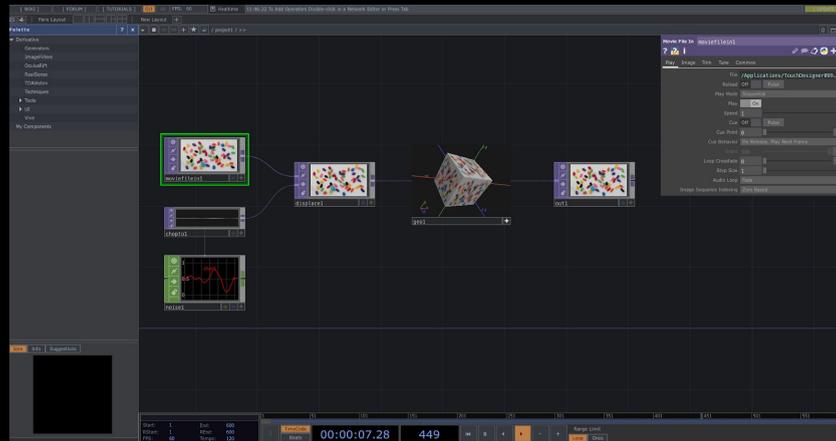# MULTIMEDIA PROJECT 2723QCM

2019

(week 1)

TOUCHDESIGNER (TD)
PRACTICAL INTRODUCTION

Interface basics

- What in Pure data (Pd) we call a 'patch', in TD is called a 'network'
- What in Pure data (Pd) we call an 'object', in TD are called 'operators' or 'nodes'. 'Operator' is accurate in terms of TD terminology, 'Node' speaks to general network terminology.
- In Pd inlets are usually at the top of an object, outlets are at the bottom -- this encourages a top-to-bottom workflow. In TD the signal flow is left to right, inlets on left and outlets on the right of an operator.
- The main window is the 'network editor', also referred to as the workspace or worksheet.
- On the left of the screen you will find the 'Pallette', which contains a library of components.
- In the lower part of the screen is the transport. Touch designer perculates or 'cooks' data every frame, which is why the transport is always playing, unless you manually stop it.
- Zoom in / out of the network editor with the mouse scrolling wheel.
- Click and drag with the left mouse button to pan network.
- Click and drag with the right mouse button to define a selection area.

1. Use 'command + A' to select the existing network, then delete.
2. Add an operator: press tab or double click anywhere on black background space to bring up Operator (OP) Create Dialog. By pressing tab, you can navigate through the fifferent OP families. Choose an Operator to add.

Operator types

- TOP (texture operator); these are the simplest nodes in TD, designed to generate 2D graphics. Another way of thinking of TOP is in terms of Raster graphics. A raster graphics or bitmap image is a dot matrix data structure that represents a generally rectangular grid of pixels (points of color), viewable via a monitor, paper, or other display medium.
- CHOP (channel operators); values changing over time, can be sound or animation data.
- SOP (Surface Operators); for creating 3D graphics.
- MAT (Materials) Can be thought of as shaders for shading geometry.
- DAT (Data) Text information and tables (or arrays), contains structures and data, scripting, etc.

- Component (nodes within nodes) like a subpatch or abstraction in Pure data. Column 1: 3D objects, Column 2: Panels for creating user interfaces. Column 3: other specific components: Base for grouping, Window for outputting final TD result to projector, etc.

More interface basics
- Some nodes are dark coloured, some are light. Dark nodes are generators (or at least don't need input), for example *Movie file in* generates data from a file on the hard drive. Light colored nods usually filter or manipulate data.
- Using a 3 button mouse button on any operator 'middle click' (alternatively right-click + hold down alt/option) on a Mac to see an information screen (name/path, type, total cooks, etc)
- Pane (top upper left) allows different window types to be shown (network editor is the default); panel is for visualising a user interface, geomeoty is for visualising a 3D scene (unlike VVV / Quartz component, TD is real 3D software where different camera angles can be shown) etc...
- Right hand side of Pane allows interface to be split across the screen, or different monitors. Can be good to have network editor in one place and control interface in another.
- Selecting an operator and clicking P brings up the parameter interface for each operator. There are various subheadings.

Important to know
- 60 Frames Per Second (FPS) is the default refresh rate for most computer screens and projectors, this is the ideal target but network has to be efficient. 30 FPS is a good fallback. TD frame rate can be changed bottom left (bearing in mind that TD cooks data for every frame).
- Nodes do the processing, but they all take processing power to visualise. This is why there is a 'designer' mode for working on your network and 'perform' mode for actually performing, which shows output only (press escape to exit perform mode).
- When TD is installed there is TD and TD player, TD player only operates in perform mode (and is much cheaper, good for selling products).

Operators
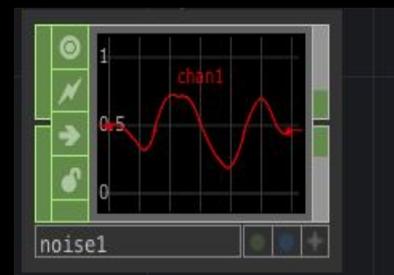Each node or operator, independent of type, has an interface:
- The inner part is called 'viewer', this visualises the data in the operator (sometimes image, sometimes data).
- On the left side is a panel with 4 buttons for simple nodes and 5 for components:
    - 1) disable viewer (useful to optimize performance)

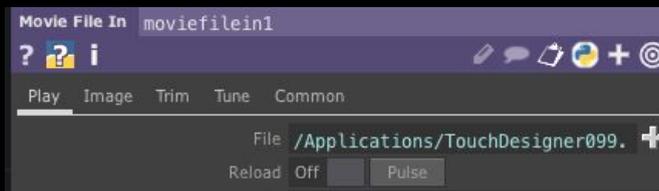   - 2) bypass
    - 3) Lock, disable input
    - 4) clone immune

- The bottom bar of the operator has a number of buttons (AKA flags) depending on type:
    - Viewer for displaying in background of network editor.
    - Viewer active for access to interaction (eg 3D)
    - Export or exporting data
    - Render... etc

Parameter editor interface

- Type of operator named at top

Icons on left:
- Left hand question mark opens help file for that operator on Derivative website
- Next question mark opens Python help, as relevant to that operator
- Next button is info. (also available via middle mouse button)

Icons on right:
1. Blue/yellow icon changes (locally) Python/T-script language for expressions
2. Plus expands or collapse all parameters, the concentric circle show only parameters that have changed from default state.
3. Tags and notes allows you to add text.

- Tabs on left have local parameters for this data type, these are grouped by usage. More complex.
- All Containers have common tab, which deal with context
- TOPS have resolution, which channel, etc etc etc
- CHOPS parameters correspond to CHOP type

Mouse
Right click:
- On each operator for a menu that is local to selected Operator
- On whole network editor (for lots of stuff)
- On parameter for parameter specifics.
- On connection to insert operator, or disconnect operators, etc

Using a 3 button mouse button on any operator 'middle click' (or right-click [two fingers on trackpad] + hold down alt/option) on a Mac to see an information screen (name/path, type, total cooks, more information)

Other
- Notice that wires 'animate' (subtly) when data is transferred, this is called 'cooking' (right click and select info to see how many times a node has been cooked)
- 3D components (like geometry, cameras, lights) etc have connectors and lines on their bottoms and tops, which connects them as parent/child in a 3D hierarchy, but no data flows along them.
- Similarly the 2D components like sliders, buttons, and containers also have connection on the bottom and tops, this is one way to group them in a panel, but again no data flows.
- Clicking a node makes it current, this creates a green border
- Yellow borders means nodes are part of a group selection.

GETTING STARTED

1. Use 'command + A' to select all operators in the network, then 'delete' (on keyboard) to delete.
2. Press 'tab' to bring up *OP Create Dialog.*
3. Navigate to TOP tab and select *Video Device In.*
4. Under 'Device' heading of *Parameter Editor Interface* (on the right) select FaceTime HD camera
5. Add a *Null* TOP and wire the output of 'videodevicein1' to the input of 'null1' by clicking and dragging.
6. Add a Transform TOP and connect as below.
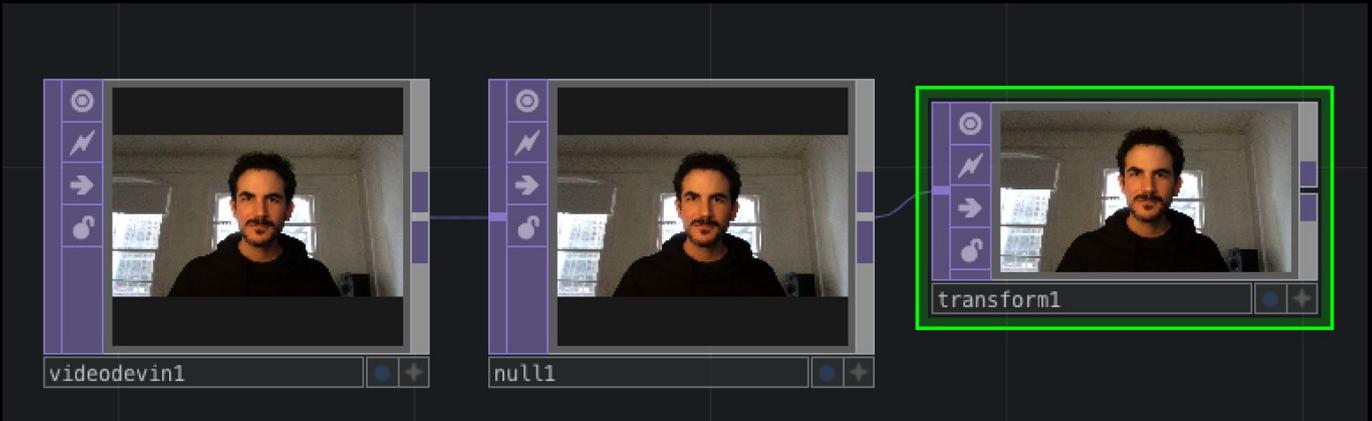
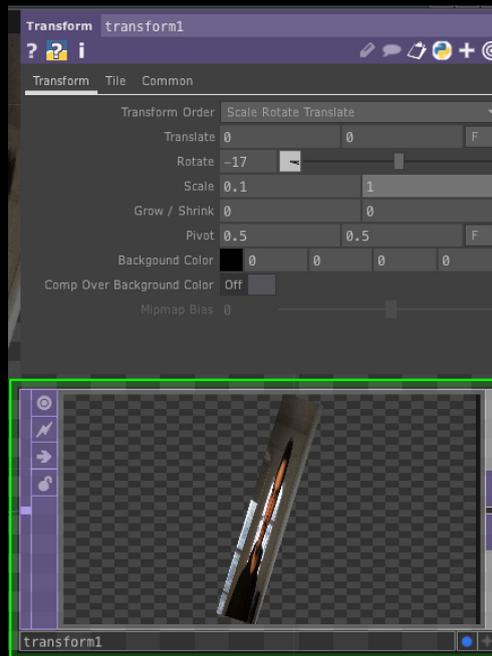7. Click blue flag on transform to view in the back of your network editor.

8. Click on *Transform* and bring up the *Parameter Editor Interface* by pressing P on the keyboard (if not already visible).
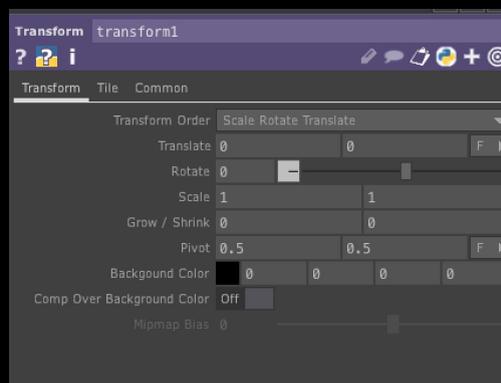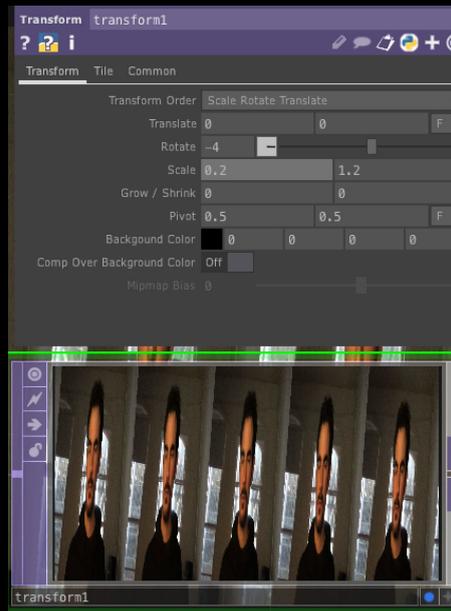

9. Click the leftmost question mark to open the helpfile (this given an overview of the operator)

10. Experiment with the *Scale* parameter (from 0.1 to 10) and *Rotate* (-360 to 360).
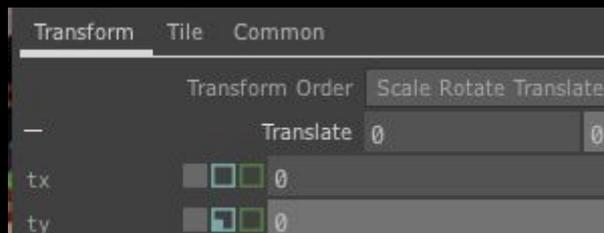

11. What happens if you look at the *Tile* tab and change *Extend* parameter from 'Zero' to 'Repeat'*....?*

12. Explore various options for a few minutes by manually entering numbers.

Automating Parameters with Python
1. Click on the 'Transform' tab
2. Click (accurately) to the immediate left of the word 'Translate', which should result in this:

Notice the three squares:

- Grey: is for entering constant numbers as you have been doing above.
- Blue: (expression) is for entering expressions (in the form of Python code or Tscript)
- Green: for exporting data from channel operators (CHOPS)

3. Click the blue square alongside *tx and* enter absTime.seconds
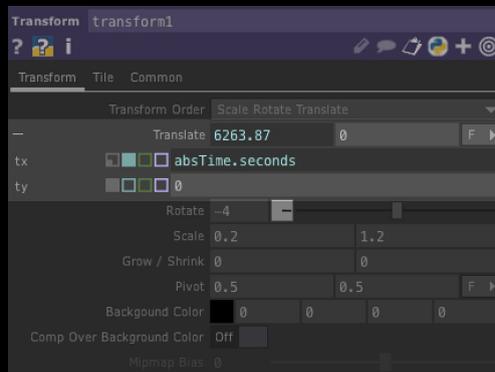
4. Click the language icon above to see equivalent expression in Tscript.
5. Return to Python and enter "absTime.seconds"
6. To stop the motion click the grey square to return to constant mode
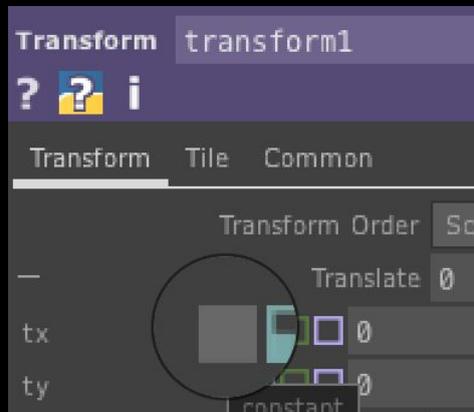
Exporting data from CHOP channels

1. Add *LFO, Math,* and *Null* CHOPS (all green) and wire together in series
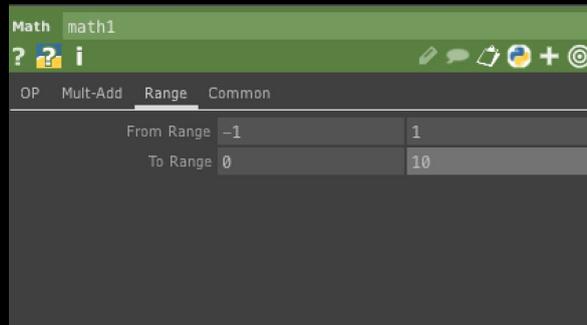

2. Add two *Trail* CHOPS as below (to visualise what LFO is doing and any changes made by Math)

3. Look at the *Parameter Editor Interface* for *math* and navigate to the *Range* tab

4. Notice LFO is varying from -1 to +1 so enter these figures into *From Range* and note that the second *Trail* updates.
5. Try entering a variety of numbers in the *To Range* for example: *From Range (-1, 1), To Range (0, 10).*

6. Select *LFO* and experiment with the *Type* option (Sine, Gaussian, Triangle, Ramp, Square, etc). Also experiment with the *Frequency* Parameter.

7. The next challenge is to export a parameter from a CHOP to a TOP operator. In this example we are going to export the data coming out of 'null2' and connect it with the *Scale* parameter of 'transform1'. To achieve this, first, we need to enable *viewer active* on the 'null2', which is the grey diamond on the bottom-right corner of the operator. Once enabled, it will turn white and the borders will be hidden.


8. Then, select *Transform* TOP so it is highlighted in green.
9. With the 'transform1' Parameter Window open, click and drag directly from *chan1 of the* 'null2' into one of the x-axis *Scale* parameter of 'transform1'.

10. You will be presented with a menu, click Export CHOP.

11. You should now see the *Scale x-axis* being controlled by the data coming from 'null2'. This is visualised by a pulsating grey arrow between 'null1' and 'transform1'.
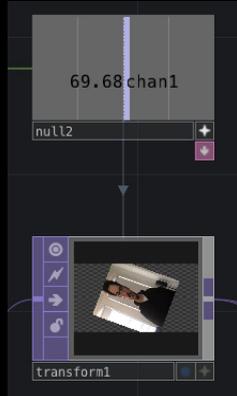
12. Explore creating other CHOPs to control other parameters of TOPs.

CREATIVE CHALLENGE: TRY THIS AND THEN EXPERIMENT
1. Using what you've learned, make your live image long and thin, almost like a line, then spin it at a variable rates (use as many *LFOs* and *Math* as you like)
2. Run the output into a *Cache TOP with* Cache Size set to 800, and output index set to -800 (check the Help to get a better understanding, but basically you're delaying action by 800 frames)
3. Connect the output of *Cache* and the output of *Transform* to a *Cross* TOP to blend between the *live* and *delayed* outputs.
4. Open up the Palette using (which is beneath the Wiki button), explore image filters such as *radialBlur, rgbDelay, monochrome,* and *lightTunnel,* etc.

13. Discuss Task for Week 2.

Week 2 Task (5%)
Complete: FROM OSCILLOSCOPE TO VIDEO-SYNTH worksheet and submit an annotated TD project of your own that explores the creative possibilities of the techniques that have been introduced to you in weeks 1 and 2. Annotate this project to evidence your understanding of the various Touch Designer operators and to explain your signal-chain using Text DATs.

For the purposes of this task it is OK to use any of the sound/music that is built into TD.

Some starting points to consider:
- Application of the learnt techniques in a different way to the in-class activity e.g. adding different TOP operators inside the feedback loop to create different results.
- Creative manipulation of parameters to create exciting and engaging results (try not to be boring, and don't be scared to make it weird and wacky. E.g exploration of interesting effects, colours, dimensions, math operations, to create interesting aesthetic results.
- Clear annotations that explain how data flows from one operator to another and how it gets transformed to create the final render.

Criteria & Marking:
- technical success;
- creative/musical success;
- clarity of understanding as evidenced by TD annotations/in class presentation.

Due at 5pm on the Friday of week 2 (Friday 2nd August)

REMEMBER TO BRING INTERESTING
REFERENCE EXAMPLES
TO SHARE WITH THE CLASS!