TPOPTRIA

Draws best-fit 3D triangles (closed 3D polylines) based on a set of 3D points, optional boundaries and optional breaklines

Example 1: Set of 3D points, no boundaries, no breaklines

Example 2: Set of 3D points and a boundary (a closed 2D polyline)

Example 3: Set of 3D points and a breakline (a 2D polyline) — compare results with Example 1

Example 4: Set of 3D points, closed boundaries and breaklines

By dividing this example into four areas with four boundary polylines, it takes far less time to create the triangles than selecting all the 3D points together in one go
**TPOPSWAP** Swaps the shared edge between two adjacent 3D triangles (closed 3D polylines)

Before

Example 1: Swapping the shared edge between two adjacent 3D triangles

After

Example 2: The shared edge will not swap if the overall outline of the two triangles would change due to the swap (so no change between before and after)

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**TPOPGETTHIN** Measures the minimum and maximum flatness ratio for a group of 3D triangles (closed 3D polylines). A triangle’s flatness ratio is the 2D length of the longest side divided by the 2D perpendicular distance to the opposite point

Before

Example 1: Flatter triangles return higher ratios minimum ratio = 4.893 maximum ratio = 96.509

After

Example 2: Less flat triangles return lower ratios minimum ratio = 1.242 maximum ratio = 2.487

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**TPOPDELTHIN** Deletes flat or near flat 3D triangles (closed 3D polylines) with the option to delete only triangles on the edge of the group

Before

Example 1: Deleting all near or near flat 3D triangles with a ratio over 5.0

28 triangles

After

Example 2: Deleting near or near flat 3D triangles with a ratio over 5.0, but only if on the edge of the group (compare the total number of triangles to example 1)

25 triangles

(With solids from TPOPSOLID added)

(22 triangles within group also deleted)

(Flat triangles within group not deleted)
TPOPSOLID draws 2D solid triangles based on a set of 3D triangles (closed 3D polylines). The z coordinate of each 2D solid can be either the average z coordinate of each 3D triangle, or the maximum slope of each triangle. There is also the option to copy the colors of the source 3D triangles.

Example 1: Draw 2D solids to identify any missing 3D triangles within the group.

Example 2: Draw 2D solids with z coordinate based on each 3D triangle’s z coordinate. When combined with COLOURBYZ, this helps identify higher (red) and lower (blue) areas within the group of 3D triangles.

Example 3: Draw 2D solids with z coordinates based on each 3D triangle’s maximum slope (expressed as a percentage, so for example 1 in 40 is 2.5%, and flat is 0%). When combined with COLOURBYZ, this helps identify steeper (red) and flatter (blue) areas within the group of 3D triangles.

Example 4: Draw 2D solids copying each 3D triangle’s color to create solid colored areas across the group of 3D triangles.
TPOPCONT

Draws contour lines (2D polylines) at user defined z intervals based on a set of 3D triangles (closed 3D polylines)

Example 1: Contour lines at 0.25 unit intervals

Example 2: Contour lines at 0.50 unit intervals

Example 3: Contour lines coloured with COLOURBYZ (in this example 1 unit major intervals, 0.25 unit minor intervals, 5 unit datum)
**TPOPCONTLABEL**
Draws text labels of contour (2D polyline) z value next to contour at user selected position. The text labels are automatically aligned to the nearest adjacent contour line segment. The user can specify the number of decimal places included in the text labels.

Example 1: Contour z values (to 3 decimal places) next to contour lines

Example 2: Contour z values (to 1 decimal place) next to appropriate contour lines

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**TPOPLEVEL**
Draws spot levels (text labels and points) at user selected locations within a group of selected 3D triangles (closed 3D polylines).

Example 1: Spot levels within a group of 3D triangles

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**TPOPSLOPEMAX**
Draws maximum slope values (text labels) and direction of maximum slope (2D polyline arrows) within selected 3D triangles (closed 3D polylines).

Example 1: Maximum slope values and direction for a group of 3D triangles

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**TPOPSLOPEDIR**
Draws slope values (text labels) and arrows (2D polyline arrows) in user defined directions within selected 3D triangles (closed 3D polylines). Downhill slopes are positive, uphill slopes are negative.

Example 1: Slope values in one direction, for example along the route of a proposed trench

Example 2: Slope values in the opposite direction (note values have switched signs)

Example 3: Slope values in a different direction for the same model

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Note that these values will not necessarily be the same as the maximum slope values returned by TPOPSLOPEMAX as they are in different directions to the maximum slope.
**TPOP_MULZ**

Multiplies the z coordinate values of selected 3D points by a user-defined value. A negative value inverts the sign of the z coordinate values. A value of less than 1 reduces z coordinate values. Example 1: 3D points with z coordinate values multiplied by 2.

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.900</td>
<td>13.800</td>
</tr>
<tr>
<td>7.400</td>
<td>14.800</td>
</tr>
<tr>
<td>8.300</td>
<td>16.600</td>
</tr>
<tr>
<td>2.100</td>
<td>4.200</td>
</tr>
</tbody>
</table>

Example 2: 3D points with z coordinate values multiplied by 0.5.

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.000</td>
<td>3.500</td>
</tr>
<tr>
<td>6.800</td>
<td>3.400</td>
</tr>
<tr>
<td>6.600</td>
<td>3.300</td>
</tr>
<tr>
<td>2.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Example 3: 3D points with z coordinate values inverted by multiplying them by -1.

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.000</td>
<td>-6.000</td>
</tr>
<tr>
<td>7.400</td>
<td>-7.400</td>
</tr>
<tr>
<td>8.300</td>
<td>-8.300</td>
</tr>
<tr>
<td>2.100</td>
<td>-2.100</td>
</tr>
</tbody>
</table>

**TPOP_VOL**

Returns the volume between selected 3D triangles (closed 3D polylines) and a zero baseline (z = 0). TPOP_VOL does not calculate cut and fill volumes separately. See TPOP_INTERS for how to do this.

Example 1: The volume of these 3D triangles above a zero baseline is 988.602 cubic units.

Example 2: Draws 2D polylines and 3D points where two sets of 3D triangles (closed 3D polylines) intersect. It requires each set of 3D triangles to be on different layers. It can also help calculate cut and fill volumes when using TPOP_VOL.

Example 3: Use TPOP_VOL to calculate the volume for each model and obtain the cut or fill volume from these values (for this example it's 1023.357 cubic units of fill).

<table>
<thead>
<tr>
<th>Old Volume</th>
<th>New Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>2780.397</td>
<td>3803.754</td>
</tr>
</tbody>
</table>

Example 4: Determining where triangles intercept large flat slightly angled plane (consisting of two triangles to form a large sloping rectangle).