Viewing

3D ANIMATION TOOLS **Houdini** 6 ™

In the Viewer Pane, press Space to temporarily invoke the **View** tool or the Esc key to firmly invoke the **View** tool where Space is not required. The Space is also not required to Zoom and Pan in 2D panes such as the network pane, the compositing viewer pane, or the channel editor.

View Tool Options

Tumble	Space + 🖰
Dolly (camera position)	Space + 🖰
Pan	Space + 🖰
Zoom (window size)	Space + Alt + 🖰
Zoom In (drag to right)	Space + Ctrl + 🖰
Zoom Out (drag to left)	Space + Ctrl + 🖰
Rotate	Space + Ctrl + 🖰

Display Options

Shaded/Wireframe	W
Display Options	Space + D
Ortho/Perspective	Space + O
See One/See All	Space + E
Save View to Camera	Space + V
Select Viewport	Space + X

Snapping

Snap Toggle	Ctrl + J
Snap Options...	Ctrl + K

Viewport Options

Viewport Menu	Space + Ctrl + 🖰
Home	Space + H
Home Selected	Space + Shift + H
Home C-Plane	Space + A
Frame	Space + F
Frame Selected	Space + Shift + F
Frame C-Plane	Space + Shift + A

Viewports   Space + Ctrl + 🖰

Perspective Viewport	Space + 1
Top Viewport	Space + 2
Front Viewport	Space + 3
Side Viewport	Space + 4
UV Editor	Space + 5
Bottom Viewport	
Back Viewport	
Left Viewport	
Single/Quad Toggle	Space + T

Panes

Selector and Handle Controls (See Selection)

Network Controls

Pane Linking
Increment Link — Alt + Shift + =
Decrement Link — Alt + -

Operation Controls Stowbar

Copy Pane — Alt + C
Maximize toggle — Alt + [ ]
Close Pane — Alt + /

Pop-up Menus (Context Sensitive)

Add Operator Menu — Tab ...
Operator Menu — Ctrl + 🖰
Geometry Menu — 🖰 (on geometry)
Handle Menu — 🖰 (on handle)

Choose Renderer/Flipbook

View Controls

Launch Render
Home View
Persp/Ortho
Camera Param
Camera Menu
Lock to View
Viewport Layouts
Shading
C-Plane Toggle
See One/All
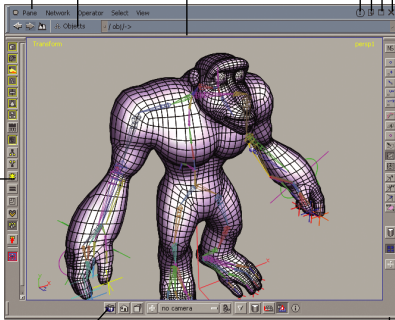
Display Options
Non-Selected
Points
Point Numbers
Point Normals
Point Texture Coordinates
Point Positions
Primitive Hulls
Primitive Numbers
Primitive Breakpoints
Primitive Normals
Profiles
Profile Numbers
Vertex Numbers
Vertex texture Coordinates
Vertex Grips
Vertex Backface Flip

Shading Menu
Apply Operation to All Split Views
Display Options Window...

Memory Controls Stowbar

Pane Layout

Desktops... — Alt + D
Split Left/Right — Alt + [
Split Top/Bottom — Alt +]
Edit Toolbar — Ctrl + T
Move Playbar Here — Alt + P

Stowbars

To reveal and collapse toolbars, click on their corresponding stowbars or toggle them using the **Pane > Toolbars and Controls** menu.
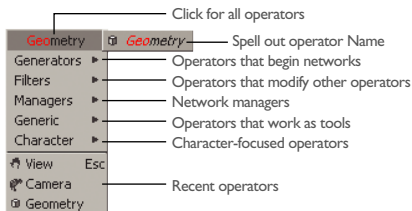
- 🖰- click to reveal toolbar
Transform

- 🖰 - click to hide toolbar
Transform

Operators

Adding an Operator

$\boxed{Tab}$ + $\boxed{G}$ $\boxed{E}$ $\boxed{O}$ ... + $\boxed{\mathbb{P}}$

Spell out operator name or select operator from sub-menus

- Click for all operators
- Spell out operator Name
- **Generators** — Operators that begin networks
- **Filters** — Operators that modify other operators
- **Managers** — Network managers
- **Generic** — Operators that work as tools
- **Character** — Character-focused operators
- View   Esc
- Camera
- Geometry — Recent operators

Viewer Pane - When adding Operators in the viewer pane, read the help prompt, follow instructions then $\mathbb{P}$ to complete.
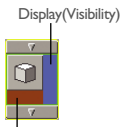
Network Pane - When adding Operators in the network pane, $\mathbb{P}$ to place operator then set appropriate display flags.
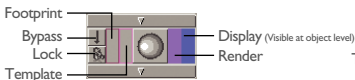
Operator Options

Connect Input	$\mathbb{P}$ + click...
Get Input Type	$\mathbb{P}$ + click...
Add Operator	$\mathbb{P}$ + click...
Get Information	$\mathbb{P}$ + click...
Operator Menu	$\mathbb{P}$ + click...
Add Operator	$\mathbb{P}$ + click...
Insert Operator	$\mathbb{P}$ + click...

A selected operator is highlighted in yellow

A current operator is highlighted in light green
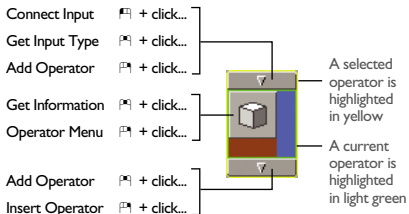
Edit Current Operation (Use hotkey in Viewer Pane)	$\boxed{Enter}$
Start Favourite Operation (Use hotkey in Viewer Pane)	$\boxed{S}$
Parameter Window	$\boxed{P}$
Find Operator...	$\boxed{Alt}$ + $\boxed{F}$
Rename Selected nodes...	$\boxed{Alt}$ + $\boxed{W}$

Operator Flags

Display(Visibility)

Selectable

Object Operator (OBJ)

Footprint
Bypass
Lock
Template
Display (Visible at object level)
Render

Geometry Operator (SOP)

Bypass
Template
Display
Cook

Particle Operator (POP)

Template
Push to Cache
Bypass
Render
Display
$\mathbb{P}$ > **Thumbnail** to create
Icon Plane Selector
Toggle Icon Preview
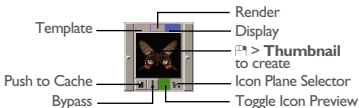
Compositing Operator (COP)

Bypass
Lock
Audio
Graph
Export
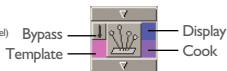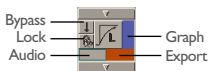
Channel Operator (CHOP)

Networks

Jump Back Alt + ←
Jump Forward Alt + →
Bookmark Menu
Add Bookmark Alt + $Shift$ + K
Edit Bookmarks... Alt + B

Network Menu
Current Network Path

Pick List
Operator Info
Operator Menu

/ obj / model / skin
curve1
curve2
merge
skin

SOPs
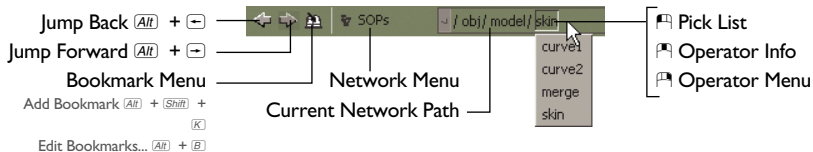
Network Display D

Worksheet mode	T
Group List	X
Link Style	S
Operator Names	N
Color Palette	C
Network Overview	O
Layout All	L
Layout Selected	$Shift$ + L
Previous Zoom	B

Connect
on input, then
on output

Disconnect
on input, then
in open space

curve1   curve2

merge

Collapse
Selected
into Subnet
$Shift$ + C

Connection Menu
Operator Menu

input_curves

skin

> Hide Inputs

skin2

skin1
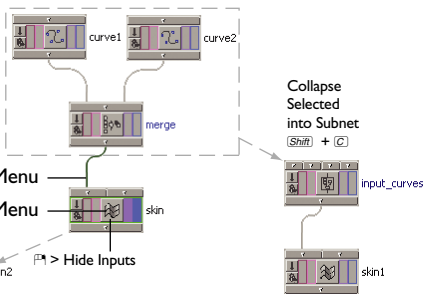
Network Operators $Ctrl$ +

Cut, Copy, Paste	$Ctrl$ + X, C, V
Delete	Del
Select All	A
Expose All	$Shift$ + E
Hide Selected	$Shift$ + D
Add Group	$Shift$ + G

Network Navigation $Ctrl$ +

Move to Parent Operation	$PgUp$
Move to Child Operation	$PgDn$
Move to Left Sibling	$Shift$ + $PgUp$
Move to Right Sibling	$Shift$ + $PgDn$
Move to First Operation	$Home$
Move to Last Operation	End

Handles

All Handles

- ⌐ Manipulate handle
- ⌐ Ladder handle
- ⌐ Handle option menu
- K Set keyframe on all handle parameters
- V Scope append channels
- Enter Show operator-specific handles
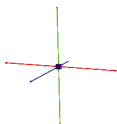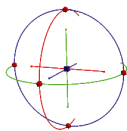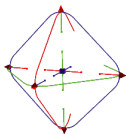
Peak Handle

With the Edit SOP's transform handle, press Y to toggle the Peak handle and move along normal

Transform Handles

T Translate

R Rotate handle

E Scale handle
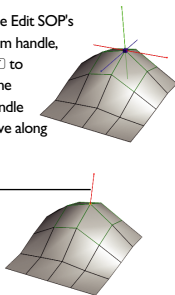
Set Pivot/ Detach Handle

- Ins Permanently edit object's pivot
- ⌐ Temporarily Detach handle

1. Ins /⌐ Toggle pivot/Detach
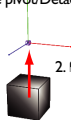
2. ⌐ Drag Handle
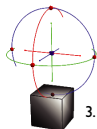
3. Ins /⌐ Toggle Pivot/Attach

Pose Handles

⌐ > **Show Blend Handle** for FK/IK Blend Handle
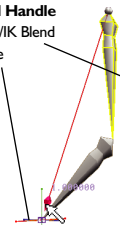
T Translate Mode
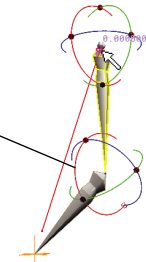
R Rotate Mode

Parameters

Option menu

Click-drag to Viewer pane to create HUD sliders.

Alt + Set Keyframe

Ctrl + Remove Keyframe

Shift + Scope Append

Shift + Scope Channels

Geometry   geo1

| Transform | Shading | Render | Physical | Misc |

Keep position when parenting   Pre-transform

Transform Order   Scale Rot Trans   Rx Ry Rz

Translate	-1.27043	0.372115	0
Rotate	0	0	-84.9783
Scale	1	1	1
Pivot	0	0	0
Uniform Scale	1		

No Channel
Channel
Keyframe
Pending Keyframe

on field to bring up the Ladder handle. Drag up/down to choose increment, then drag left/right to edit value.

| 10 |
| 1 4 |
| 4 |
| .1 |
| .01 |
| .001 |

Selection Masks

Objects

|		
	Select Geometry Objects	*1*
	Select Camera Objects	*2*
	Select Light Objects	*3*
	Select Bone Objects	*4*
	Select Null Objects	*5*
	Select Blend Objects	*6*
	Select Other Object Types	*7*
	Select All Object Types	*8*
	Select Entire Subnet	*-*
	Select Child Objects	*9*
	Select Parent Objects	*0*
	Select All Objects of Type	*A*

Geometry

	Select Points	*1*
	Select Vertices	
	Select Edges	*2*
	Select Breakpoints	*3*
	Select Primitives	*4*
	Select Point Groups	*5*
	Select Primitive Groups	*6*
	Select Connected Primitives	*7*
	Select Connected Points	*8*
	Select Connected Vertices	
	Select Connected Edges	*9*
	Select Connected Breakpoints	*0*
	Select Whole Geometry	*-*

General

	Secure Selection	*=*
	Re-select for Operator	*□*

• Secure selection locks you to your selection until you use Re-select. Turn off secure selection to make it faster to re-select.

| | Replace *Shift* + to Add |
| | Toggle Box/Lasso/Brush Picking |

| | Locate Selectable Items |

| | Select Front/Back Polygons | *B* |

Channels

Graph Editor ①

Graph Option menu   `Ctrl` 🏳
Create key	`Alt` + 🏳
Home Current	`G`
Home All	`H`
Frame Selected	`F`
Create Time Group	`Q`
Attach/Detach Time Group	`A`
Scope Time Group	`S`
Tie/Untie Selection	`T`
Add Keys at Current Time	`K`
Set Selected Slopes to Zero	`0`
Smooth Selected Slopes	`9`
Vertical Adapt	`V`
Scale Handle	`Y`
Long Channel Names	`N`

Channel Option menu   `Ctrl` 🏳
Show/ Add Channel Lister	`Tab`
Add Group	`Shift` + `G`
Show Only Scoped Channels	`B`

Full Channel Names	`N`
Open Group List	`X`
Open Parameter Chooser	`Z`
Open Channel Chooser	`Q`

Table View ②

Add Keys	`K`
Delete Keys	`Del`
Copy	`Ctrl` + `C`
Paste	`Ctrl` + `V`
Full Channel Names	`N`
Scope Time Group	`S`

Dope Sheet ③

Stretch/Paste	`Z`		Enable Keys	`E`
Replace	`R`		Snap Selection to Keys	`S`
Visual Paste	`Shift` + `V`		Select Columns	`A`
Visual Stretch/Paste	`Shift` + `Z`		Select Rows	`A`
Visual Replace	`Shift` + `R`		Toggle Handle	`Y`
Collapse to Groups	`C`		Home Selection	`G`
Expand Groups	`X`		Home All	`H`
Disable Keys	`D`			

Houdini Tools and Techniques

Tools and Operators

Houdini tools are defined by their operators. There are hundreds of operators available throughout Houdini that can be used when you are in the proper context. Each of Houdini's network types defines the context where tools and operators can be used.

The following tables offer a mapping of typical computer graphics techniques and the appropriate Houdini tool. The network type is labeled for each tool to help you find its proper context. Use the `Tab` key to get the tool then use the Status bar at the bottom of the desktop for the tool prompts.

Network Types

Objects	OBJ
Geometry	SOP
Particles	POP
Shaders	SHOP
VEX Builder	VOP
Motion and Audio	CHOP
Compositing	COP
Outputs	ROP

Working with Objects

Technique	Tool	Type	Technique	Tool	Type
Positioning Objects			**Creating Objects**		
Move, rotate, and scale `S`	Transform	OBJ	Model object	Geometry	OBJ
Getting object handles	Objects	OBJ	Kinematic Bones	Bones	OBJ
Parenting objects	Parent	OBJ	Null	Null	OBJ
Blend parents	Blend	OBJ	Lighting	Light	OBJ
				Ambient Light	OBJ
Viewing Objects			Camera	Camera	OBJ
Tumble, dolly, and pan `Space`	View	OBJ	Camera Cuts	Switcher	OBJ
Test render in viewport	Render	OBJ	**Modifying Objects**		
Organizing Objects/Operators			Mirroring Objects	Mirror	OBJ
Object subnetwork	SubNetwork	Various	Duplicating Objects	Copy	OBJ
New network managers	Managers...	Various	Bring object into another model	Object Merge	SOP

Modeling

Technique	Tool	Type
Creating Geometry		
Import geometry	File	SOP
Create a primitive cube	Box	SOP
Create a primitive sphere	Sphere	SOP
Create a primitive cylinder	Tube	SOP
Create a primitive cone	Tube (Top Radius - 0)	SOP
Create a primitive plane	Grid	SOP
Metaballs	Metaball/Merge	SOP
Draw curves	Curve	SOP
Reverse curve direction	Reverse	SOP
Create 2D text curves	Font	SOP
Modify Geometry		
Move, scale and rotate	Transform	SOP
Copy geometry	Copy/Duplicate	SOP
Mirror geometry	Mirror	SOP
Merge geometry	Merge	SOP
Project surface onto another	Ray/Project	SOP
Edit points	Edit	SOP
Use Brush to edit point data	Sculpt/Paint/Comb	SOP
Randomly deform points	Fractal	SOP
Smooth geometry	Smooth/Divide	SOP
Surface Modeling		
Loft curves	Skin	SOP
Multi/birail	Rail/Skin	SOP
Lathe/Revolve	Revolve	SOP
Create curve on surface	Project	SOP
Trim surfaces	Trim	SOP
Create edge fillets	Fillet/Bridge	SOP

Technique	Tool	Type
Polygon Modeling		
Extrude faces	Poly Extrude	SOP
Split faces	Poly Split	SOP
Create closed polygons	Poly Cap	SOP
Boolean	Cookie	SOP
Consolidate polygon points	Fuse	SOP
Mirror and consolidate points	Mirror	SOP
Cut polygons with infinite plane	Clip	SOP
Compute normals	Facet	SOP
Cusp Polygons	Facet/Edge Cusp	SOP
Remove a face, edge or point	Blast	SOP
Remove and repair hole	Dissolve	SOP
Connect polygons	Poly Knit/Poly Stitch	SOP
Connect points of open faces	Poly Loft	SOP
Reduce number of polygons	Poly Reduce	SOP
Collapse edge or primitive	Edge Collapse	SOP
Flip edges of polygon	Edge Flip	SOP
Add polygons and points	Add/Curve	SOP
Subdivision Surface Modeling		
Subdivide polygon geometry	Subdivide	SOP
Add creases	Crease	SOP
Deformations		
Blend shapes	Blend	SOP
Lattice deformations	Lattice	SOP
Bend, Twist, Shear, Taper	Twist	SOP
Squash and stretch	Twist	SOP
Define capture weights	Capture	SOP
Deform capture points	Deform	SOP

Animation

Technique	Tool	Type
Path Animation	Follow Path	OBJ
	Curve/Resample	SOP
Aim at another object	Look At	OBJ
Channel Operations		
Get channels for editing	Fetch	CHOP
Blend animated channels	Blend	CHOP
Create follow through	Lag	CHOP
Add randomness	Noise	CHOP
Stretch a channel	Stretch	CHOP
Define an event	Trigger	CHOP

Characters

Technique	Tool	Type
Kinematics		
Draw skeleton bones	Bones	OBJ
Create kinematics (IK, Spline IK...)	Bones	OBJ
Mirror kinematics	Mirror	OBJ
Pose a skeleton	Pose	OBJ
Move an end affector	Pose/Transform	OBJ
Animated parenting	Dynamic Parent	OBJ
Character Deformations		
Bind Skin	Capture Geometry	OBJ
Weight Capture points	Edit Capture Region	OBJ
	Edit Capture Weight	OBJ
	Paint Capture Weight	OBJ
Mirror Capture Weights	Mirror Capture Weights	OBJ
Muscle-style deformations	Inflate/Bulge/Magnet	SOP
Facial Blending	Blend	SOP

Shading

Technique	Tool	Type
Applying Shaders		
Assign to object	Geometry (Shading tab)	OBJ
Assign to geometry	Shader	SOP
Shaders		
Mantra shaders	VEX...	SHOP
RenderMan shaders	Rman....	SHOP
Plastic shader	VEX Plastic	SHOP
Layered shader	VEX Layered	SHOP
Create a shadow matte	Shadow Matte	SHOP
Building Shaders		
Define a lighting model	Lighting Model	VOP
Create a Skin lighting model	Skin	VOP
Add a texture map	Texture	VOP
Add a bump map	Bump Map	VOP
Blend colors	Color Mix	VOP
Multiply colors	Multiply	VOP
Invert colors	Invert	VOP
Compute luminance	Luminance	VOP
Setting UV's on Geometry		
Put UVs onto geometry	UV Project	SOP
	UV Texture	SOP
	UV Unwrap	SOP
Set UV Layer	Layer	SOP
Editing UVs in UV Editor	UV Edit	SOP
	UV Fuse	SOP
Setting UV's on Shader		
Define a shading layer	Shading Layer Parm	VOP
Define a rest position	Rest Position	VOP

Rendering

Technique	Tool	Type
Render to Mantra	Mantra	ROP
Render to RenderMan	RenderMan (If available)	ROP
	Alfred (If available)	ROP
Render a composite	Composite	ROP
Hidden line/ UV Map	Wren 1.0	ROP
Test Render in Viewport	Render	Various

Compositing

Technique	Tool	Type
Creating Sequences		
Import a shot	File	COP
Create a ramp	Ramp	COP
Create text	Font	COP
Create a rotospline	Rotospline	COP
Create a 3:2 pulldown	Pulldown	COP
Combining Sequences		
Layering multiple sequences	Layer	COP
Blend sequences	Blend	COP
Composite Effects		
Set brightness and contrast	Bright/Contrast	COP
Set hue and saturation	HSV	COP
Blur sequence	Blur	COP
Luminance keying	Lumakey	COP
Depth Effects		
Redefine scene lighting	Lighting	COP
Simulate depth of field	Depth of Field	COP
Simulate fog	Grid	COP

Particle Effects

Technique	Tool	Type
Particle Emission		
Create simple particle system	Particle	SOP
Birth particles from point	Location	POP
Birth particles from geometry	Source	POP
Split particles	Split/Collision	POP
Set the particles age	Age	POP
Rotate particles to point	Look At	POP
Follow a leader	Follow	POP
Particle instancing	Instance	POP
Forces		
Object-level force	Force	OBJ
Global directional force (gravity)	Force	POP
Cone shaped fan	Fan	POP
Wind with turbulence	Wind	POP
Rotational force	Torque	POP
Force particles to orbit point	Orbit	POP
Set air/water resistance	Resistance/Drag	POP
Force field attractor	Metaball	SOP
Particle Behaviors		
Particle collisions and sliding	Collision	POP
Attract particles	Attractor	POP
Kill particles based on rules	Kill	POP
Set inter-particle forces	Interact	POP
Set a boundary for particles	Limit/Soft Limit	POP
Define a Particle event	Event	POP
Other		
Change render characteristics	Render	POP
Soft Body dynamics	Softbody	POP

Learning

To learn Houdini, you have access to a wealth of knowledge. This material is always being updated and you can visit *www.sidefx.com* to find out about new learning material and updated versions of Apprentice.

Help Browser

Click on the **?** in the upper right of the desktop to open an embedded browser that gives you access to the user guide and help. The user guide will get you started with Houdini, while the help will provide details.

Houdini Community

Select **Go > External Links > Houdini Community** in the Help browser, or go to *www.sidefx.com/community*. Here you will find new versions of Apprentice and new learning materials. The **Video Tutorial** site is a particularly rich resource of Houdini learning that contains videos and support files.

Houdini Forums

Select **Go > External Links > Houdini Forum** to access the Houdini forum from the Help Browser or go to *www.sidefx.com/forum*. Here you will be able to learn about Houdini, post questions and participate in the larger Houdini community.