Draw Reduce Tool

This tool reduces a polygonal mesh by simply drawing over its edges. This tool merely combines 4 existing methods of reducing mesh topology in Maya, wrapped into a single, more intuitive interface. However, there are also some additional, little advantages this tool has to offer, providing more control in "collapse edge" and "merge vertex" operations, with the advantages being that collapsing/merging operations are controlled by the "drawn stroke" itself. The edges that the drawn stroke crosses over the mesh may have one of the following reduction operations done to them: "Edit Polygon->Collapse Edge", "Edit Polygons->Merge Vertices" (i.e. the "endpoint verts" of the drawn-over edges), "edge deletion" or "Edit Polygons->Delete Edge", and "vertex deletion" or "Edit Polygons->Delete Vertex" (i.e. the "endpoint verts" of the drawn-over edges). Click on the tool's shelf button or Sacred Tool icon to invoke the tool, hit <ENTER> or simply switch to another tool to exit. Drawing with the LMB vs. the MMB varies the behaviour of the tool, and modifier keys (i.e. <SHIFT> <CONTROL>) pressed while drawing the stroke enables other tool features as well.

QUICKY GUIDE:
Since it seems that all the reduction-mode/mouse-button/modifier combinations may be a little somewhat daunting to remember, these two little tables will summarize the tool's functions, hopefully making things clearer and easier to remember:

Table #1: "Reduction Type" = "Collapse E./Merge V."

Mouse Button/Control Held?	Left Mouse Button	Middle Mouse Button
NO, CTRL RELEASED	"Collapse Edge" on all edges drawn over, WITHOUT any "edge-snapping".	"Merge Vertex" on ALL endpoint vertices of any edges that are drawn over.
YES, CTRL PRESSED	"Collapse Edge" all edges drawn over, WITH "edge-	"Merge Vertex" ONLY *ONE* VERTEX PER

	snapping".	EDGE on any edges that are drawn over.

Table #2: "Reduction Type" = "Delete Edges/Verts":

Mouse Button/Control Held?	Left Mouse Button	Middle Mouse Button
NO, CTRL RELEASED	Delete all edges drawn over. Equivalent to selecting those edges and hitting <Delete>.	"Extended" delete on all edges drawn over. Equivalent to selecting those edges and doing an "Edit Polygons->Delete Edge".
YES, CTRL PRESSED	Delete *ONE* VERTEX PER EDGE on any edges that are drawn over (the vert closer to draw stroke).	"Extended" delete on *ONE* VERTEX PER EDGE on any edges that are drawn over. Equivalent to "Edit Polygons->Delete Vertex" (vert closest to stroke).

CONTROLS:

The tool's features can be explained as its controls are being described here.

Left-mouse button (LMB) vs Middle-mouse button (MMB):

This tool is broken up into TWO modes ("Collapse E./Merge V." and "Delete Edges/Verts"):

Within the first mode ("Collapse E./Merge V."), ending the draw stroke with the LMB shall "collapse" edges drawn over, where using the MMB "merges" the "endpoint vertices" of edges drawn over.

Within the second mode ("Delete Edges/Verts"), ending the draw stroke with the LMB shall do a "normal delete" on the edges or

verts (if <CONTROL> also held) that are drawn over (equivalent of selecting those edges/verts and hitting <Delete/Backspace>. Note that you can only delete "winged vertices" with the LMB. Using the MMB does an "extended delete" (equivalent of doing "Edit Polygons->Delete Edge" or "Edit Polygons->Delete Vertex"). What's the difference, you ask? Well, for "edges" doing an extended delete will first delete the edge itself, but in addition, will remove the edges' "endpoint verts" as well if they are "winged-vertices". For "vertices", doing an extended delete will delete the vertices themselves, plus any "edges connected" to them.

PRESSING <ENTER>:
Exits the Draw Reduce Tool, and returns to the regular "Select Tool".

<BACKSPACE> OR <DELETE> KEYS:
Abort the current drawn stroke (especially in "line mode"), without completing reduction.

POINT-CLICKS:
Quickly pressing and releasing a mouse button WITHOUT DRAGGING invokes a few extra tool features:

·Point-clicking WITHOUT holding any modifiers will select another mesh for the tool to operate on. Doing this on "empty space" simply deselects the current selected poly mesh (i.e select "nothing").
·Point-clicking while holding <CONTROL>, and using the LMB will toggle ON/OFF "backface-culling" for the current

selected poly mesh. With backface-culling ON, only ONE side of the selected poly mesh shall be reduced at a time, where having it OFF reduces ALL sides at once.

·Point-clicking while holding <CONTROL>, and using the MMB will toggle ON/OFF "vertex display" on the current selected poly mesh. It is a good idea to have the vertices of a mesh displayed while reducing, especially when it is essential to distinguish "winged-vertices" and their connected edges.

MARQUEE-SELECTING:
With "nothing" selected, this tool operates like the regular Maya (Marquee) Selection Tool, but only "poly meshes" can be selected (i.e. simply mouse-button press and drag a selection box around the mesh that you wish to reduce).

PRESSING MOUSE-BUTTON:
Starts the draw stroke or selection marquee.

DRAGGING:
Dragging the mouse while holding down a mouse-button simply draws the stroke used for reducing the selected mesh. However, in "line mode" (see below), dragging will also interactively "place" the endpoint of the most recent "line segment" on the stroke, which would be "floating around" until you release the mouse button, which finalizes the line segment.

RELEASING MOUSE BUTTON:
Ends the draw stroke - clears it from view, then computes and does the reduction. Also, if <SHIFT> is held down, "line mode" is invoked each time a mouse button is released.

<SHIFT> MODIFIER:
As mentioned right above, holding down

<SHIFT> and releasing a mouse button will invoke "line mode". "Line mode" puts the tool into a state that allows you to append "straight line segments" to the draw stroke. "Multiple" line segments in the same stroke is possible (simply keep <SHIFT> held down throughout). Note that after you release the mouse button while holding <SHIFT>, you are merely letting the tool know that you are in "line mode" (and note how the stroke does not yet end and the reduction is not yet computed). In order to actually "drag out a segment", you must KEEP ON HOLDING <SHIFT> while dragging. If you do not, then line mode ceases, and the stroke draws normally again. This is how you can move in and out of line mode within the same stroke. The line can only be seen with the LMB or MMB *PRESSED*. In other words, ALWAYS HOLD DOWN A MOUSE BUTTON WHILE DRAGGING OUT A LINE SEGMENT!

<CONTROL> MODIFIER:
This modifier key does FIVE things for this tool, depending on which reduction type is being used:

- If "collapsing edges" (i.e. "Reduction Type" = "Collapse E./Merge V." and you use the LMB to end your stroke), then holding <CONTROL> while DRAGGING the mouse enables "edge-snapping" for only the edges drawn over when <CONTROL> was held. Any edges drawn over with <CONTROL> held shall be collapsed AT PRECISE DISTANCES along them (see "Edge-Snapping" options below for more details).
- If "merging vertices" (i.e. "Reduction Type" = "Collapse E./Merge V." and you use the MMB to end your stroke), then holding <CONTROL> while DRAGGING the mouse will include ONLY *ONE* of the edge's endpoint vertices in the merge operation for only

the edges drawn over when <CONTROL> was held. The vertex that is chosen within each edge is the one that's *CLOSEST* to the crossing point where the drawn stroke crossed over the edge.

If doing "normal deletion" (i.e. "Reduction Type" = "Delete Edges/Verts" and you use the LMB to end your stroke), then holding <CONTROL> while DRAGGING the mouse will choose ONLY *ONE* of the edge's endpoint vertices to delete, in ALL edges drawn over. The vertex that is chosen within each edge is the one that's *CLOSEST* to the crossing point where the drawn stroke crossed over the edge.

Does exactly the same as 3), but for "EXTENDED deletion". To be precise and long-winded: If doing "EXTENDED deletion" (i.e. "Reduction Type" = "Delete Edges/Verts" and you use the MMB to end your stroke), then holding <CONTROL> while DRAGGING the mouse will choose ONLY *ONE* of the edge's endpoint vertices to do an *extended* delete on, in ALL edges drawn over. The vertex that is chosen within each edge is the one that's *CLOSEST* to the crossing point where the drawn stroke crossed over the edge.

See above to see how <CONTROL> affects "point-clicks".

Hold down BOTH <SHIFT> *AND* <CONTROL> together to SIMULTANEOUSLY have both "line mode" AND any one of the effects that holding <CONTROL> provides (see previous section).

Holding down BOTH LMB *AND* MMB simultaneously only serves a minor purpose, and that is to complete the stroke while still in "line mode" WITHOUT HAVING TO RELEASE <SHIFT>. For instance, say you're holding down <SHIFT> and dragging around to place the stroke's end line segment on your

draw stroke. Normally, in order to complete the stroke (and hence compute the crossed), one would FIRST "release <SHIFT>", THEN release the mouse button. But this tool has been designed so that you can complete the tool by holding down the *OTHER* mouse button, and releasing the "original" mouse button to end the stroke while in line mode. Just a minor little tidbit of a feature. Some also find this little mouse manoever somewhat "therapeutic" in an odd little way.

TOOL OPTIONS:

Min Draw Sample Size: This tool's algorithm works by sampling the mesh with "selection voxels", or little boxes that are created as you draw. This setting sets the smallest possible size of these voxels. It is suggested that you play around with different sizes to see which one works best for you. Default is set at "25" pixels. Larger sample sizes give a better chance of successful reduction, but leave "clunkier/segmented" draw strokes. Try NOT to set this to be TOO SMALL (e.g. 2, etc...), but it may be necessary, especially when reducing really tight/convoluted areas in a mesh.

Reduction Type: There are two modes of reduction:

Choosing "Collapse E./Merge V." will either use the drawn stroke to "collapse" all "edges" drawn over (using LMB to draw), or "merge" together the endpoint "vertices" of the drawn over edges into one vertex (using MMB to draw).
Choosing "Delete Edges/Verts" will either use the drawn stroke to do a "normal deletion" of the edges/verts drawn over (using LMB to draw), or do an

"extended deletion" of the edge/verts drawn over (using MMB to draw).

Merge Vertices At: For the "Merge V." operation (i.e. "Reduction Type" = "Collapse E./Merge V." and using MMB to draw), there are two ways the merged vertices may end up:

Choosing "End Of Stroke" which is the default, means that the drawn over edge-verts shall be collapsed to the point on the mesh where the draw stroke ends. If your drawn stroke does NOT end on a mesh, the verts will automatically be collapsed at their "centroid" (see next option).
Choosing "Centroid" means that the drawn over edge-verts shall be collapsed at the "averaged center" of all of those vertices.

Edge-Snapping When: This indicates when the user can have (or NOT have) edge-snapping enabled for collapsing edges, or similar "endpoint-related" variances of the tool when <CONTROL> is held. Three choices:

Choosing "Never" means edge-snapping will NEVER be enabled.
Choosing "CTL+Drag" means edge-snapping will be enabled ONLY when <CONTROL> is pressed while the mouse is being dragged. This means you will be able to edge-snap "some" drawn-over edges, and not others in the SAME stroke, depending on when <CONTROL> is held or not.
Choosing "Always" means edge-snapping will ALWAYS be enabled, regardless of whether <CONTROL> is held down, or not.

Edge-Snapping Type: There are TWO kinds "edge-snapping" for collapsing edges:

The first kind of edge-snapping is by "Closest Endpoint", which snaps the collapsing edge endpoint verts along the drawn over edges by a "fixed distance" that is measured from the *CLOSEST VERTEX* ON THE EDGE FROM WHERE THE DRAWN STROKE CROSSED THE EDGE.
The second is by "Edge Intervals", which breaks each edge drawn over by the draw stroke, into an integer number of evenly spaced "intervals". The collapsing point will snap to the *END OF AN INTERVAL* WHOSE END IS CLOSEST TO WHERE THE DRAWN STROKE CROSSED THE EDGE.

Snapping Endpoint Offset: Applies only for "Closest Endpoint" edge-snapping. It specifies the "distance from the closest vertex to snap to" that the collapsing point should be offset from, on each edge drawn over. For instance, a value of 0.5 means that the two endpoint vertices of the collapsed edge will meet exactly in the "middle" of that edge, after it has been collapsed. Values range from 0.0 to 1.0.

Number Of Snap Intervals: Applies only for "Edge Intervals" edge-snapping. It specifies the "number of imaginary intervals to divide up an edge" for snapping. For instance, if you set it to "3", your edges' collapsing points will snap to 0, 0.333, 0.666 and 1.0. For "10", it would be 0.0, 0.1, 0.2, ... , 1.0, and so forth.

Auto Backface Culling: If checked ON, this Will always automatically turn ON "backface-culling" on ALL poly meshes in the scene when this tool is invoked, and will also automatically turn it OFF when exiting the tool. You'd want to keep it "ON", which is the default if you're going to do your reductions

"ONE side at a time".

TIPS:

- Keep your eyes on the Maya Command-Line to get feedback while using this tool, such as "backface-culling" status, etc...
- Smaller sample sizes are less precise, but keeps the draw stroke smoother - this increases the chances of the reductionfailing. Larger sample sizes (also equivalent to drawing faster) decreases the chances of failure but leaves "clunky" drawn strokes.
- If you're "collapsing edges", setting "Snapping Endpoint Offset" to EXACTLY 0.0 or 1.0 will make one vertex COLLAPSE ONTO THE OTHER *WITHOUT* MOVING THE FIRST VERTEX, for each edge drawn over.

To use, Bonus Tools->Draw Reduce Tool.