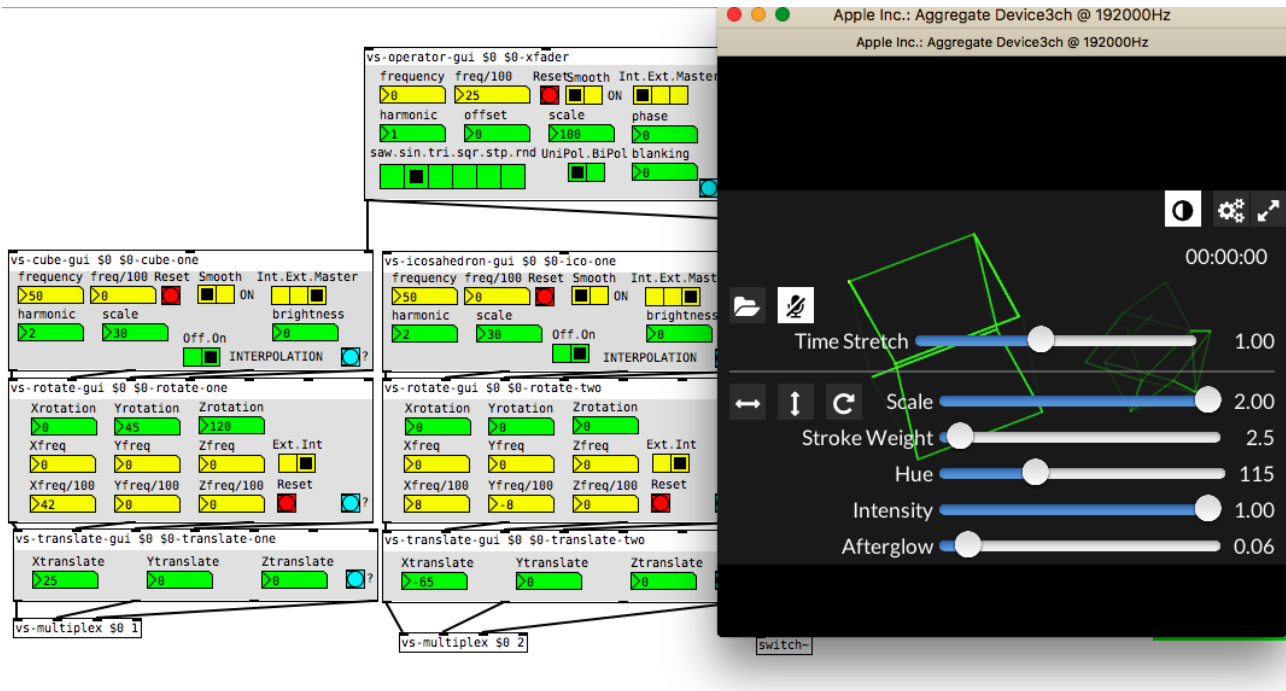# TUTORIAL: USING HANSI RABER'S OSCILLOSCOPE APPLICATION to PREVIEW VECTOR SYNTHESIS on MacOS

This tutorial shows how to use SoundFlower and Hansi Raber's Oscilloscope app to visualize the X, Y, and brightness signals from my Vector Synthesis library for Pure Data without a hardware oscilloscope and DC coupled soundcard.

1) First, download and install the following (please use these specific versions):

https://github.com/kritzikratzi/Oscilloscope/releases/tag/1.0.9
https://github.com/mattingalls/Soundflower/releases/download/2.0b2/Soundflower-2.0b2.dmg

Please pay close attention to the SoundFlower installation security steps listed on the SoundFlower page.

Plus the Vector Synthesis library patches at:

https://github.com/macumbista/vectorsynthesis

And of course the latest "Vanilla" Pure Data if you have not already installed it:

https://puredata.info/downloads/pure-data

2) Next, we should create an "Aggregate Device" in your Audio/MIDI settings which sends the output of Pd both to the oscilloscope software and to your soundcard. That way you can see and hear the vector shapes at the same time. Go to "Audio MIDI Setup" under your MacOS Applications/Utilities folder. Create a new Aggregate Device and add first "SoundFlower (64 chan)" to it, and then "Built In Output" (or whatever audio interface you want to use). The order you add them is important! Set this device's Sample Rate to 192.0 kHz for best visual results.
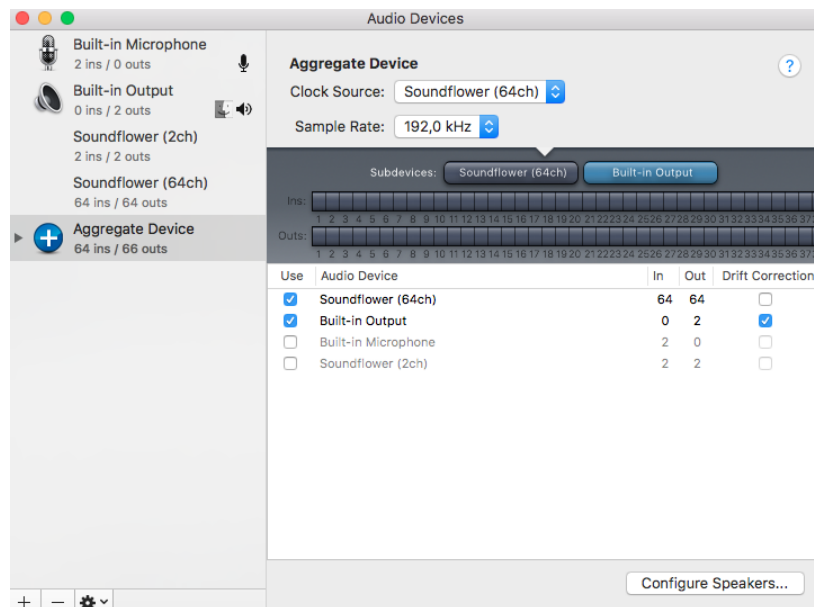

3) Start Pd and choose "Aggregate Device" as output, and set the number of output channels to 66. Make sure the sample rate here matches the sample rate of the Aggregate Device for best results. If you are using the built in audio interface, you may need to change the Block Size default from 64 to something higher such as 512 or 1024 to avoid audio glitches. Increasing the delay from 50 msec to 100 or more can also give your computer more time to calculate glitch-free audio.
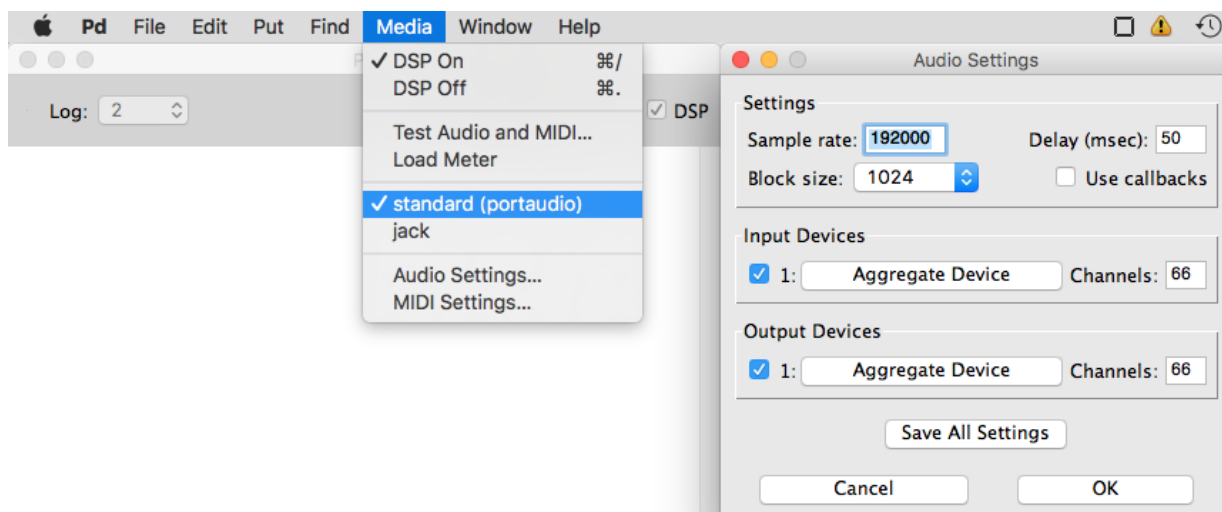

Then open a patch which uses brightness modulation ("000.G.VECTOR_MULTIPLEXING.pd" for example) and turn on audio DSP in Pd.

4) Start the Oscilloscope app and choose "Built In Output" as output Audio Device on this screen. (CAUTION: the app will crash if you select the same device for both output in this screen, and input in the next screen.) Make sure your sample rate in this app matches the sample rate of the Aggregate Device for best results.
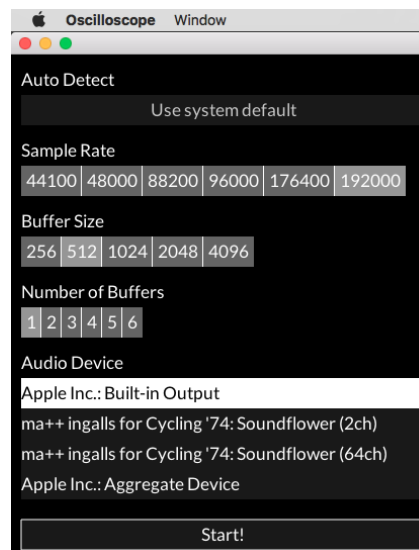

5) Click the "Start!" button in Oscilloscope. In the next screen, hold down the SHIFT key and click the microphone icon. Still holding the SHIFT key, click the "Aggregate Device" as input.
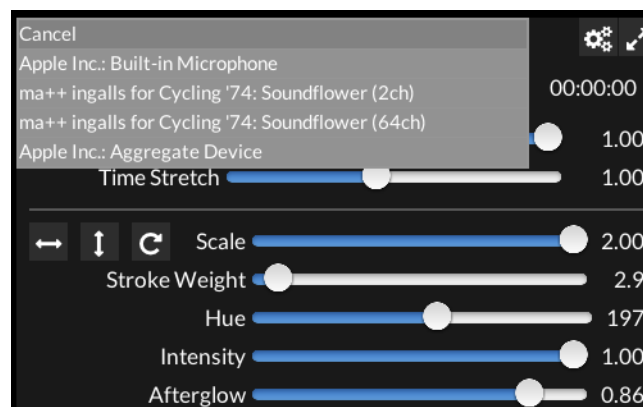
6) Once you have done that, you will see a little "half-moon" icon which toggles the brightness modulation on and off. (If it does not appear, it's because you did not hold SHIFT while selecting the Aggregate Device input.) TIP: the Tab key gets rid of the menu in this window.
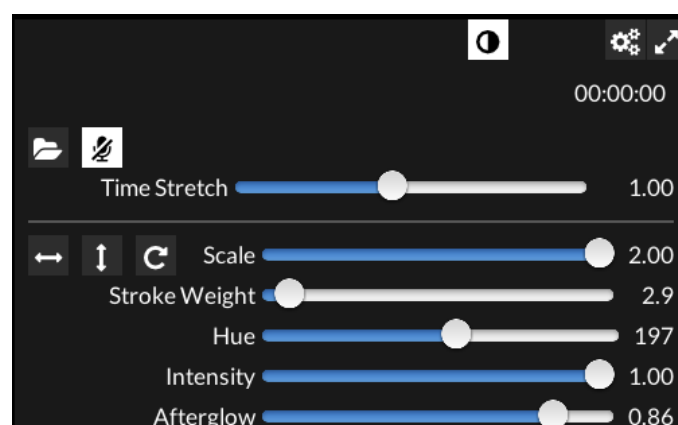
7) If you have set up everything correctly, in Pure Data, the first 64 output channels are sent to SoundFlower. Oscilloscope listens to the first three and uses them as the X, Y, and brightness channels respectively. The next 61 channels are virtual and unused. Channels 65 and 66 of your Aggregate Device go to the first two hardware outputs of your built in soundcard, or whatever other audio device which you specified when you created the Aggregate Device. The [vs-audiodac-gui] abstraction we will use in the Pd example patches allows you to specify which channels are used for the audio you hear, so select 65 and 66 when using the Aggregate Device.
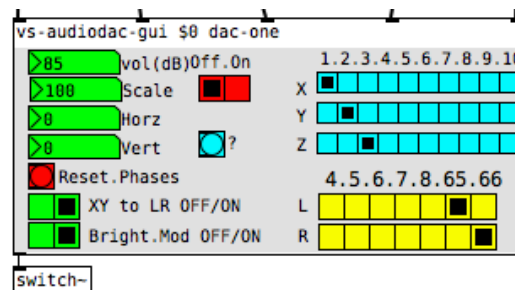
Please do not bug Hansi with bug reports on this version of the application, it is a pre-release specifically for us to to play around with. It may sometimes crash if you do weird things to it (like selecting the same audio device for input and output).

Derek Holzer
macumbista@gmail.com
September 2018
Helsinki