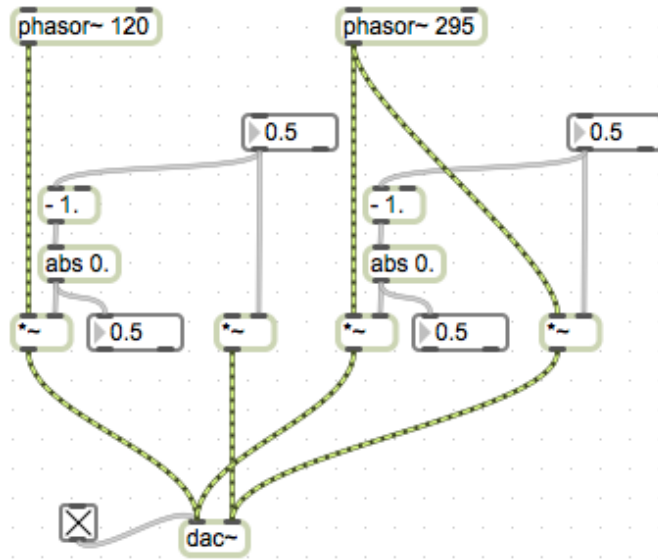
B. Panning (stereo)

- If we expand our mono panning setup by adding a second mono source, we get the following:



- In this setup, we hear either right, left, or a mix by some percentage.

3. To recreate stereo panning, where each channel is treated independently, essentially we need to recreate our mono panning setup for **both** of our sources. However, there is a flaw hidden in this approach (demo).



4. If we adjust the panning anywhere away from center on either setup, one of the stereo channels will be receiving a total amplitude greater than 1. This causes distortion.
- 5.