

MULTIMEDIA PROJECT
2723QCM

2019

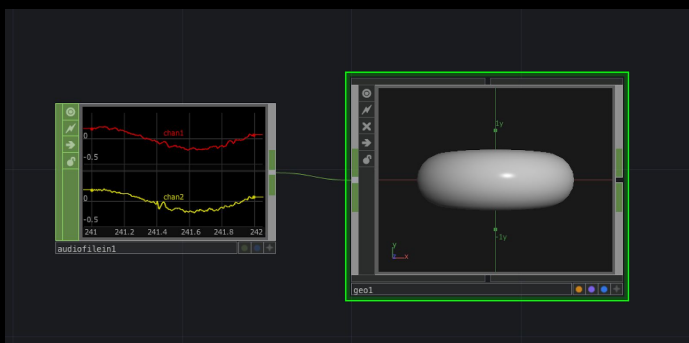
(week 2)

FROM OSCILLOSCOPE TO VIDEO-SYNTH

For this tutorial we will create a simple way of visualizing audio by introducing the basic operators required to generate a 3D render in Touch Designer.

1) First we need to create the audio input which we intend to visualise. Press TAB in your keyboard and navigate to the CHOP tab to create an 'Audio File In' Chop operator. By default, "Audio File In" opens with an audio file already loaded. For the purpose of this tutorial, we will work with this audio file, but experiment in changing this source into other audio files or even a mic audio input (CHOP Audio Device In).

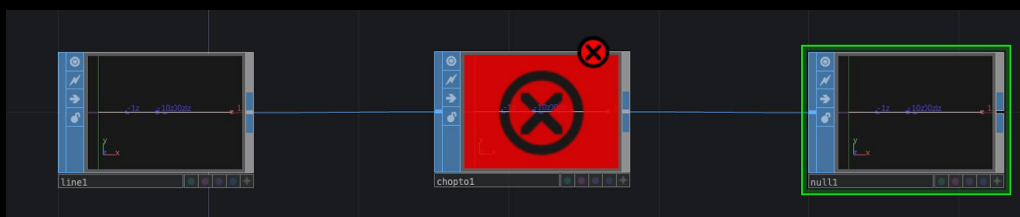
2) To generate a 3D render we will need to create 3 basic operators which are essential for creating any 3D graphics: 1) COMP 'Geometry' 2) COMP 'Camera' 3) COMP 'Light'. To create the "Geometry COMP, right-click on the output connectors of the 'Audio File In' operator (connectors should become bright green), navigate to the COMP tab, and select "Geometry". This should create the operator automatically connected to the "Audio File In" operator.



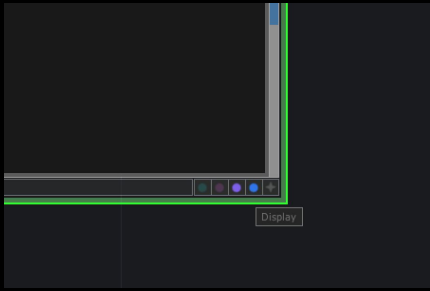
3) Double-Click on the "Geometry" operator, now called 'torus1'. By double-clicking you enter inside a new network. This network is made up of 'in1', 'out1' and 'torus1'. Delete the 'torus1' operator and create more space between 'in1' and 'out 1' so that we can create other operators.



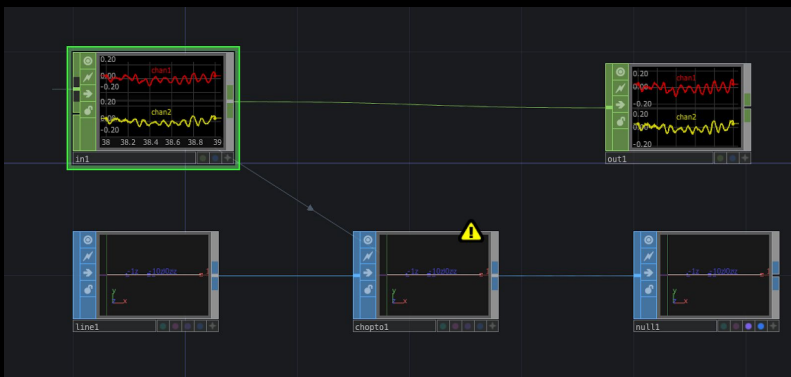
4) To generate the basic graphic for our oscilloscope, we are going to use a 'Line' SOP. Press 'tab', navigate to SOP and select 'Line'. Right-click on the output connectors of the 'Line' operator and create a SOP "CHOP to". Then, follow the same process to create a SOP 'Null'.



On the 'Null' operator, ensure the 'Display' (blue light) and 'Render' (purple light) modes are enabled.



5) The 'CHOP to' operator is necessary in order to connect our audio CHOP with the 'Line' SOP. To start the connection simply drag and drop the audio 'in1' operator inside the 'chopto1' operator. When released, you should see a moving arrow between 'in1' and 'chopto1', as image below.

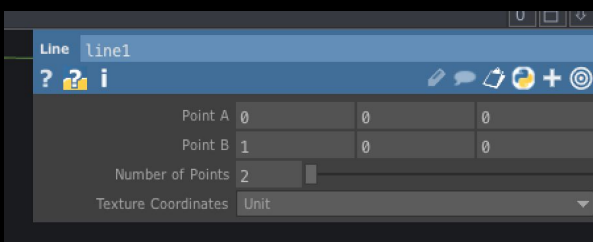
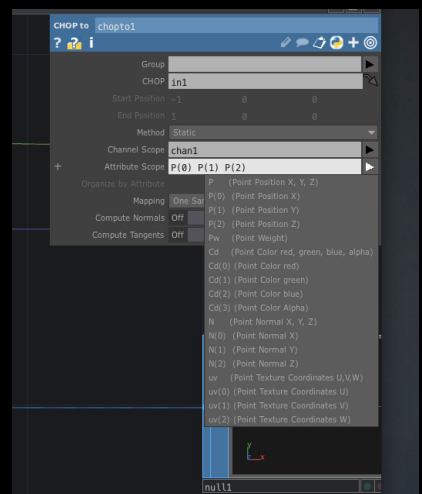


6) Next, we need to adjust some of the parameters of 'chopto1' in order to control the desired parameters of our 'Line'. Select the 'chopto1' operator and press the letter 'P' in your keyboard. This should open the 'Parameter Editor Interface'.

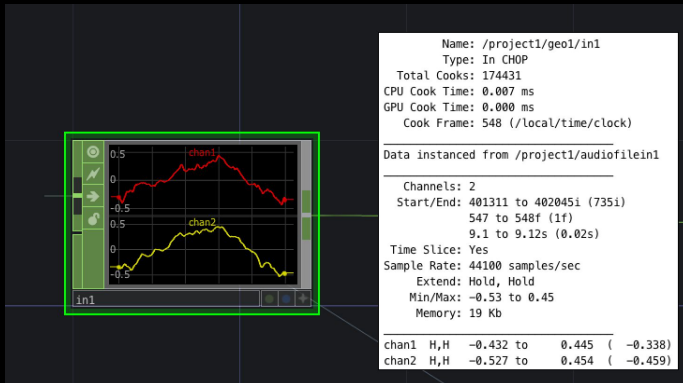
a) What data do we want our 'chopto1' operator to look at? Under the 'Channel Scope' parameter we can specify the source of data, in this case, we want to look at channel 1 from 'in1'. To establish this connection, under the 'Channel Scope' parameter type: chan1. You should immediately see some changes in the operator.

b) What attribute do we want to change with this data? We want to control the position of the 'Line' in the Y-axis. To achieve this, first delete the default attribute from the 'Attribute Scope' parameter, and then click on the black triangle located on the right side of the parameter. A menu-window should pop-up. Select P(1) as your attribute which corresponds to the points in the Y axis. You should immediately see the line jumping up and down in the Y axis.

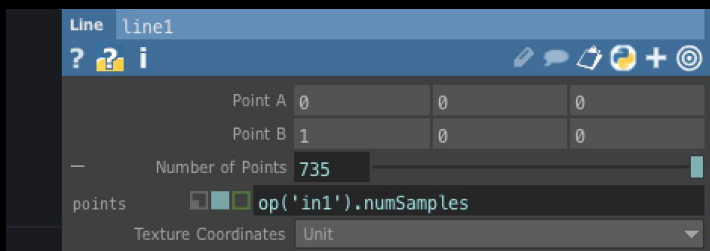
7) Next, we need to correspond the number of points in the line with the number of samples that we are receiving from our audio so that we get a more accurate representation of the audio data. If you click on the 'line1' operator and you look at the 'Parameter Editor Interface', you should see that our line only has 2 points.



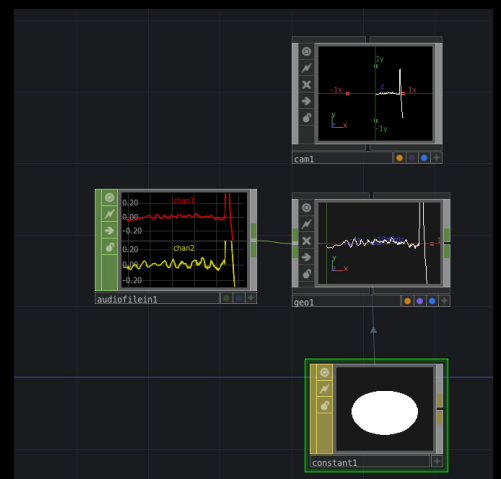
To find out the number of samples that we are receiving from our audio, click on the 'in1' window, press 'P' to open the 'Parameters Editor Interface', and click 'i' to open the info window. Under the "Start/End" text you should see (735i). This corresponds to the number of samples. This means that we need to generate 735 points in our line to correspond a point for each sample.



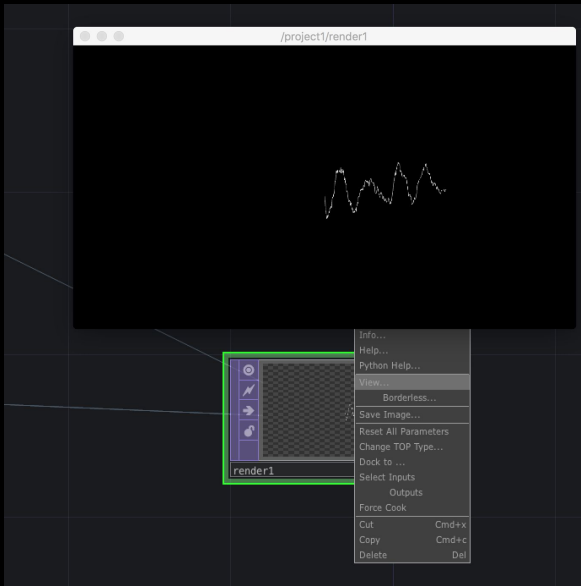
8) To change the number of points in our 'line1' we need a write a script inside the 'Number of Points' parameter. First, roll-over the 'Number of Points' parameter. On the left, you should see a 'plus(+)' sign. Click on it, this should open the 'point' parameters modes. Now, replace the '2' with the following expression: **op('in1').numSamples**. As you can see, the 'Number of Points' is immediately updated to '735' and we start looking at a more accurate sound wave.



9) Zoom-out of this network to go back into our initial network. In this network, we need to create a camera COMP. Also, create a 'Constant' MAT, to generate a material for our line. To apply the material into our line, drag and drop the 'constant1' into the 'geo1' operator, and when prompted with a menu, select 'Param: Material'. You should immediately see a connection between 'constant1' and 'geo1' and you should now see a sharper line.

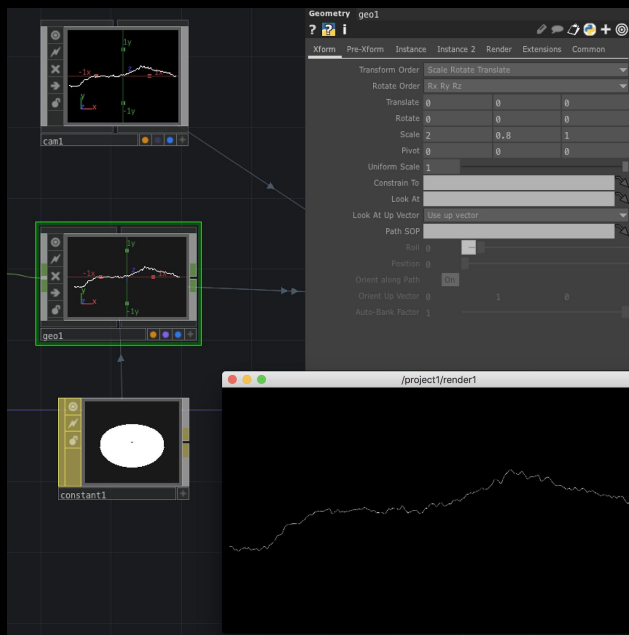


10) To render what we've got so far, create a render TOP which should automatically generate a connection with 'cam1' and 'geo1'. To visualise the result of our render right-click the 'render1' operator and select 'View...'. This should open a separate floating window. Resize the window so that it floats in the corner of your screen and so that we can monitor the new changes.



11) As you can see, the render doesn't fill-out the space of our window. To adjust this: First, zoom-in into the network of 'geo1' by double-clicking on it. Then, select the 'line1' operator and change the X parameter of 'Point A' from '0' to '-1'. You should see how the line is centred in the screen. To further match the size of the render to that of our window, we can continue to change the parameters of line, but even better, we can do this from the parameters of 'geo1'. To do this, zoom-out back into the initial network, select the 'geo1' operator and adjust the 'Scale' parameters to match the dimension of the floating screen. To change the X position, adjust the first box of 'Scale', for example type '2'. You should see how the sound wave now covers the entire floating screen. To allow more space for the amplitude of the wave, we can scale down the Y parameter so that it fits better into the height of the screen.

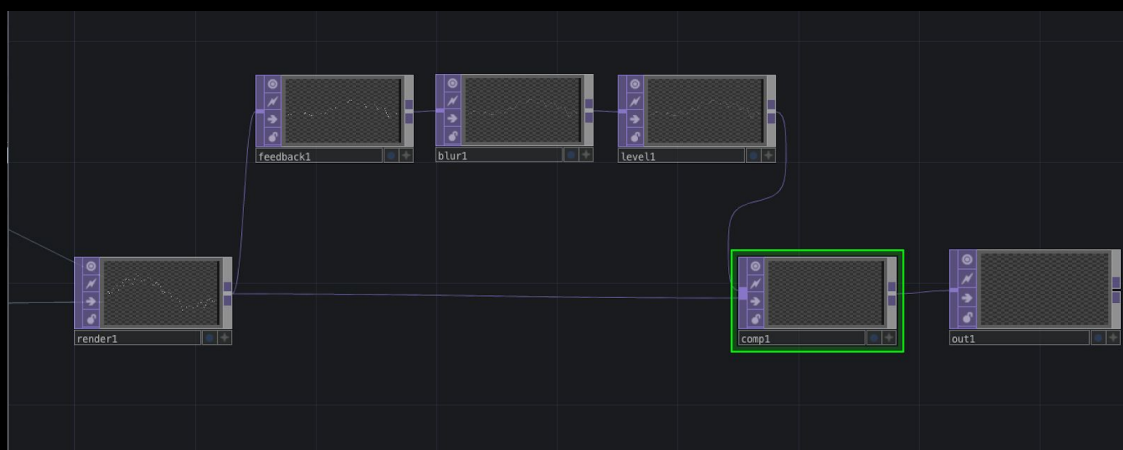
For example, type '0.8' in the second box of 'Scale'. At this stage, you should have a basic visualization of the audio file. To make this a little more interesting, we are going to create some feedback, which will allow us expand the possibilities of control.



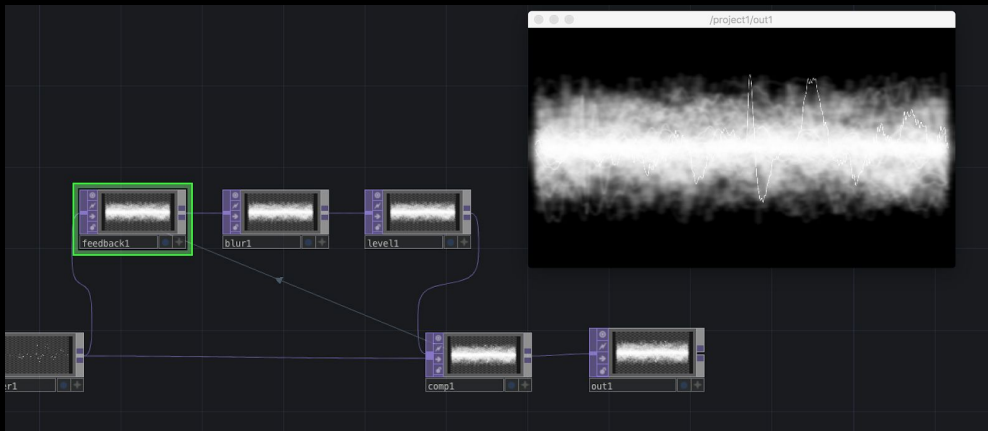
12) Create an 'Out' TOP by right-clicking on the output connectors of the 'render1' operator and by navigating to TOP/Out.

13) Roll-over the magenta cable that is connecting 'render1' and 'out1'. When rolling-over, the cable should turn yellow. Right-click on the yellow cable and select 'Insert Operator', then navigate to TOP/Feedback and create it. Repeat the process by right-clicking on the connection between 'feedback1' and 'out1' to insert a 'Blur' TOP, and the same for inserting a 'Level' TOP. Now, to combine the data coming from 'render1' with the one coming from 'level1', create a 'Composite' TOP by inserting it between 'level1' and 'out1' by following the same process as above. Next, connect your 'render1' with your 'out1'. Finally, select the 'comp1' operator and

change the 'Operation' parameter to 'Add'. This will add the data coming from 'render1' with the one coming from 'level1'. This section of your network should be looking as follows:

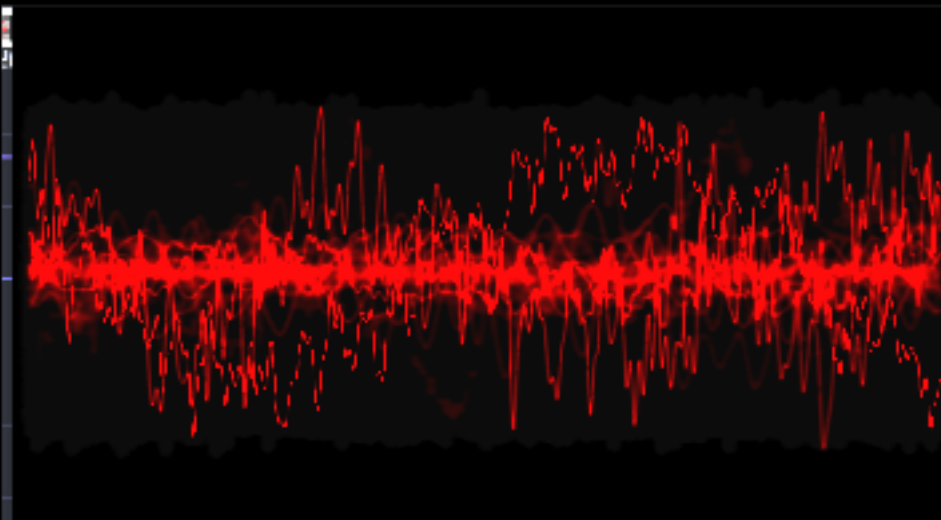


14) To complete the feedback loop, drag the 'comp1' operator into the 'feedback1' operator. You should now see the original wave with it's feedback:



15) To improve the balance between the feedback and the original wave, we need to adjust some parameters. First, inside the parameters window of 'level1', under the 'Post' tab, adjust the 'Opacity' to around 0.95. This will make the feedback opacity to fade-out smoothly allowing for the new audio to be clearly visualised. Also, navigate to the 'Pre' tab and change the 'Black Level' to 0.001, creating a nicer contrast.

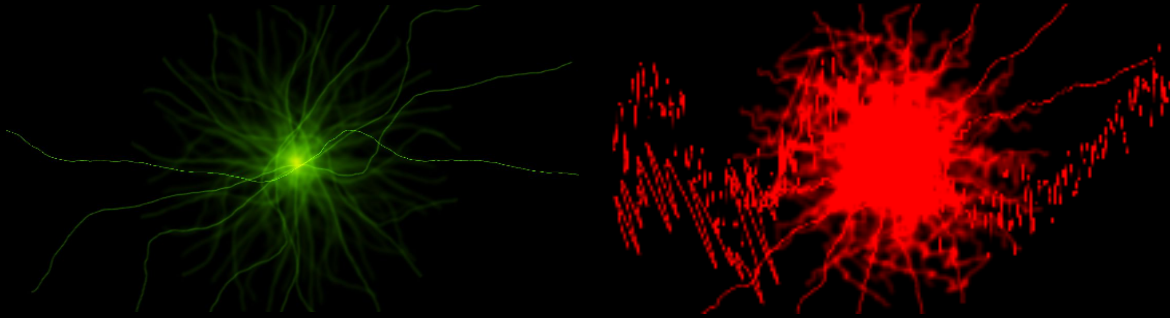
16) Now, let's experiment in changing the colour of the sound wave. Select your material operator 'constant' MAT, and adjust the 'Color' parameter to the desired colour. Why not a remarkable Griffith red?



17) To add even more parameters of control into our render let's add a 'Transform' TOP into the feedback loop. For this, roll-over the magenta connection between 'level1' and 'comp1', right-click and 'Insert Operator' TOP 'Transform'. This will now extend the possibilities of manipulation of our feedback signal. Experiment by changing some of this parameters and visualise the results. Start by making changes to the millesimal (e.g from 0 to 0.001, 0.002), so that you can understand the transformations.

18) Change other parameters from your feedback loop operators: 'level1', 'blur1', 'level1', 'transform1' and try to come up with interesting results.

19) Finally, swap your 'Audio File in' with 'Audio Device In' to visualise data coming from a microphone connected to your computer. Make sure you choose the correct sound device and channel in the parameters window of the operator.



Based on Oscilloscope tutorial by Matthew Regan: <https://www.youtube.com/watch?v=tXC7ZoBpdQk>