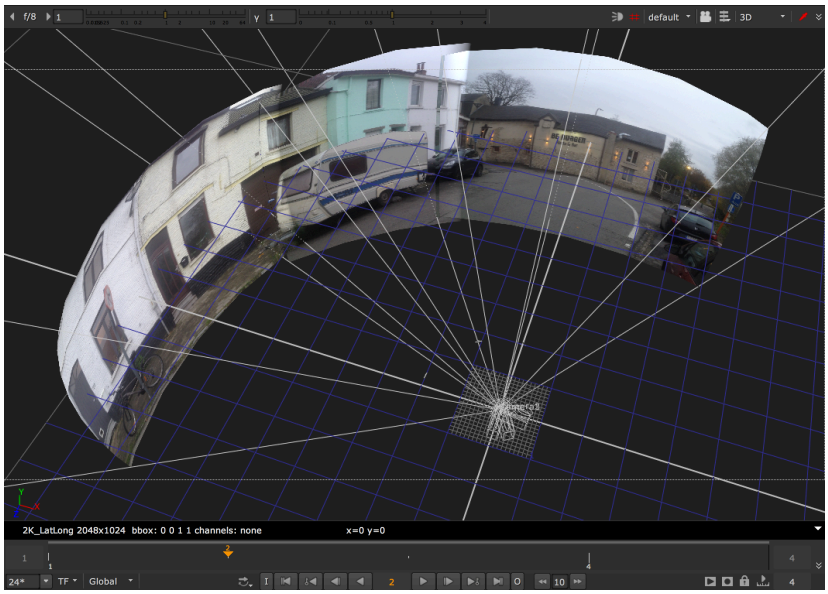
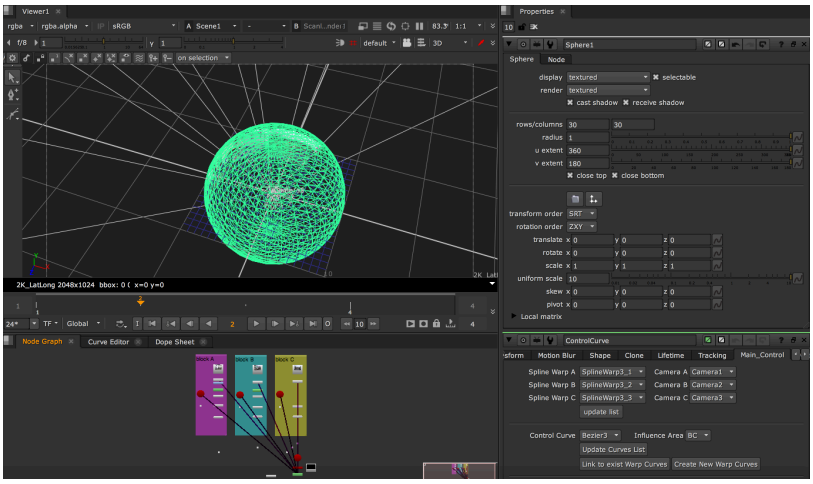
Overview

Stitch_tool is a custom tool inside Nuke, that help seamless stitching images of video from multi-camera rig for projecting its on 3D sphere and using as background. It created used standard Nuke nodes + Python. It use «intellectual» image distortion of camera rig videos with SplineWarp nodes for having perfect stitching. Simple stich with physically correct Nuke camera set up according real rig usually not give perfect result. Images at the stich edges need to be a little distorted to stich become perfect. To do this was created Stitch_tool





This version is first prototype of this tool. Current version have next limitation and condition of its correct working:

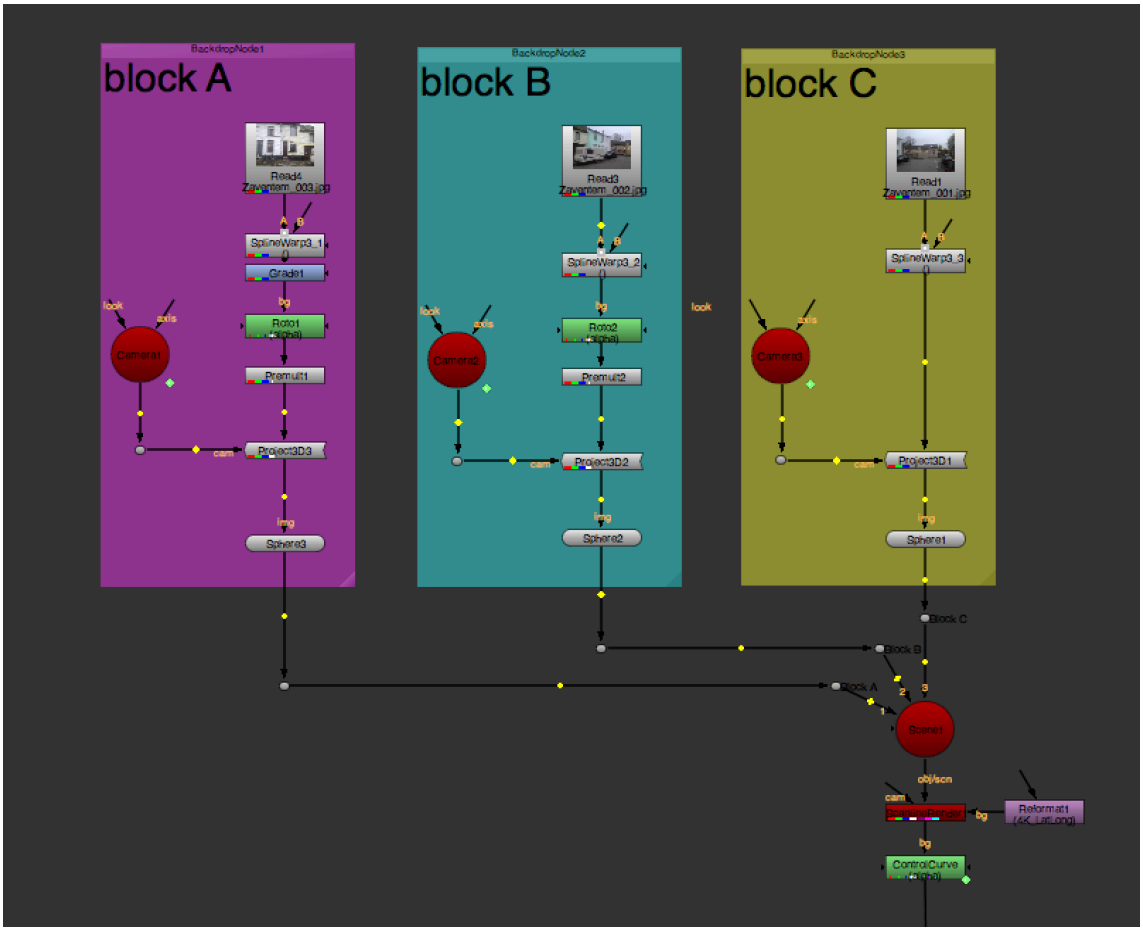
- All cameras and Sphere positions must be set to (0,0,0) – zero point.
- Current version work with 3 camera rig
- As Control and Warp curves must used Bezier curves
- Control curves must match name convention and joined to pairs with Join Tool to all setup work correctly
- Tangent points scale (to correct setup Tangent points) in this release set manually with Tangent scale slider

Usage

Stitch_tool not a single node or gizmo tool. It contain of ControlCurve node which control set of nodes. Set of nodes can be different but must contain with 3 Cameras nodes and 3 SplineWarp nodes – one for each camera . So for correct work of this tool is required initial setup of Nuke project.

1. **Initial setup**

Example of initial setup for one camera - Read node with video from one of three camera connected with Spline Warp node and putted to the Project3D node. It connected with one of three cameras that set same way as real cameras in rig. Project3D node project source image to the 3D Sphere. Each of three sphere projections connected to Scene node. All this rendered with ScanlineRender using spherical projection mode to receive LatLong image as result.
This LatLong image can be used than in script to have spherical background. ControlCurve node must be connected to ScanlineRender output to have possibility create control curves with LatLong image. ControlCurve is a customized Roto node with additional MainControl tab.

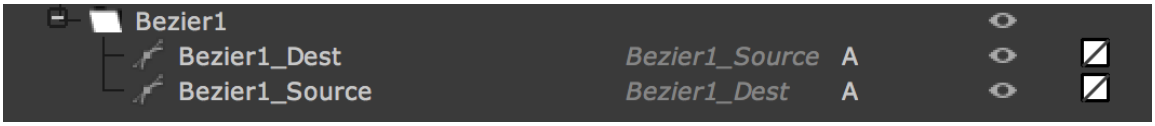


2. **Curves Set Up**

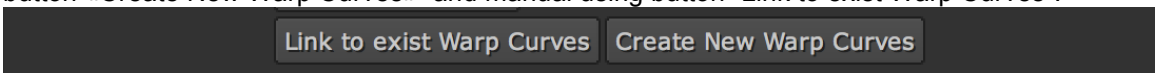
First we need to go to the ControlCurve node and draw Bezier curves at the areas of stich. Basically it a open curve line placed along all stich area. It need to be placed on areas that present in both stitching images to get good result. Second suggestion – place control points at the places of image that can be simply identified on both images.
After you have control Bezier curve we need to set up dependent curves at SplineWarp nodes for stitching images. Each SplineWarp node will need to have 2 dependent curves – source and destination. Source curve will used for control deformation of image. Destination curve is connected by expression to Control curve. And it is a mathematical projection of Control curve that exist in LatLong coordinates of sphere to source image coordinates. Source and Destination

curves need to be connected by Join Tool as source and destination of warp. Warp mode must be set to «Warped A» mode.

For correct working all tool it need to use name convention. For example we create control curve named «Bezier1», and we made it for stitching A and B images. In this case in both SplineWarp nodes, for images A and B will be created new layer named same as control curve «Bezier1» and two curve within it «Bezier1_Source» and «Bezier1_Dest». This is Source and Destination curves.



In current version of Stitch_Tool we have two way make curve setup: – automatical way using button «Create New Warp Curves» and manual using button “Link to exist Warp Curves”.

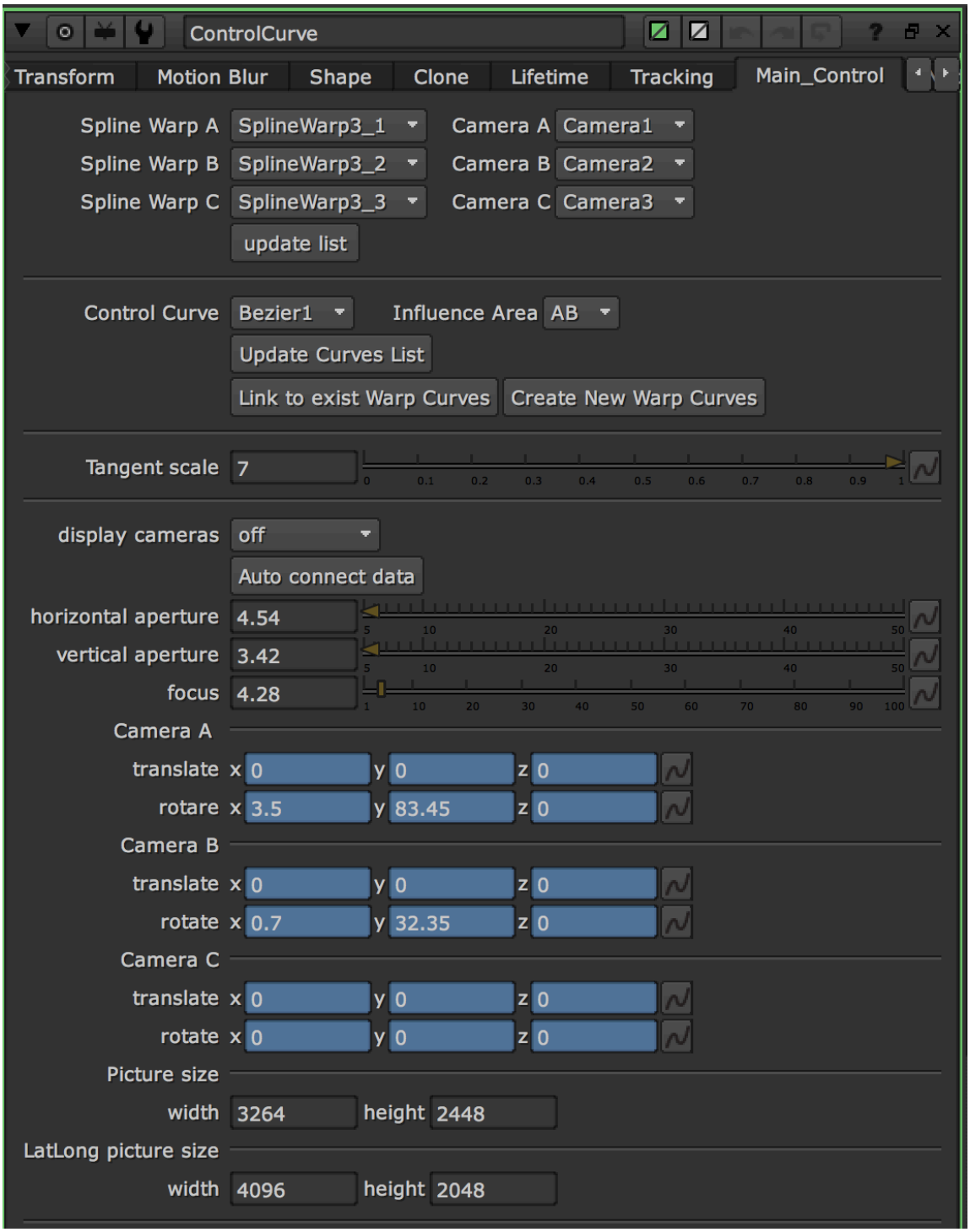


When we press “Link to exist Warp Curves” - script only connect with special expression Control and Destination curves, but they need to be created manually before this.
In automatical way, when we press «Create New Warp Curves» - script create all set of curves automatically. Only two operations need to do after that: make created curves open and correctly join it by Join Tool. These operations are not automated because of limitation Python in Nuke. Probably in next versions way to automate it will be found
Manual connection of curves can be used for experiments and if automatic curve creation will give an error

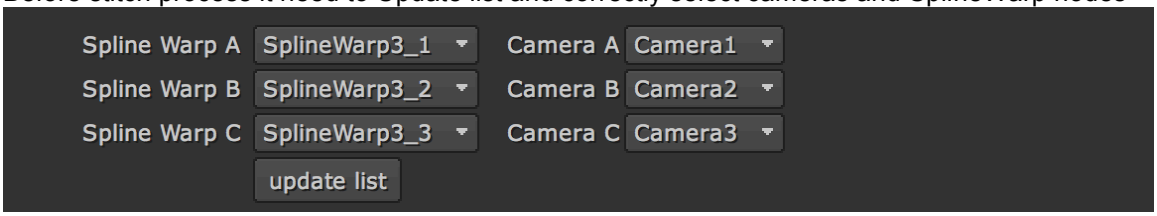
3.Correct distortion

After we set up all required curves, we can move control points of Source nodes to get good stitching with minimal distortion. To do this it better to have two viewer windows. We will move Source curve in SplineWarp node with source image but result will be visible in the viewer with LatLong image. If you satisfy result with corrected A image we will need to do same operation with B image. This correction operation can be iteration process and can be repeated some times if need. After you stitch images with correcting of Source curves you can find that resulting Lat Long image have good stitching, but unfortunately have some distortion in area of Control curve. In this case you can remove distortion by moving control points of Control curve. You do not need to worry about the line of stitching - the stitch will be held automatically.

Stitch Tool Controls
Main set of controls located at Main_Control tab at ControlCurve node.

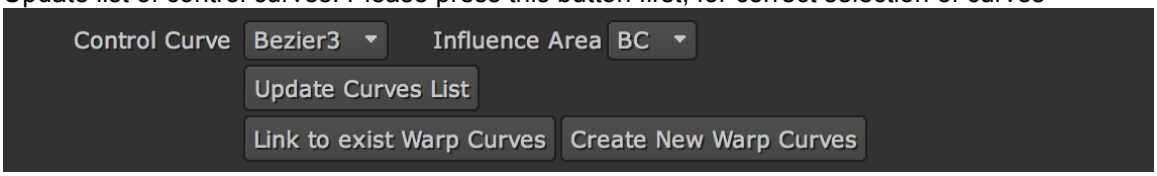


Camera and SplineWarp setup
Before stitch process it need to Update list and correctly select cameras and SplineWarp nodes



Control Curve and Influence area:
Select Bezier control curve in ControlCurve node and what images it used for (A and B or B and C)

Button "Update Curves List":
Update list of control curves. Please press this button first, for correct selection of curves



Button " Link to exist Warp Curves":
Link exist control curve to existing set of Warp Curves. Before press this button you must set next curves:

1) Draw control curve in this node and select correctly from pulldown choice control it name and influence area.

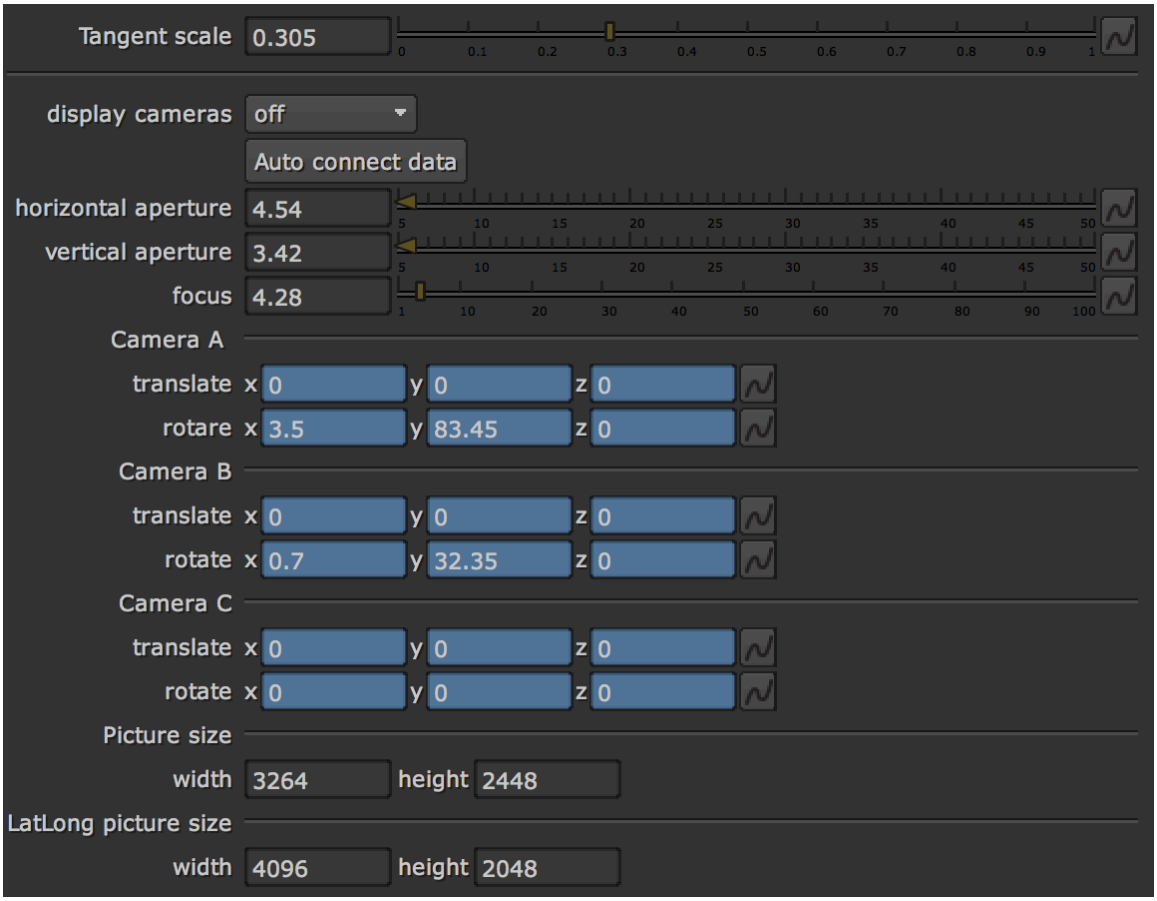
2) You need to draw and correctly name set of curves in appropriate to influence area SplineWarp nodes. If influence area "AB" - you need to set 2 curves in Area A SplineWarp node and 2 curves in Area B SplineWarp node.
To install all the script expressions to SplineWarp correctly, you need to follow the naming convention. In each node you need to create layer named same as control curve. and in this layer create two curves with name starting same way (as control curve) and finishing to "_Source" and "_Dest"
Example: if control curve named "Bezier1", you need to create in both SplineWarp nodes layer named "Bezier1" and two splines in it : "Bezier1_Dest" and "Bezier1_Source"
Also you will need to link this source and destination by Link tool in SplineWarp node

Button "Create New Warp Curves":
This function in Beta version in this release.
Now it work in semi-automated mode. Automatically created required set of curve with correct name convention. And Control curve at LatLong image automatically connected to Destination curve
Manually you need to do two thing
- check if automatically created curves are same open or close as Control curve. Automatically curves created close. In most cases Control curve is open. In current Nuke releases it not possible to correct open/close mode by Python, only manually
- join Source and Destination curves using Join Tool

Tangent scale:
Scale tangents of destination curve

Display Cameras
Turn on and off cameras in 3D view

Button «Auto Connect data»
Fill all data from cameras to knobs below, and connect camera transformation and rotation to transformation and rotation knobs



Video Tutorial

https://www.youtube.com/watch?v=Qypo7GPOU1A