

Mesh Normals / Smoothing

Normals are unit 3d vectors(xyz) used in back-face culling, lighting and other calculations. Smooth and sharp edges deal with normals used in lighting calculations.

First must be explained how generally normals are assigned to each polygon vertex. Two methods are explained:

A)'explicit normal' assignment where a normal is explicitly assigned to each vertex - one normal per vertex:

For smooth surfaces this provides good results. However, all creases and sharp corners disappear.

The reason for this is that creases and sharp corners require two or more distinct normals at each vertex, but only a single normal is assigned per vertex.

B) smoothing groups(allows you to have smooth areas and sharp edges altogether).

If two or more polygons share a single vertex, and each polygon requires a different vertex normal, then the concept of 'smoothing groups' is used to allow different normals to be assigned to a single vertex.

(for example, the corner of a square box which requires 3 different vertex normals, all at 90 degrees from each other).

Rather than explicitly assign the different normals to the vertex, one or more smoothing groups are assigned to the vertex.

Thus, the original vertex normal(s) are lost (thrown away) and replaced with some numbers representing the assigned smoothing groups.

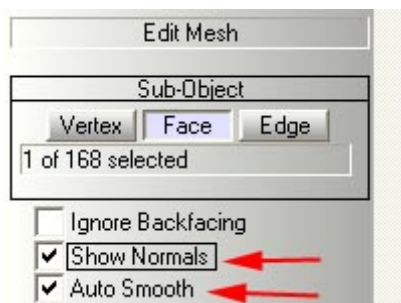
At a later stage, during a rendering process, the smoothing groups will be used to recompute the one or more normals assigned to a single vertex.

In this manner 3 different normals can be assigned to the corner of a box, for example.

LR3D supports smoothing groups but also stores normals for each vertex(faces that share the vertex contribute to the calculation of its normal).

Viewing mesh normals:

Check 'Show Normals' option when in Vertex or Face editing mode(img 1).



Smoothing:

Use 'Smooth' after mesh modifications to recalculate normals(img 2).

'Autosmooth' option handles this task for some modifiers(img 1).



Grouping Faces:

Select the faces you want to group and press a smoothing group button.

Faces can be assigned to more than 1 smoothing groups.

Ungrouping Faces:

Either depress smoothing group button(s) or press 'Clear' to clear all groups(img 3).

Let LR3D find smoothing groups:

Set the degrees value and press 'Auto-Smooth'(img 3).

If the angle of neighboring faces is less than the degrees value those faces will be grouped and smoothed.

Select Faces that share the same smoothing group:

Press 'Select By SG'(img 3).



Examples:

A sphere uses 1 smoothing group for all of its faces.

A cylinder uses 2 smoothing groups: 1 for each cap(top,bottom) and one for the sides.

Prometheus