Appendix C

Camera Transfer Tools - User Guide

I. Background

These tools were "inspired" by a tutorial on SCAD's website called 'Maya to Houdini Camera Matching'. It involves using a MEL script to save out Maya's frame values, setting up a CHOP network manually in Houdini, manually copying camera attributes like resolution and f-stop, etc and manually converting Maya's camera horizontal aperture into Houdini camera horizontal aperture.

I found the tutorial quite useful while doing a group project at Bournemouth University, but there was also room for improvement. I decided to make the process easier and more robust and to implement the reverse (Houdini->Maya camera transfer) as well. The project also was a good exercise in Python, HOM and Python for Maya. Last, but not least, I wanted to create tools that can be useful to anyone working with Houdini or Maya. It is a way for me to give back to the CG community.

II. Tools installation

1. Supported Houdini and Maya versions:

- Houdini 9.5 and later, both 32-bit and 64-bit. Tested on both Windows and Linux (Ubuntu).
- Maya 8.5 and later, both 32-bit and 64-bit. Tested on both Windows and Linux (Ubuntu).
Note: I don't have access to a Mac, so the tools have not been tested on OS X.

2. Installation:

1. Code and help installation:
Copy the folder 'mt_tools' to your $HOME directory.
On Windows $HOME is My Documents/
On Linux it is ~username/

2. Houdini shelf installation:
Copy the included default.shelf file to $HOME/houdiniX.Y/toolbar/,
where houdiniX.Y is your Houdini version.

3. Maya shelf installation:
Copy shelf_MT_tools.mel to your $HOME/maya/$version/prefs/shelves/ folder.
For example, on a Windows machine having a 32-bit installation of Maya 2008,
this directory would be My Documents/maya/2008/prefs/shelves.

Note: This user guide demonstrates the use of the camera transfer tools by doing a "roundrip" transfer of a camera from Maya to Houdini and back to Maya. I have tested using the scene file provided in the tutorial mentioned above.

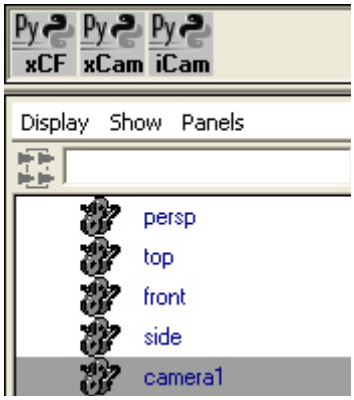
III. Exporting a Maya camera

Previous: Introduction | Next: Importing a Maya Camera in Houdini - CHOPs | Home

III. Exporting a Maya camera

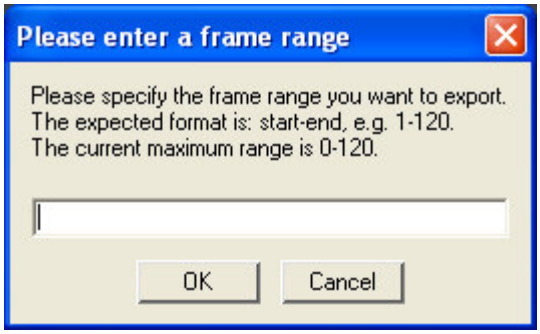
In essence, the tool saves the camera's shape node settings (aperture, f-stop, etc) as well as frame values to an external file. It supports both static cameras and cameras animated via keyframes, set driven keys, expressions and motion paths. Note that only channels with values that vary over the specified frame range are considered animated by the tool. You can have a camera animated on a motion path, that has all of its channels connected to the motion path curve, but only half the channels have values that actually change. The tool will consider the rest of the channels to be static and will export a single value for each of them, instead of saving an entire column of identical numbers.

Select a camera and click the icon of the Export Maya camera tool (xCam) in the custom shelf called MT_tools.



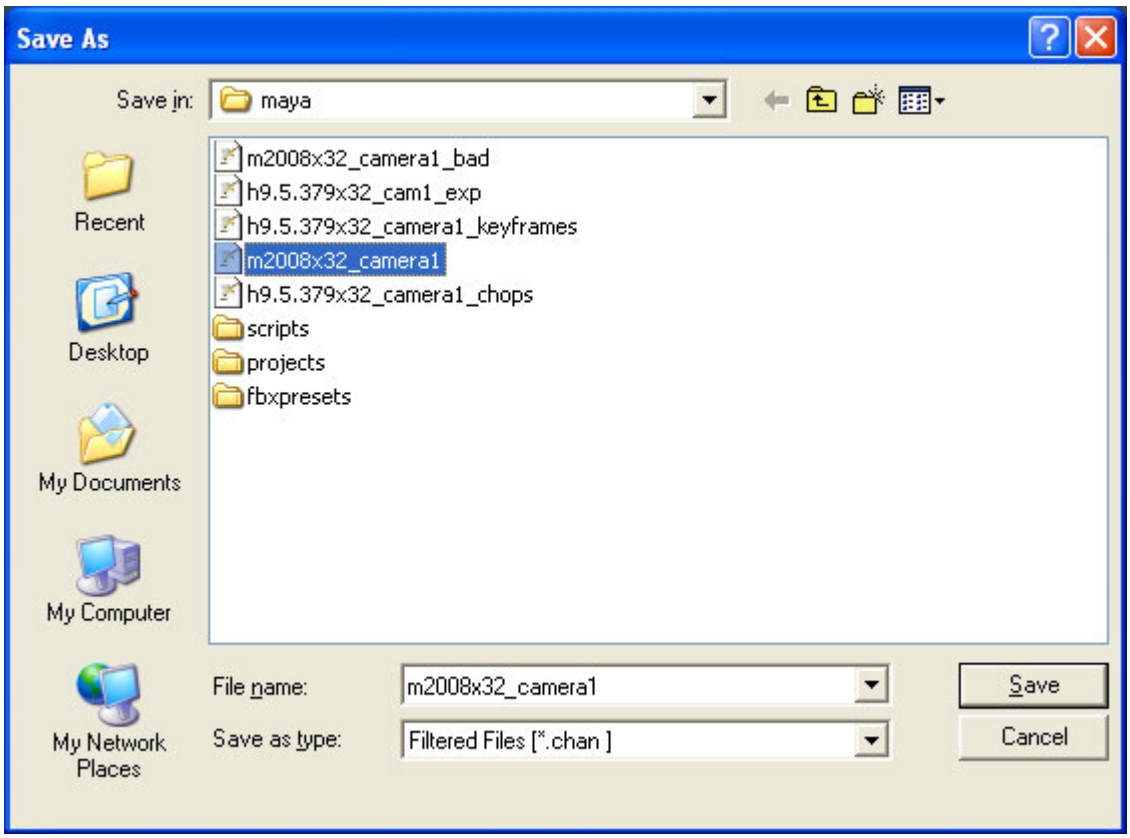
If the selection is not a single camera, you will see an error message and the process will be aborted.

Upon selecting a single camera and clicking the tool's icon, you will see a dialog window, which asks for the frame range to be exported. The maximum allowed range is the current scene animation range.

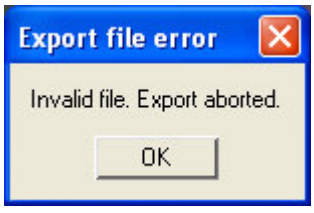


The tool has built-in data validation and will cancel the export process if you enter an invalid range.

Assuming that valid a range has been entered, next the tool will display a standard file dialog window, which allows you to specify the name and path of the file in which the camera data will be saved. By default the tool points to Maya's home directory - My Documents/maya on Windows, ~/maya on Linux. If you don't type the expected file extension (.chan), the tool will include it automatically.



If you cancel or try to save without entering a file name, the process will be aborted.



Previous: Introduction | Next: Importing a Maya Camera in Houdini - CHOPs | Top | Home

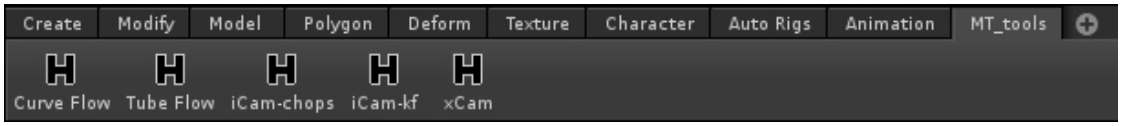
Previous: Exporting a Maya camera | Next: Importing a Maya Camera - keyframes | Home

IV. Importing a Maya camera in Houdini - CHOPs

There are 2 Houdini shelf tools which allow you to import a Maya camera:

- Import Maya Camera - CHOPs (iCam-chops)

- Import Maya Camera - Bake Keyframes (iCam-kf)

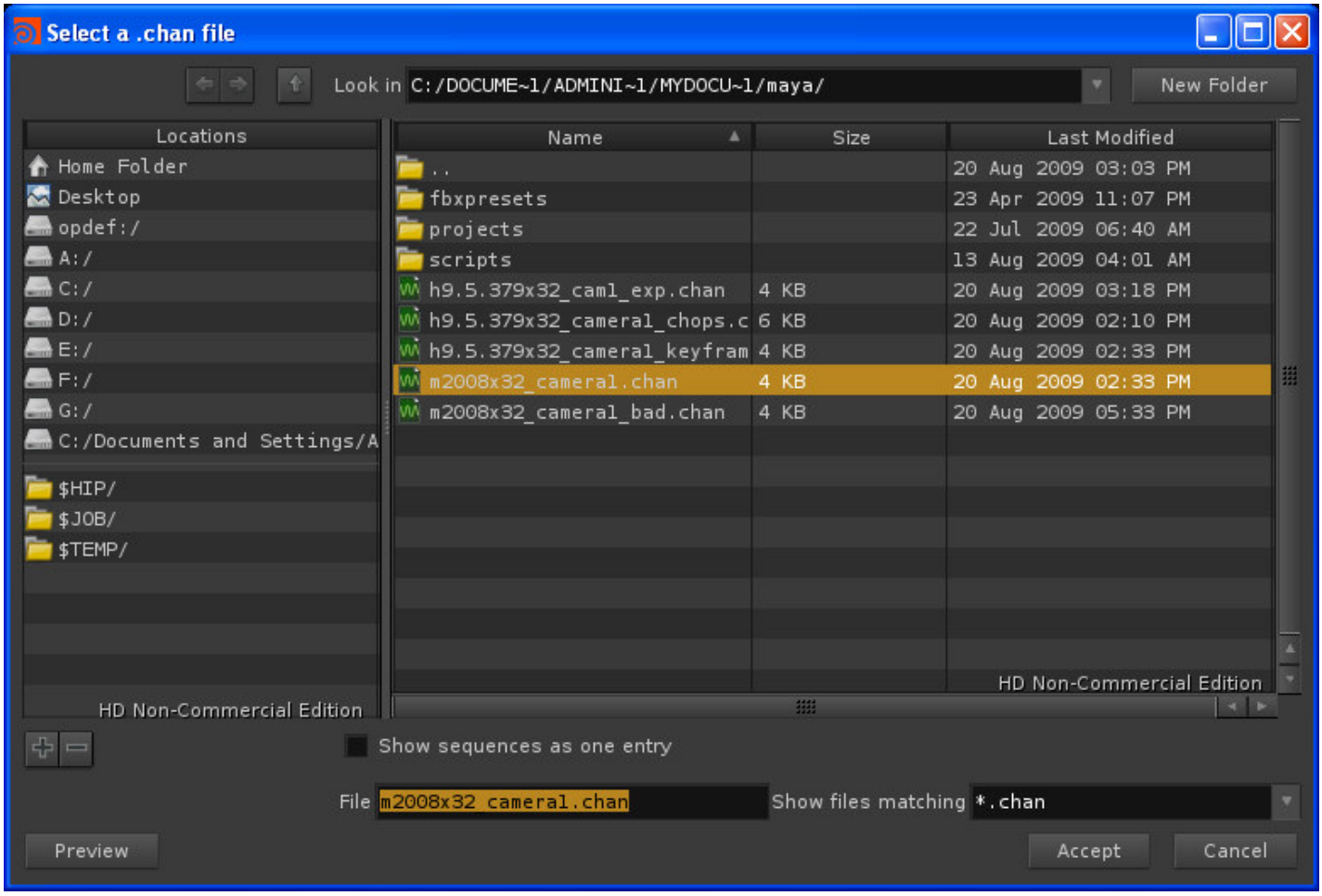


Importing a Maya camera using CHOPs:

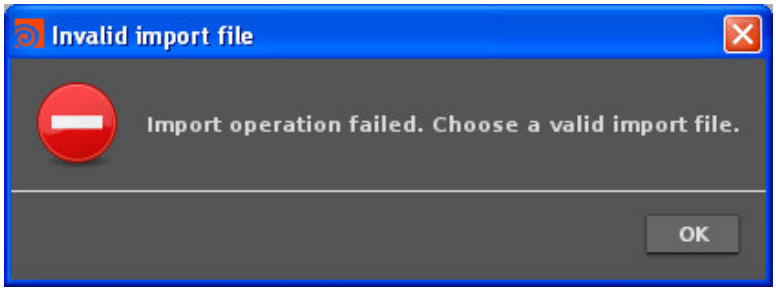
This tool automatically creates a CHOP network and maps the channels found in the file (each is stored in a separate column of numbers) to the camera's transform/rotate channels. If you delete a CHOP-driven camera, the next time you try to import a camera the tool will delete all orphaned CHOP networks, and then it will create the new camera. Orphaned CHOP networks are networks with Export CHOP nodes which reference non-existent cameras.

Begin by clicking the tool's icon (iCam-chops) on the custom shelf called MT_tools.

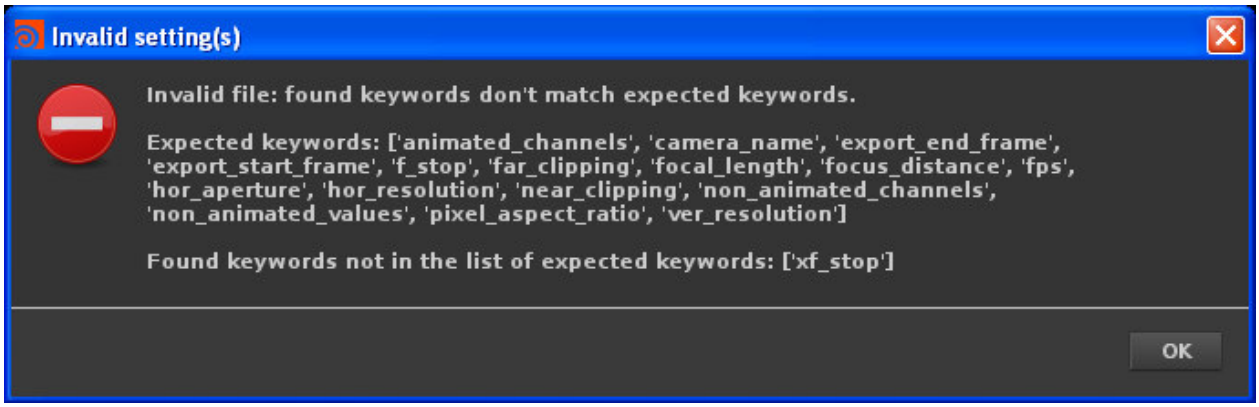
The tool will open a file dialog window which allows you to choose a camera data file (.chan) to import. By default it points to Maya's home directory.



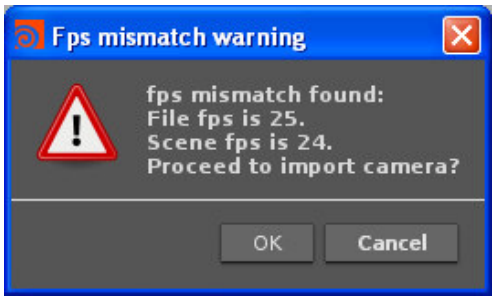
If you cancel, the tool will show an error message and will abort the import process.



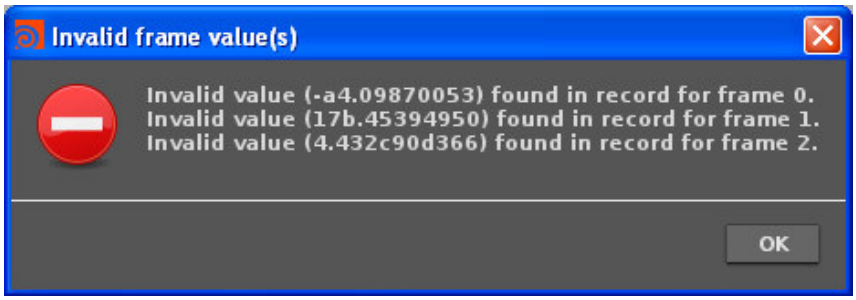
Assuming that a file was selected, the tool will check if the right keywords exist.They are used to store camera shape node settings, as well as global settings like Maya scene fps.



If that is the case, the tool will compare the Houdini scene fps and the Maya file fps. If they don't match, it will display a warning and ask the user to choose whether to proceed or not. The default button is set to 'Cancel'.

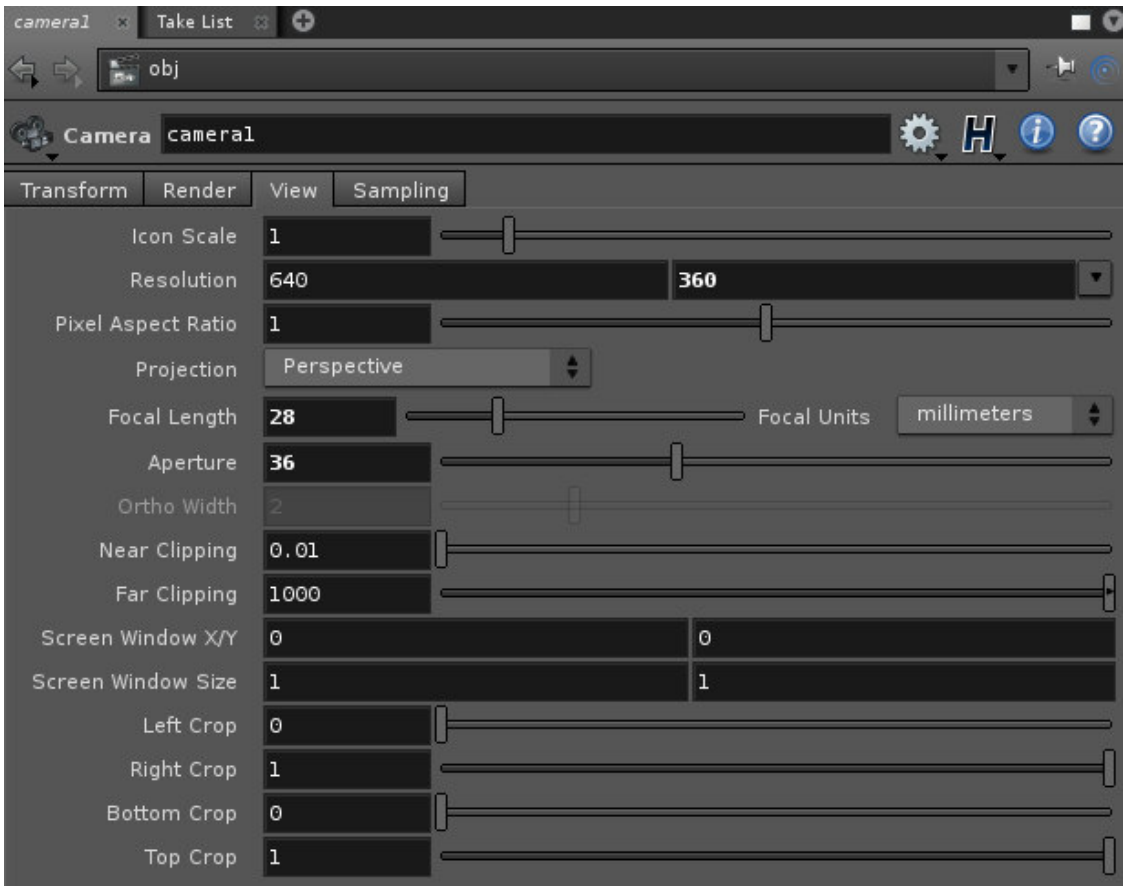


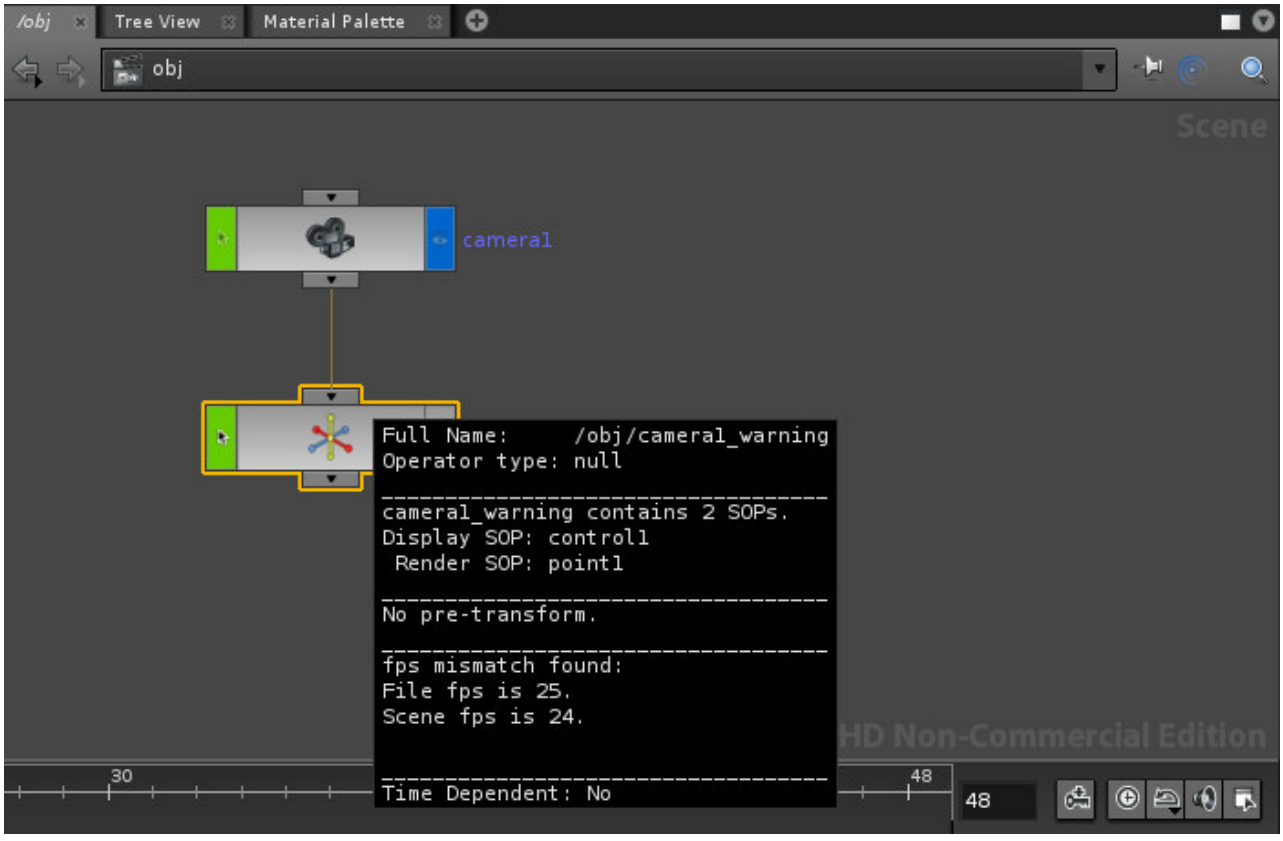
If the user chooses to proceed, the tool will examine the frame records to check if they contain only numerical data.

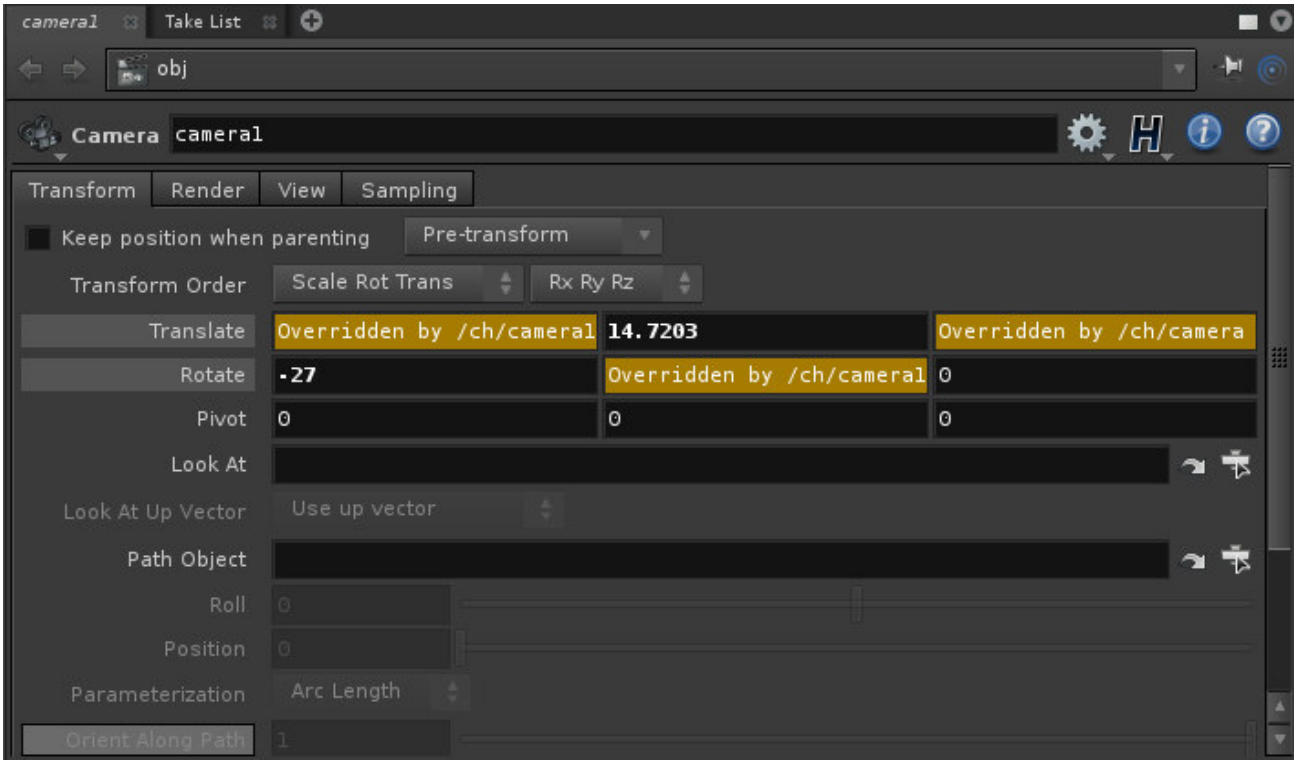


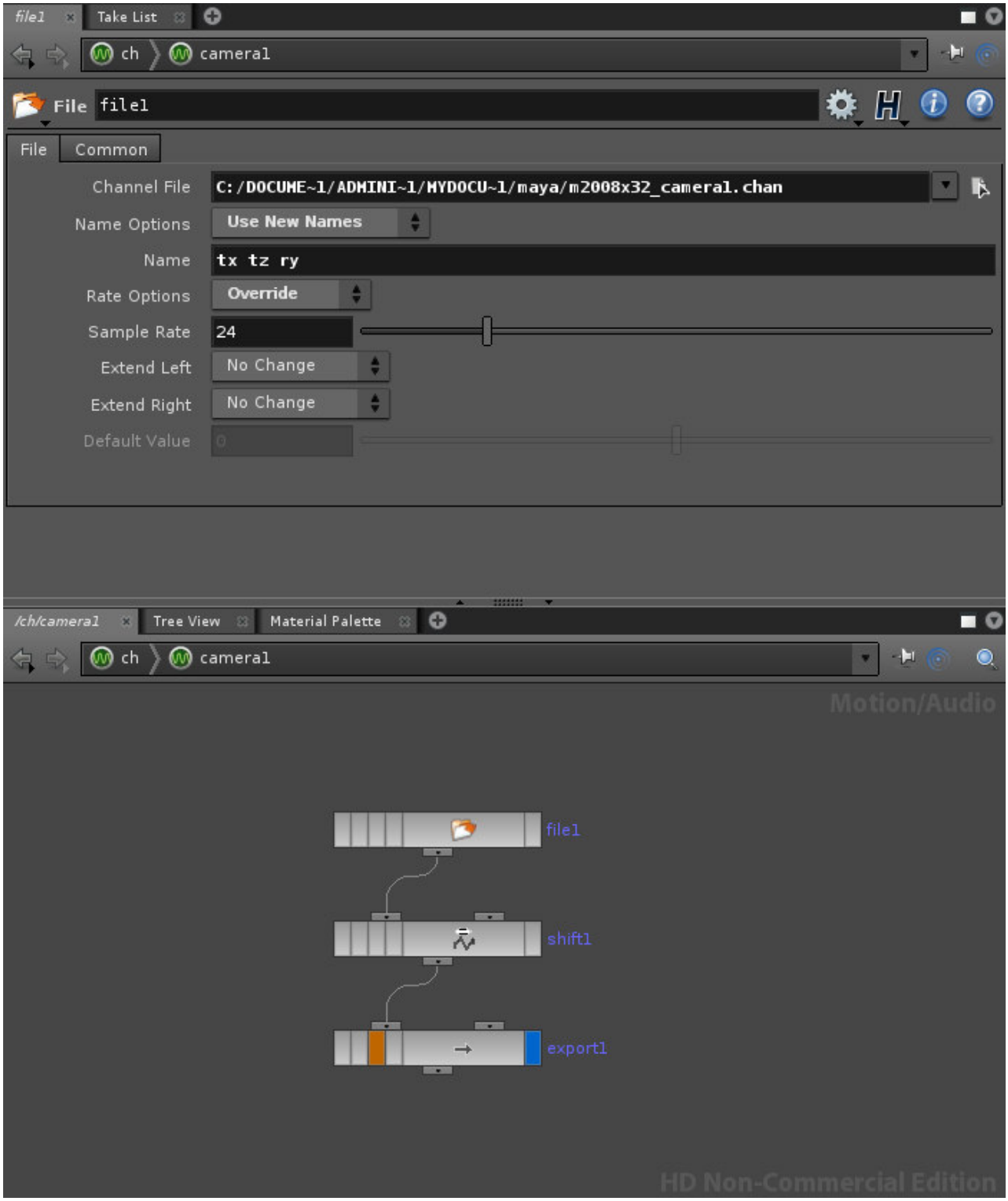
If that too is passed, the tool will create the camera and the CHOP network. It will convert the horizontal aperture of the Maya camera into a Houdini horizontal aperture. The vertical aperture is calculated automatically by Houdini using the horizontal aperture, the device aspect ratio and the pixel aspect ratio. If there is a fps mismatch that the user chose to ignore, the tool will attach a Null to the camera's node with a comment matching the fps warning message. Finally, it will compare the scene frame range and the file frame range and will show a message if the file start frame precedes the scene start frame and/or the file end frame is greater than the scene end frame. It's just a reminder that some of the imported data is outside the current scene frame range.

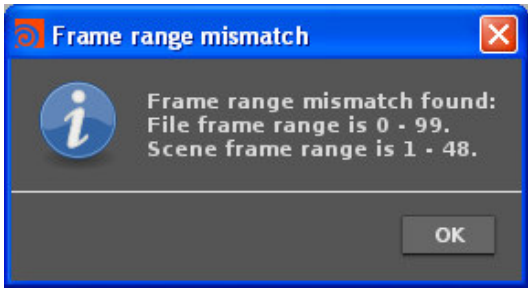
Note that while in Maya the scene can start at frame 0, in Houdini it can start at frame at frame 1 or greater. If the Maya camera data includes values for frame 0, they will be ignored by the tool, as there is no frame 0 in Houdini to map them to.






camera1
Take List
obj
Camera
camera1
Transform
Render
View
Sampling
Keep position when parenting
Pre-transform
Transform Order
Scale Rot Trans
Rx Ry Rz
Translate
Overridden by /ch/camera1
14.7203
Overridden by /ch/camera
Rotate
-27
Overridden by /ch/camera1
0
Pivot
0
0
0
Look At
Look At Up Vector
Use up vector
Path Object
Roll
0
Position
0
Parameterization
Arc Length
Orient Along Path
1



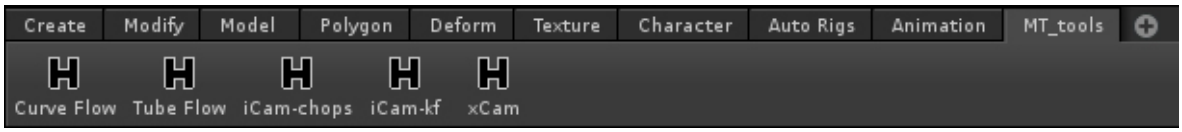


Previous: Exporting a Maya camera | Next: Importing a Maya Camera - keyframes | Top | Home

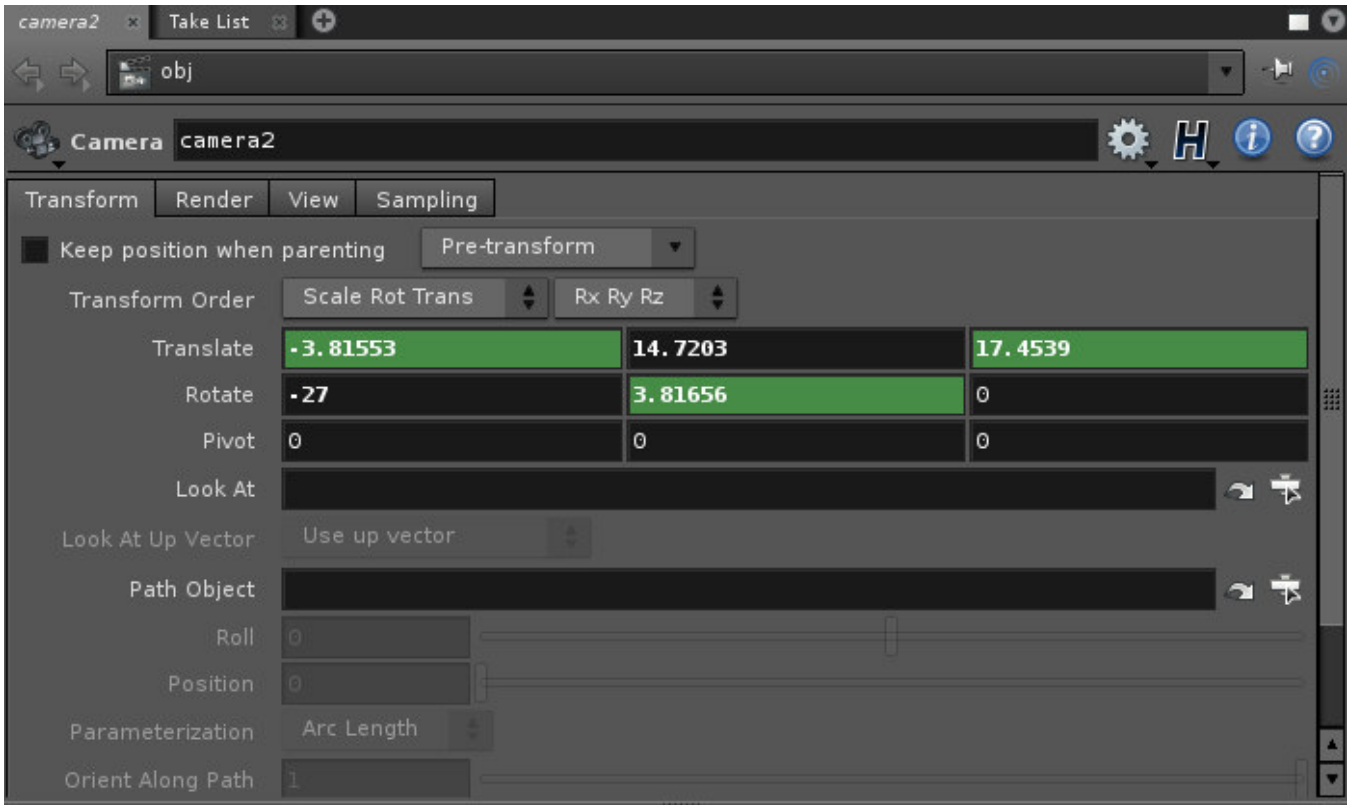
Previous: Importing a Maya camera - CHOPs | Next: Exporting a Houdini camera | Home

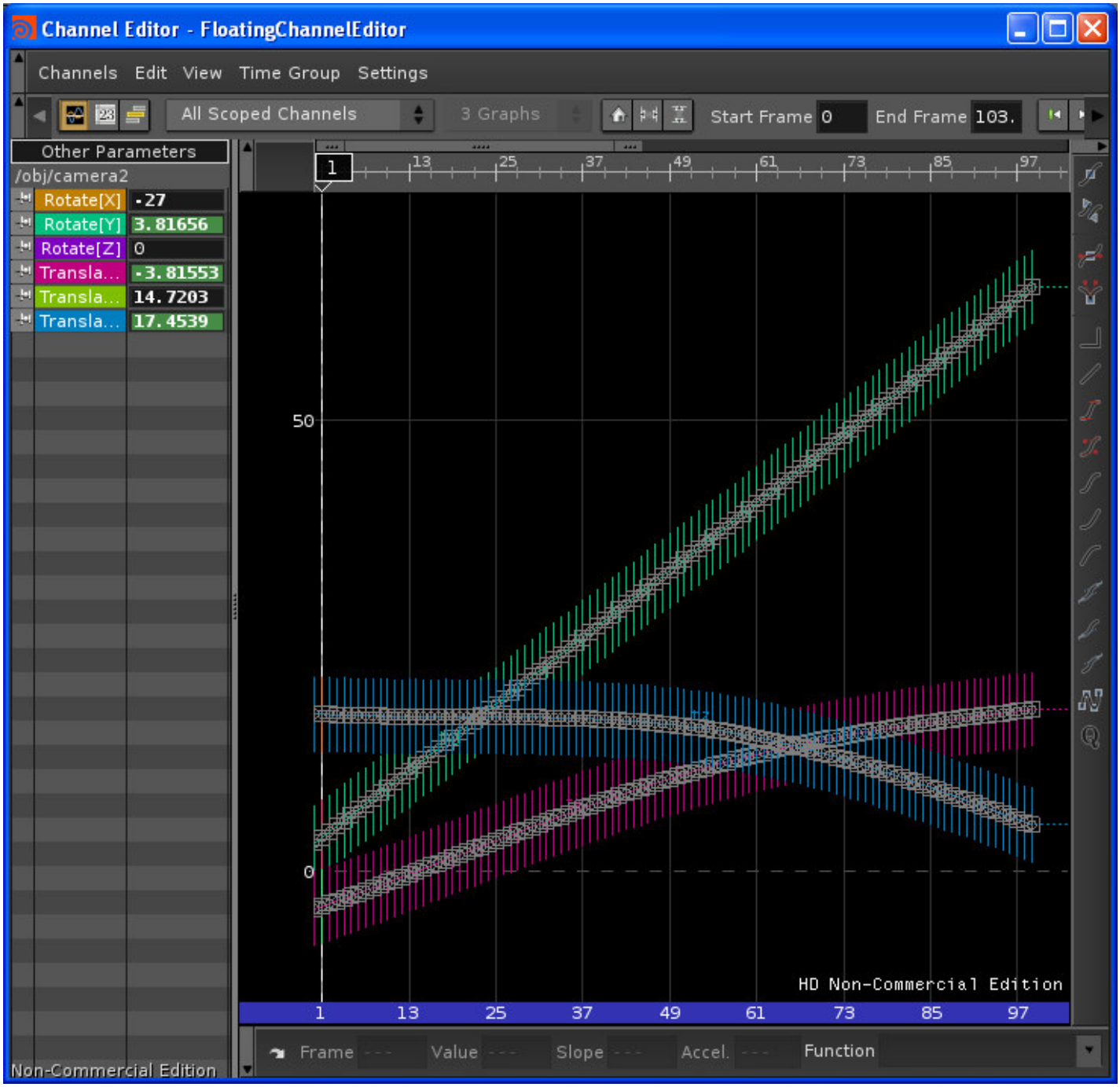
V. Importing a Maya Camera in Houdini - keyframes

A disadvantage of using CHOPs is that you can not modify the animation using traditional tools like the Channel Editor. You can use CHOP nodes, but users who work mostly in other applications can be intimidated. Therefore, I created a alternative tool, which is activated by the iCam-kf icon on the MT_tools shelf.



It bakes the frame values from the file as keyframes over the frame range specified in the file. Similarly to the CHOP camera import tool, this tool does the same data validation and displays the same error messages and a warning if it finds a fps mismatch (see previous chapter). At the end of the process, it too informs the user if the file's frame range is outside the scene frame range.



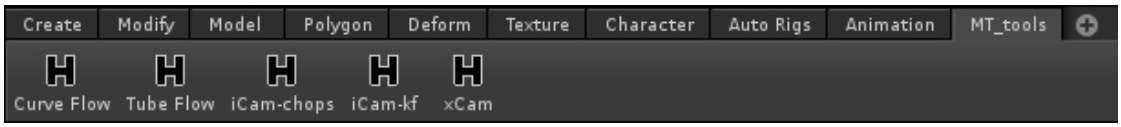


Previous: Importing a Maya camera - CHOPs | Next: Exporting a Houdini camera | Top | Home

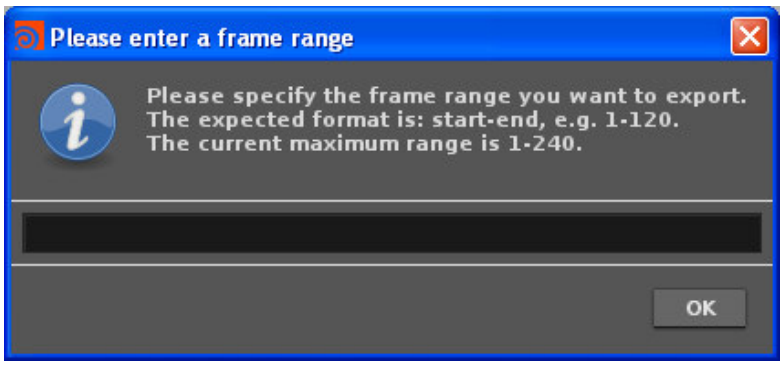
Previous - importing a Maya camera - keyframes | Next - importing a Houdini camera | Home

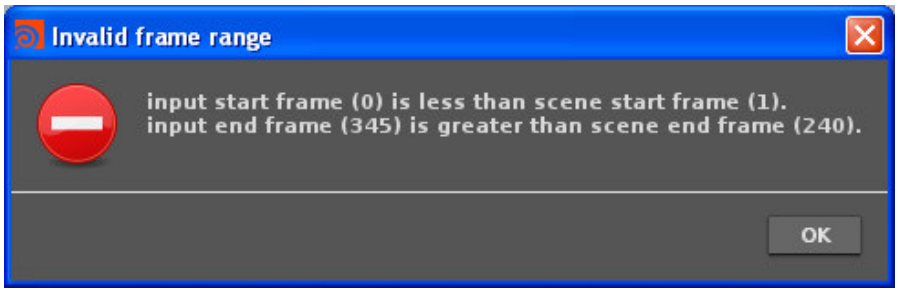
VI. Exporting a Houdini camera

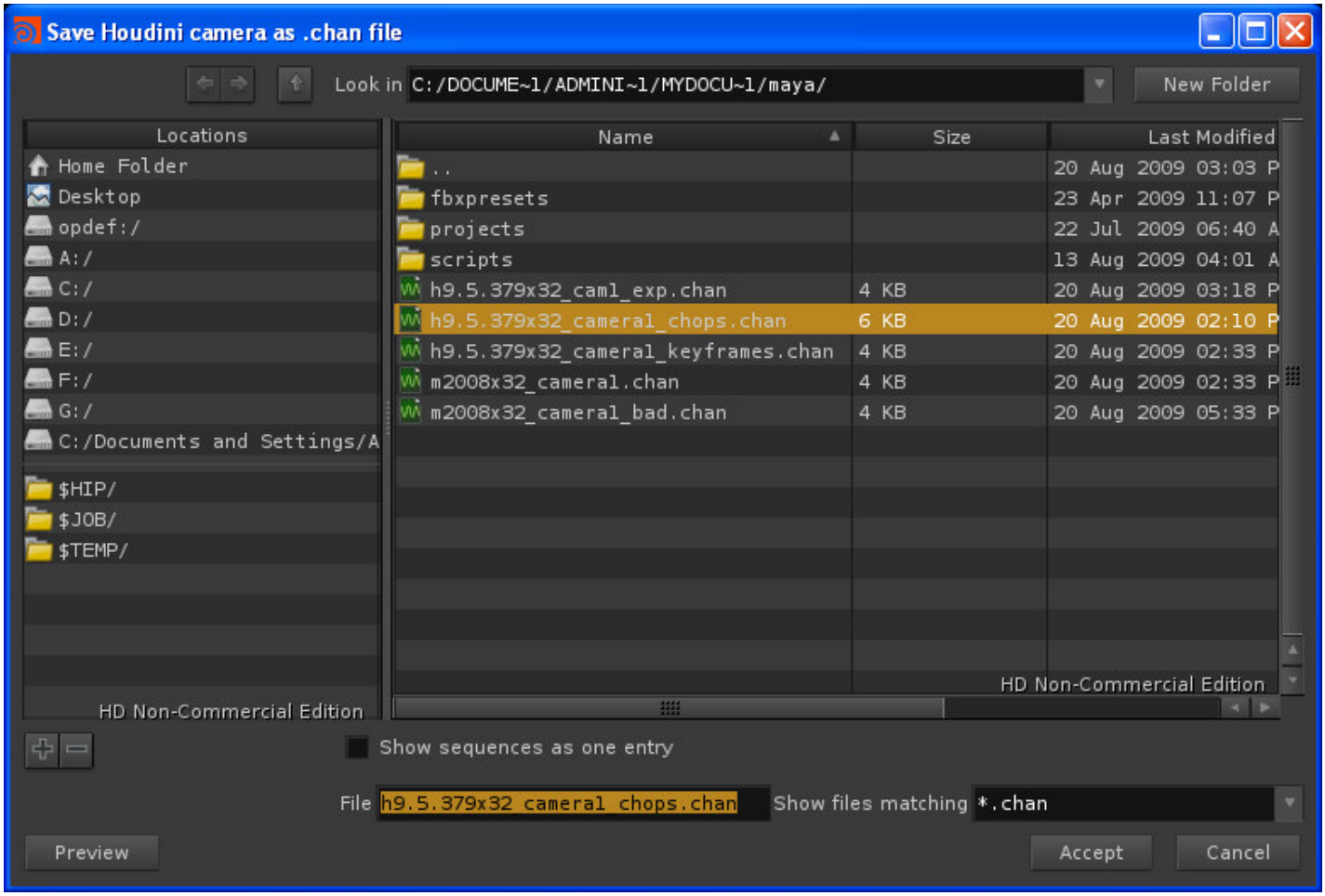
This tool is activated by the xCam icon on the MT_tools shelf in Houdini.



It works similarly to the *Export Maya camera* tool. It asks for a frame to export, which has to be within the scene frame range. The frame range is validated, if it's valid the tool displays a file dialog allowing the user to choose a folder and file where to save the camera data. The default folder is Maya's home folder.





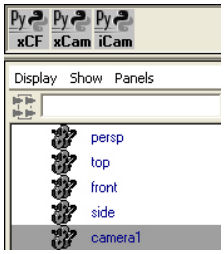


Previous - importing a Maya camera - keyframes | Next - importing a Houdini camera | Top | Home

Previous - Exporting a Houdini camera | Home

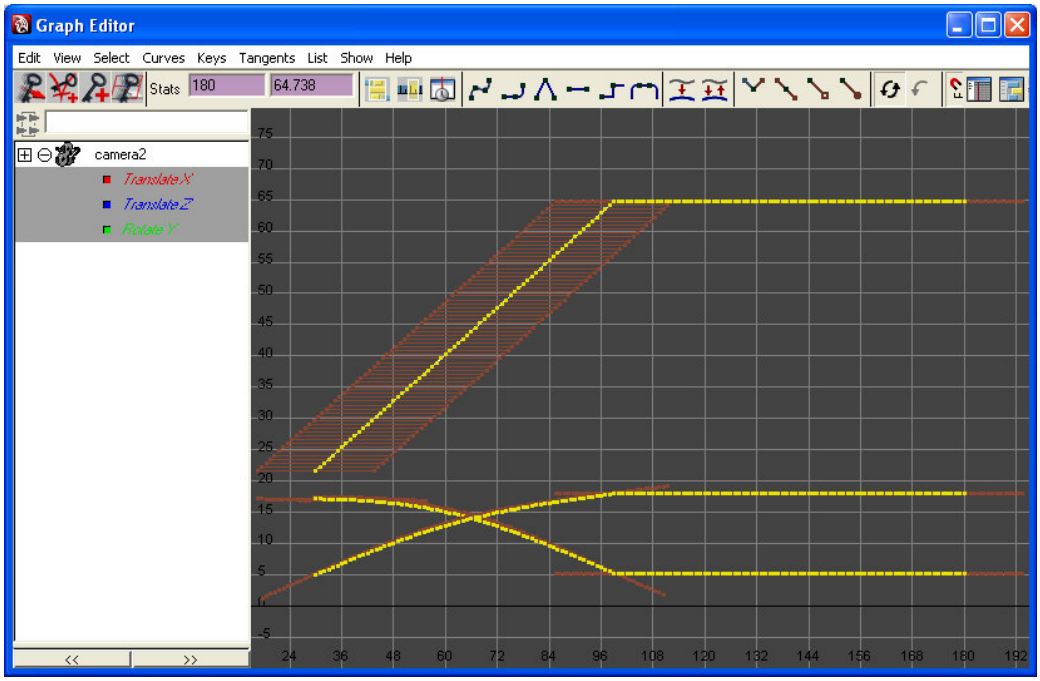
VII. Importing a Houdini camera

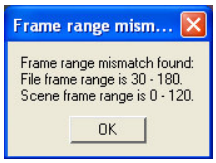
This tool is activated by the iCam icon on the MT_tools custom shelf in Maya.



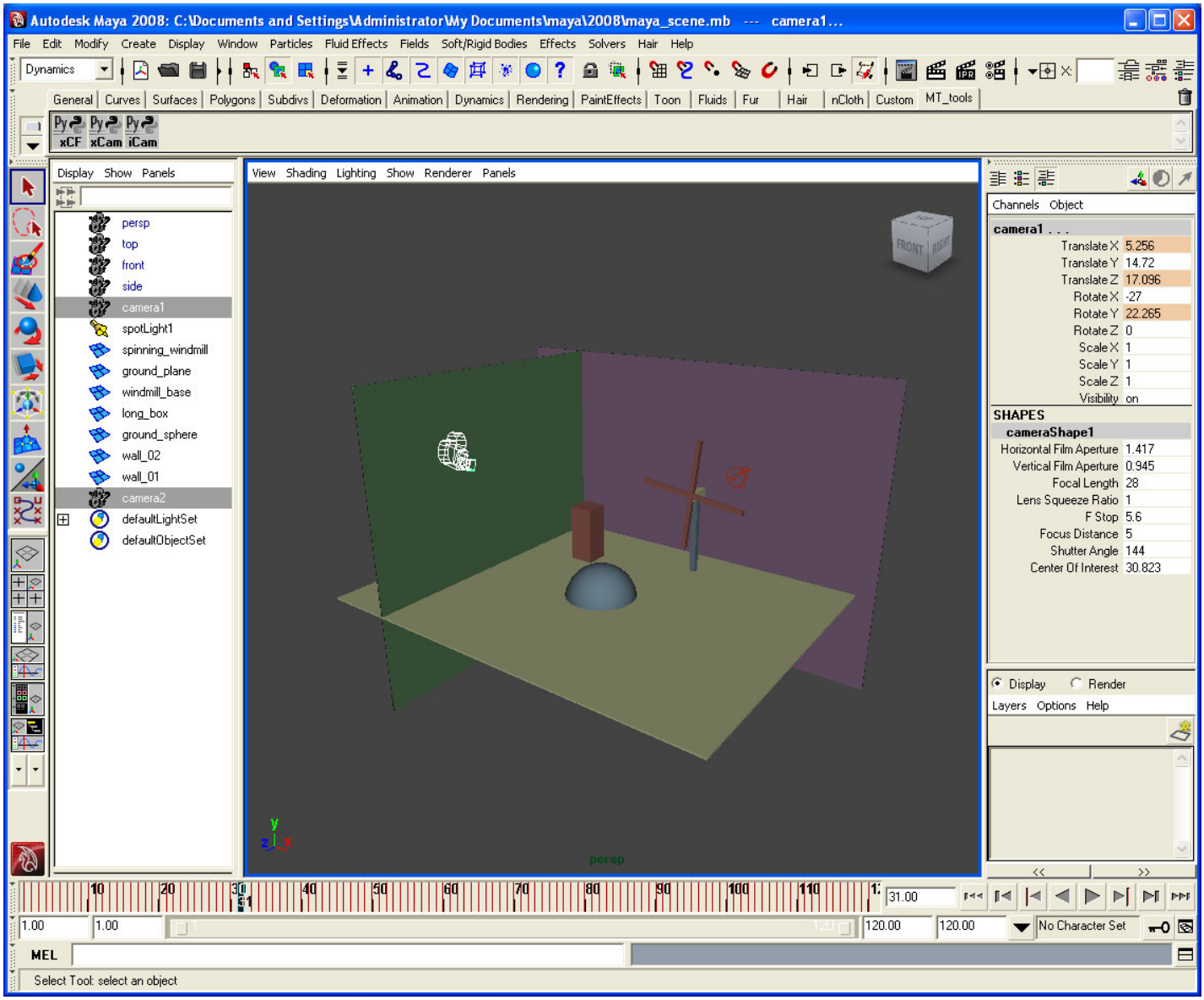
It works similarly to the *Import Maya camera - keyframes* tool. It opens a .chan file, verifies that the required keywords are present and checks for mismatch between the Maya scene fps and the file's fps value.

If the user ignores the warning, the tool validates the frame data and creates keyframes for the frame range specified in the file. Finally, if the file's frame range is outside the scene's frame range the tool informs the user.



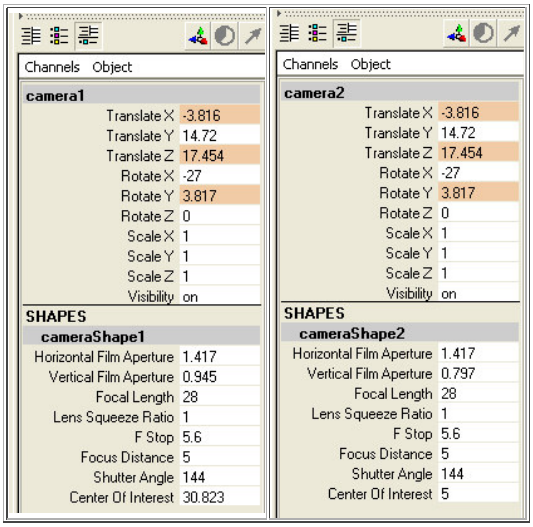


Here is a snapshot with the original camera (camera1) and the camera that was exported to Houdini and then exported out of Houdini and imported into Maya (camera2). The frame values and the motion of the two cameras match.

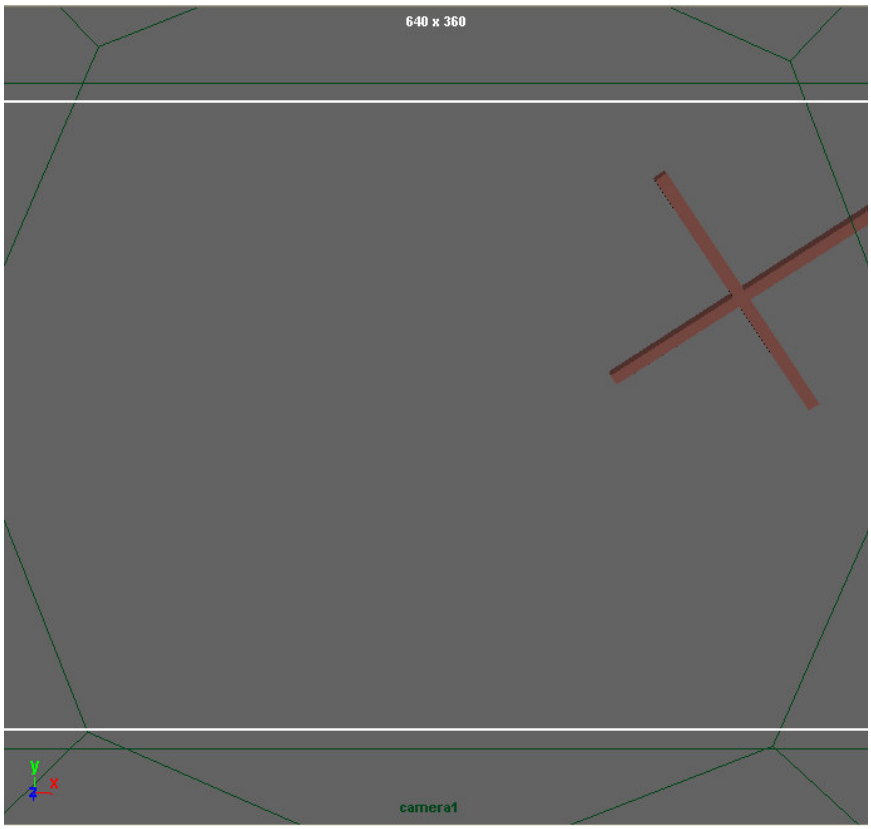


Note that the vertical aperture of the imported camera will probably differ from the vertical aperture of the Maya camera. In Maya cameras are created with default apertures 1.417 and 0.945, which translates to a default aperture ratio of 1.5. However, the aperture ratio should depend on the device (resolution) aspect ratio and the pixel aspect ratio. For a scene with square pixels, the aperture ratio should equal the resolution ratio. E.g. for a 640x360 frame the aperture ratio should be 1.778, instead of the default 1.5, and as the horizontal aperture changes, the vertical aperture should change as well. However, in Maya by default changing the horizontal aperture does not affect the vertical aperture - it stays at 0.945.

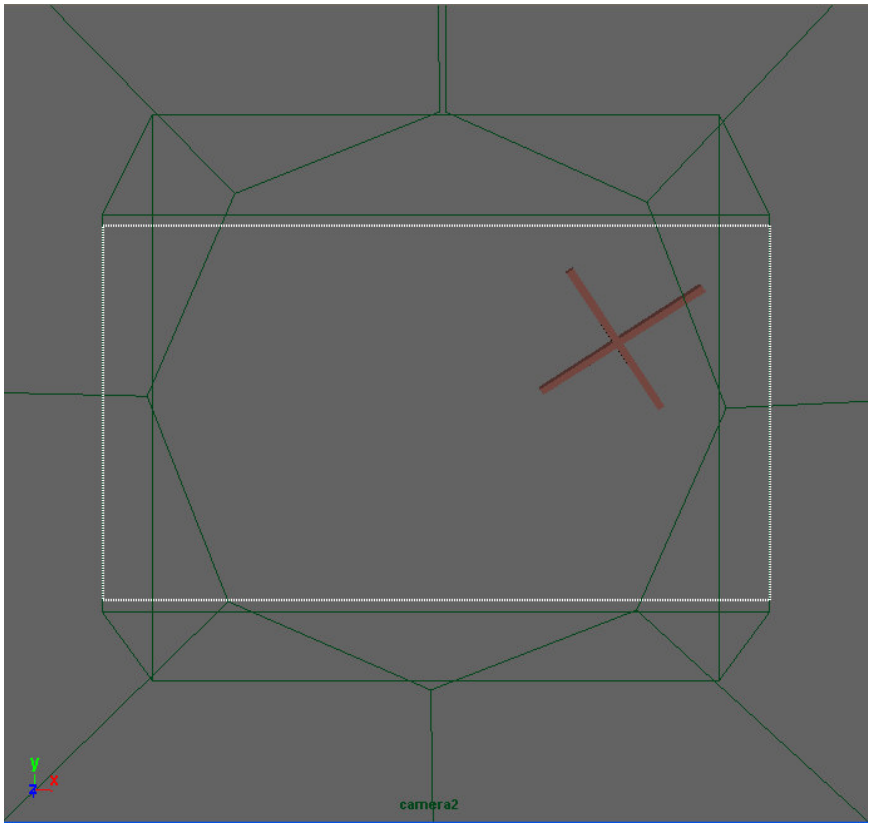
My camera import tool calculates the vertical aperture using the relationship described above. This is why the vertical film aperture of camera2 is 0.797 (1.417/1.778), not the default 0.945. In my opinion this is the correct way to set the vertical aperture. I'd interested to hear arguments why the vertical aperture should remain unchanged. In any event, be aware that the framing of the imported camera will differ from that of the default Maya camera.



Looking through camera1



Looking through camera2



Previous - Exporting a Houdini camera | Top | Home