

Cut and fill volume in AutoCAD 1.4

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LT_SCALE is an application for AutoCAD at least 2010 or BricsCAD at least V14.

New commands are introduced in AutoCAD or BricsCAD, useful for designers:

LSC: multiplies with a number the scale of 'Linetype' for the selected entities,
HSC: multiplies with a number the scale for the selected HATCHs,
PSC: adjusts the scale for LINES with 'Linetype'=POARTA* for the selected LINES,
KMP: writes the mileage in the BLOCKs inserted on a POLYLINE,
YTE: changes the Y texts of some points, relative to an origin point,
XTE: changes the X text of some points, relative to X=0 of the current UCS,
PTE: inserts elevation and slope with triangle on a POLYLINE,
P3D: creates 3D axis and roadside, starting from 2D,
VOL: calculates the volume of filling and digging,
DTH: creates hatch styles from a DWG.

Installation

Follow the steps:

1) Unzip "lt_scale.zip" in "c:\lt_scale" folder

2) in AutoCAD

- starting with Autocad 2014, set the SECURELOAD variable to 0 or the TRUSTEDPATHS variable to "c:\lt_scale"

- launch the menu functions:

Tools

Load Application

Startup Suite

Add

c:\lt_scale\lt_scale.vlx

- close and then restart AutoCAD

in BricsCAD

- launch the menu function:

Tools (or Manage)

Load Application

Add

c:\lt_scale\lt_scale.des

Load

3) open a DWG (for example "c:\lt_scale\LSC+HSC example.dwg").

The shareware version works only 21 times and will only interpret 18 points at PTE and P3D commands!

Launch in work

Launching is done in AutoCAD with the commands shown below.

After any of the commands, you can give the AutoCAD UNDO, BACK command, returning to the state before the LT_SCALE commands.

LSC

Multiplies with a user-specified number LINETYPE scales for selected entities. It is useful when you do not want to change the LINETYPE scales for all entities in the drawing (with the AutoCAD LTSCALE command), but you want a change for only a few entities.

HSC

Multiplies with a user-specified number, the scales of the HATCH entities, from the set of selected entities.

PSC

Adjusts the scale of selected LINE entities that have the LINETYPE name starting with "POARTA". The scale will have a value equal to the length of the LINE entity! The command is useful when you have LINETYPE with SHAPE and you want SHAPE to cover the entire LINE length.

You can redefine the "POARTA" text by typing in AutoCAD an AutoLISP expression as in the example

```
(setq psc_name "OTHER_NAME")
```

"OTHER_NAME" becomes the beginning of the new LINETYPE name for which the PSC command will act. This redefinition is only valid in the current AutoCAD session.

KMP

KMP will update the mileage in the form of attributes in BLOCK entities inserted on a POLYLINE or LWPOLYLINE.

The drawing unit is considered [m].

First you must select a POLYLINE or LWPOLYLINE.

Then you will select an initial BLOCK that must have the attributes KM and M. The value in KM will be the part in kilometers of the initial kilometer and the value in M will be the part in meters.

The KMP command will look for the BLOCKs that are inserted on the POLYLINE that you have selected and have KM and M attributes. Their attributes will be completed with mileage, based on the POLYLINE distance between the initial BLOCK insertion point and the current BLOCK insertion point.

The command is useful when you have many BLOCKs that identify culverts, manholes, etc., for which you have to enter the mileage from an initial kilometer (see "c:\lt_scale\KMP_example.dwg").

YTE

With YTE you can modify the Y coordinate enrolled in a TEXT entity, depending on the Y coordinate of an indicated point and an initial Y.

The drawing unit is considered [m].

First you will indicate the scale on Y of the drawing, for example, for the scale 1:0.1 (actually 10:1) you will enter the 0.1 value.

Then you will indicate a point ("The origin point") relative to which the Y points will be corrected.

A TEXT entity will then be selected, representing the real value of the Y coordinate of the origin point indicated above.

Also indicate the number of decimal places for the Y value to be enrolled.

Then, repeatedly, one point (possibly with OSNAP options) and a TEXT entity will be indicated. The TEXT will automatically change to represent the Y coordinate of the indicated point relative to the origin point and the Y scale. Before giving the YTE

command, enter some TEXT entities near the drawing points for which you want to enter the Y value!

Exiting the command is done by pressing ENTER again.

The command is useful to adjust the Y values to an origin point, for example, from drawings representing sections or longitudinal profiles (see "c:\lt_scale\YTE+PTE_example.dwg").

XTE

With XTE, you repeatedly modify the TEXT entities that represent the X coordinate of an indicated point.

The drawing unit is considered [m].

First you will point the X scale of the drawing, for example, for the 1:2 scale you will enter 2.

Also indicate the number of decimal places for the X value to be enrolled.

Then, repeatedly, one point and a TEXT entity will be indicated. The TEXT entity will change to the value of the X coordinate of the point, relative to the origin of the current UCS.

Exiting the command is done by pressing ENTER again.

An example where you can use the command is the row of accumulated distances from a longitudinal profile. In this case, change first the UCS in the first point from which the distances are gathered.

PTE

PTE enters the Y elevation and the slope of the segments between the vertices of a selected POLYLINE or LWPOLYLINE.

The drawing unit is considered [m].

Will be introduced:

- the scale on X of the drawing, for example, for 1:2 scale you will enter 2,
- the scale on Y of the drawing, for example, for 1:0.1 scale (actually 10:1) you will enter the 0.1 value,
- a point ("The origin point") relative to which will be further calculated the Y coordinate of the POLYLINE,
- a TEXT entity representing the real value of the Y coordinate of the origin point indicated above,
- translation on X of the triangle with TEXT that will be automatically entered in the vertices,
- the number of decimal places of the TEXTs that represent Y,
- the number of decimal places at the slopes of the segments,
- position of the triangles, above or below the POLYLINE,
- POLYLINE or LWPOLYLINE entities will be repeatedly selected.

At the POLYLINE vertices a triangle with its Y value will be inserted, and the slope and the flow direction will be entered between the vertices.

An example of use is a POLYLINE introduced into a longitudinal profile, representing the ditch bottom line (see "c:\lt_scale\YTE+PTE_example.dwg"). The POLYLINE Y coordinates can result from cross sections.

P3D

P3D generates the 3D axis, the edges and the surface of a road, starting from 2D POLYLINE from a DWG.

DWG is considered in [m].

Will be introduced:

- the scale on X of the longitudinal profile, for example, for 1:2 scale you will enter 2,

- the scale on Y of the longitudinal profile, for example, for 1:0.1 scale (actually 10:1) you will enter the 0.1 value,
- a point ("The origin point") relative to which will be further calculated the Y coordinates of the vertices of the POLYLINE representing the longitudinal profile,
- a TEXT entity representing the real value of the Y coordinate of the origin point indicated above,
- select a POLYLINE representing the longitudinal profile of the road axis,
- select a POLYLINE representing the road axis in the XOY plane, which must be 1:1 scale,
- the left edge distance of the road,
- the right edge distance of the road.

Optionally, you can create 3 input files with the same name as the DWG file:

1) a DVT extension file, with transversal slopes at different points on the road axis; it has articles with three fields, of the following form

```
s left_slope right_slope
```

- "s" is the cumulative distance on the axis in the plane corresponding to a point; s must take values between 0 and the axis length in the plane, in the sense of increasing the value,
- "left_slope" is the left transverse slope in %; if the point on the edge is lower than the point on the axis, the value is positive, otherwise it is negative,
- "right_slope" is the right transverse slope in %; if the point on the edge is lower than the point on the axis, the value is negative, otherwise it is positive,
- for any point on the road axis, the transverse slope will be determined by interpolation between neighboring items in the DVT file,
- if the DVT file is missing, slopes will be considered everywhere as 0;

2) a WR extension file with right extra widening at different points on the road axis; it has articles with two values, of the following form

```
s right_extra
```

- where "s" has the meaning of the DVT file, and "right_extra" is the distance that gathers at the distance from the axis to the right edge of the road;
- for any point on the road axis, the "right_extra" will be determined by interpolation between neighboring items in the WR file,
 - if the WR file is missing, "right_extra" will be considered everywhere as 0;

3) a WL extension file with left extra widening at different points on the road axis; it has articles with two values, of the following form

```
s left_extra
```

- where "s" has the meaning of the DVT file, and "left_extra" is the distance that gathers at the distance from the axis to the left edge of the road;
- for any point on the road axis, the "left_extra" will be determined by interpolation between neighboring items in the WL file,
 - if the WL file is missing, "left_extra" will be considered everywhere as 0.

It will be generated three 3D POLYLINE corresponding to the road axis and to the left and right margins. In fact, for each point (vertex) of the POLYLINE representing the axis of the road in the plane, the 3D points of the axis and of the edges will be determined.

It also generates 3DFACE entities representing the surface of the road.

And some texts are also written: accumulated distance ("s"), Z coordinate of the axis, distances to the edges and transversal slopes.

You have an example at "c:\lt_scale\P3D_example.dwg".

VOL

VOL calculates the filling and digging volumes between the project and the land surfaces. The surfaces must be 3DFACE or 3DMESH entities (created with variable MESHTYPE set to 0), having different colors between project and land. The volumes will be calculated by the intersection with vertical lines of the two surfaces.

First, the "Volume increment", which represents the step on X and Y of vertical lines, will be introduced. A value of about 10,000 vertical lines is recommended.

You will then select the set of project entities "*** Select the project set (3DFACE or 3DMESH (MESHTYPE 0)) ***". The user will select an entity, all entities with its color being automatically selected. Then another entity, of another color, can be selected. The selection is completed by pressing ENTER.

The set of land entities will then be selected "*** Select the land set (3DFACE or 3DMESH (MESHTYPE 0)) ***", in a manner similar to the project selection.

The filling and digging volumes as well as the maximum filling and digging heights will be calculated and displayed. *The test version of the program does not completely display the volumes!*

In the layer "lt_scale_volume" the vertical lines between the surfaces are also drawn. The filling ones have the color "red" and the ones of the digging have color "yellow".

You have an example in "c:\lt_scale\VOL_example.dwg".

The shareware version does not display the volume clearly.

DTH

DTH creates hatch styles from a DWG.

Polyline, Arc, Circle and Spline entities will be interpreted.

First, the program will explode the existing DWG blocks and merge the Line entities into Polylines. Then the user will enter a distance ("Segment length") which represents the length of the segments by which the Arc, Circle and Spline entities are approximated, as well as the arcs and inclined segments of the Polylines.

Next, select the entities from which you want to create a hatch style. The selected entities are automatically deleted and replaced with Polyline entities. Polylines resulting from Arc, Circle and Spline will be colored with color 211, and Polylines that were initially also Polylines, will be colored with color 122.

The DTH command also has this important utility (nonexistent in AutoCAD), to divide Polyline, Arc, Circle and Spline entities into equal segments.

A new hatch style will be automatically created in a PAT extension file, with the name and folder of the DWG file. This file will be loaded automatically in AutoCAD if it is in the DWG folder in which you want to use the hatch or if it is in a folder defined by the Tools, Options, Files and Support File Search Path menu functions. To use the new hatching style, open the DWG to be hatched, enter the

Hatch command, select the entities to be hatched (add Selected objects), select Custom for Type, and select the new hatching style for Custom pattern. In the hatch, the vertical or horizontal segments will be drawn in full, and the inclined segments will be approximated with points at the distance ("Segment length") that you indicated. If you don't like how the points look on the screen or when printing, or you have small details or errors in the approximation of the entities from which the hatching style was generated, reduce the "Segment length".

You can test the DTH command by opening the file "C:\lt_scale\DWG to PAT example.dwg", running the DTH command for one of the three bottom drawings and using the new hatch style for the top drawing.

The shareware version will only interpret a maximum number of 12 Polyline, Arc, Circle and Spline entities!