The CEDRA Corporation's

COMMAND OF THE MONTH

A monthly information bulletin   May 2006

FEATURED COMMAND

Relocating Features

Application Description

In this year's February issue of Command of the Month we discussed the capabilities of the transformation tool to mirror and repeat individual features. This month we revisit this tool, but this time we will discuss some of its feature relocation capabilities.

The Transformation tool is located in the **CEDRA-Transform-Tools** toolbar (ArcGIS® users see Figure 1), and in the **CEDRA Tool Palette**. The Transformation tool is the left-most tool in the toolbar, the one denoted by the "wiggly" line tool icon. Note that the Transformation tool is also available for ArcView® GIS users.
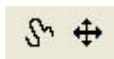
Figure 1
CEDRA-Transform-Tools Toolbar

In case one is wondering about the other tool, click at the Transformation tool and scroll down in the option list. Shown in Figure 2 is the expanded list of options available in the transformation tool. Notice that the fifth option from the bottom of the list is labeled *Translate, Rotate, Scale Features*. The function of this option can be invoked by clicking at the tool icon to the right of the "wiggly" line icon. This saves the user the process of clicking at the "wiggly" line tool icon, scrolling down the option list and selecting the said option. Thus, a few clicks can be saved by picking the tool directly. For simplicity purposes, we will refer to the right-most tool in the Transformation toolbar as the TRS tool.

The CEDRA Solution

In order to present the operational procedure for relocating, rotating and/or scaling features, we will use a portion of a floor, for which we will relocate some furniture (see Figure 3). Who said that ArcGIS® with CEDRA-AVcad can only be used for map preparation?

Note that for the sake of brevity we will use the term transformation to imply translation, rotation and/or scaling.

In perusing the list of options in Figure 2, one could categorize them in the following groups:

1. The initialization process to clear all existing selections, and zero all global variables for the control points and base lines. If so desired, this command may be used to clear feature selections at any time.

2. The options in this group provide for transformation within a single view display.

3. The options in this group enable the user to change views while establishing the control points and base lines of the transformation.

4. The options in this group enable the user to manipulate the position of text strings. This functionality also exists, for ArcGIS users, in the **CEDRA-Text-Tools** tool bar.

5. The TRS tool discussed in this document.

Figure 2
Transformation Tool List Of Options

6. The mirror and repeat functions discussed in the February 2006 issue.

7. The stretch command to expand or compress a group of features in the X (east) and/or Y (north) directions.

8. The command that performs the transformation operation dictated by the selected option(s).

Command Of The Month bulletin

This month's issue discusses the methodology of transforming point, polyline, polygon and/or annotation features with the ability of applying scaling and rotation values during the processing.
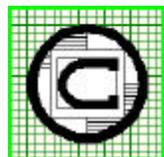
For most of the transformation operations, the user must identify an Existing Control Point and a New Control Point, while for some of the transformation operations the user may have to identify an Existing Baseline Direction as well as a New Baseline Direction. Shown in Figure 3 is a description of the control points used by the Transformation tool. The control points labeled Baseline Point 3 and New Baseline Point 3 are used to determine Y axis scaling values.

- The *existing control point* denotes the point about which a transformation is to be performed.

- The *new control point* denotes the point to which the existing control point is to be translated.

- The *existing base line* denotes the axis of the selected feature(s) about which a rotation is to occur. Note that the start point of the existing base line becomes the Existing Control Point.

- The *new base line* denotes the direction to which the existing base line, together with its associated feature(s), is to be rotated. Note that the start point of the new base line becomes the New Control Point.

As an explanation of the above consider the conference room with its eight chairs in the sample floor layout of Figure 4. In its present position, the center of this table (point D) is located 8 feet west of the east wall, and 16 feet north from the south wall. For the sake of the example, let us say that we wish to position the table and its chairs so that its center will be located exactly 8 feet west of the east wall, and 5 feet north from the south wall (point F). Hence, to carry out the translation and rotation of the conference room table, note the following:

1. Point D will be the Existing Control Point.

2. Point F will be the New Control Point.

3. The Existing Baseline Direction should start at point D and terminate at some arbitrary point E, thus implying an imaginary line parallel to a line from point B to point A.

4. The New Baseline Direction should start at point F and terminate at some arbitrary point G, thus implying an imaginary line parallel to a line from point A to point C.
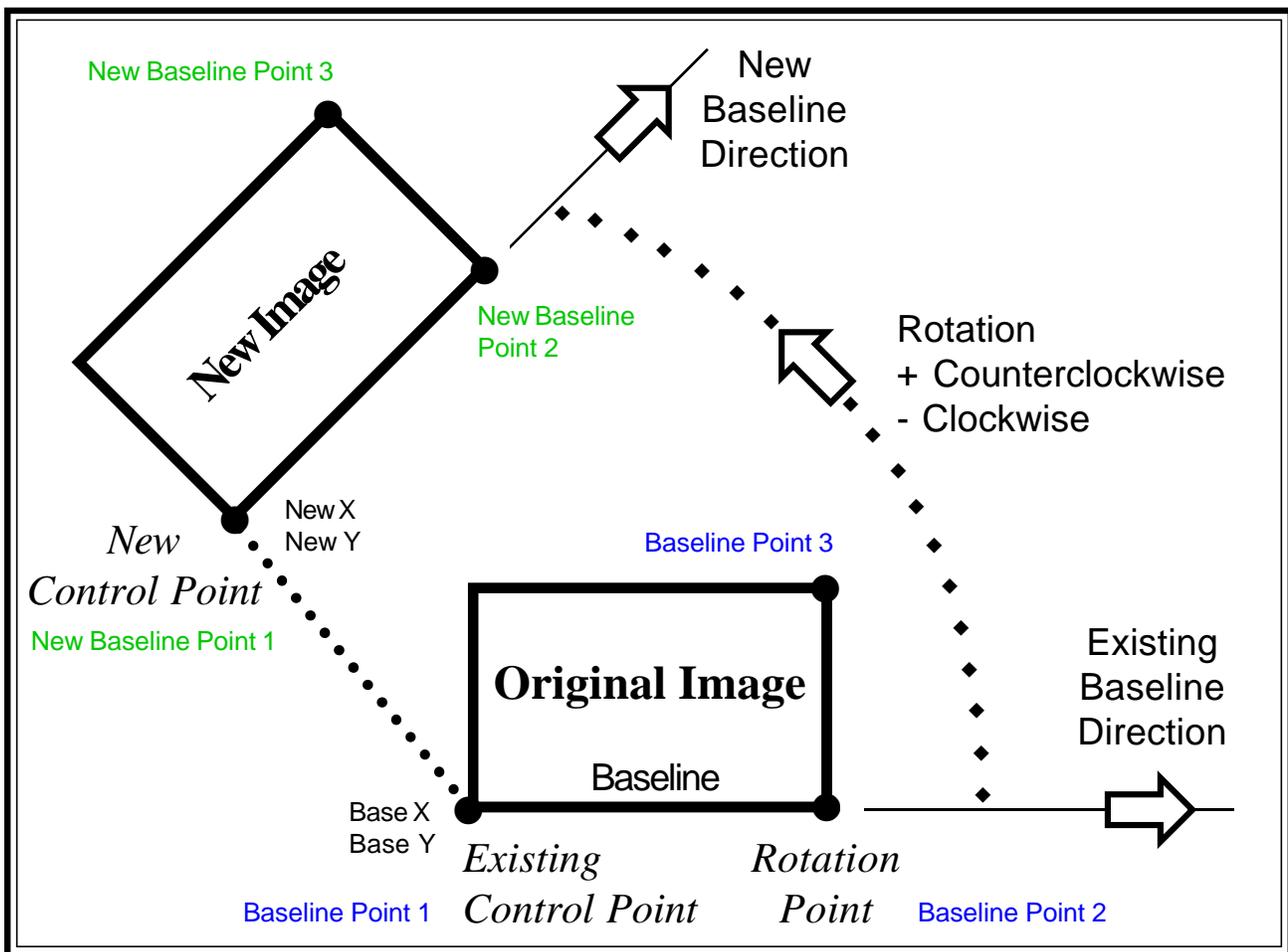

Figure 3 - Transformation Tool Control Point Locations
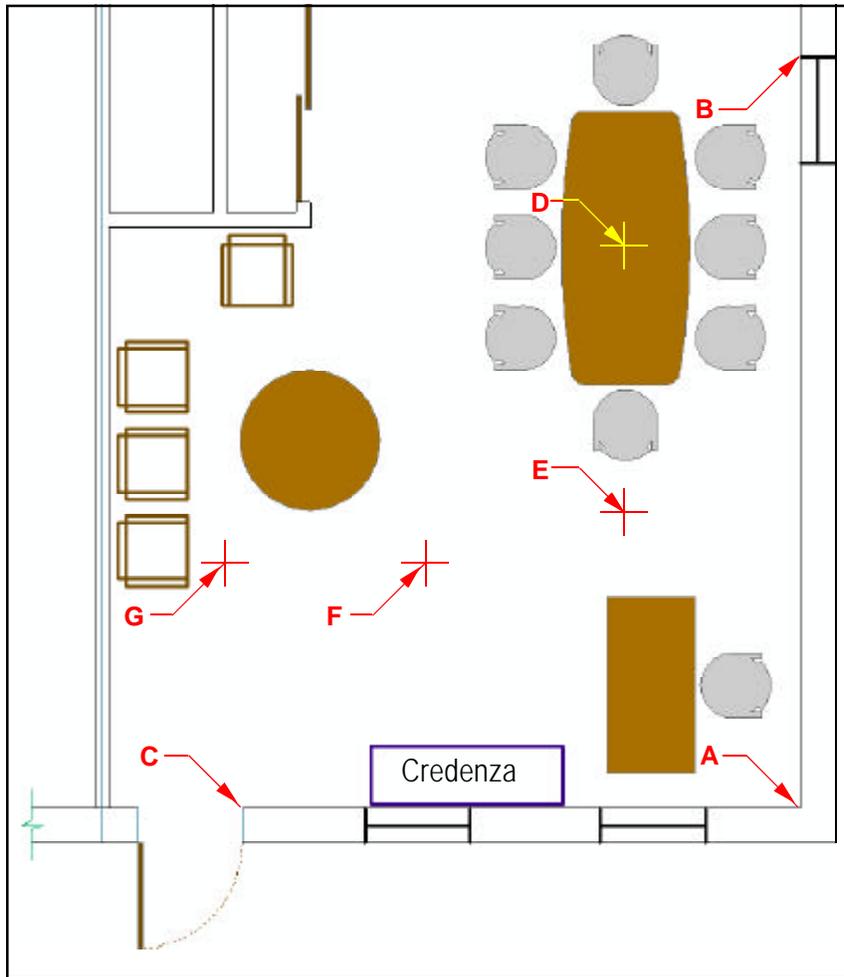
Figure 4 - Sample Floor Layout

The above will cause the conference table and its eight chairs to be translated from point D to point F, and to be rotated counterclockwise 90 degrees.

Transform The Conference Table

We will now proceed to transform the conference table and its chairs described as above. However, before we relocate the conference table and its chairs, it will be necessary to move out of the way, the desk, its chair and the credenza which are located just north of the south wall.

1.   Move the desk, chair and credenza

- Click at the layer(s) in the Table of Contents (TOC) that contain the desk, chair and credenza features to be selected.

- Click at the *Select Features* tool, and make a rectangle to select the features to be moved.

- Click at the *Transformation* tool to display the choice list box of Figure 2, scroll down, select the *Move Selected Features (no rotation)* option, and then click at the *OK* button.

- Click at the low left corner of the credenza (the long rectangle with white fill) to define the existing control point.

- Click to the east of the east wall, outside of the building, and due east of the existing control point (D) to define the new control point. The features have been relocated.

- Click at another location, but nearby to the last pick. The features are repositioned. You can reposition the features at will (see Figure 8), until another tool or menu command is selected.

Note that although the two control points can be anywhere in the view, it is advisable that they are located with some reference to the selected features.

The area north of the south wall has now been cleared to accommodate the relocation of the conference table and its chairs.

2.   Define the control points and the base lines

Our next task is to define the control points (D and F) and the base lines (DE and FG). Presented below is one of the many ways to define these points and base lines with the various geometric tools that are available within CEDRA-AVcad.

By looking at the conference table, we note that its long sides are comprised of three compound curve (one of large radius, and two of small radius), and the short sides are each comprised of a straight line. To find the center point of the conference table:

- Make certain you are in the proper directory and active layer.

- Click at the *Lines between two points* tool.

- Click at the *upper left corner* of the conference table where the small curve is tangent to the top short edge of the table, and then click at *the low right corner* of the table where the small curve is tangent to the bottom short edge of the table, to display a line.

- Click at the *upper right corner* of the conference table where the small curve is tangent to the top

short edge of the table, and then click at the *low left corner* of the table where the small curve is tangent to the bottom short edge of the table, to display a line.

- Click at the *Intersect 2 lines or polygons* ✕ tool.

- Click at one of the above two lines and confirm the selection, and then click at the other and confirm its selection to display the point of intersection (point D).

- Click at the *Points along a line or curve with plus and offset* 📐 tool.

- Click at point D, confirm the selection, then click at point B and then click at point A to display the Points w/Plus &Offset dialog box.

- Enter 10 in the *Plus Distance:* data field, and then click at the *OK* button to display point E. The tool remains active.

- Click at the *Cancel* button to abort the command.

- Click at the *Points along a line or curve with plus and offset* 📐 tool.

- Click at point A, and confirm the selection. Note that this time a line is selected.

- Enter 5 in the *Plus Distance:* data field, enter -8 in the *Offset Distance:* data field, and then click at the *OK* button to display point F The tool remains active.

- Enter 0 in the *Plus Distance:* data field, enter -18 in the *Offset Distance:* data field, and then click at the OK button to display point G The tool remains active.

  In this step it is important to note that the distance entered in the *Plus Distance:* data field is dependent on the setting of the *Traverse when entering points of lines* property

of the application's properties (see Figure 5). If the check box of this property is checked, then the entry in the *Plus Distance:* data field should be zero, and if not, that entry should be 5.

- Click at the *Cancel* button to abort the command.

So we have now defined the two control points and the endpoints of the two base lines.

3. Transform the conference table ensemble

We are now ready to transform the conference table and its eight chairs. Note that the control points and the base line endpoints, as well as the features to be transformed are all located in the current view display. Furthermore, the control points and base lines are such that their selection can easily be made. That is, there will be no interference with any other points when the control points and the base line endpoints are to be selected.

Even though we could transform the conference table and the eight chairs all together, we will transform first the chairs as a group, and then the table, in order to demonstrate two different methods.

- Click at the layer in the TOC that contains the chair features to be selected.

- Click at the *Select Features* 🔲 tool, and make a rectangle to select the eight chairs.

- Click at the *Transformation* 🔧 tool to display the choice list box of Figure 2, scroll down, select the *Pick Baseline Point 1* option, and then click at the *OK* button.

- Click sequentially at points D, E and E again to define the Existing Control Point and Existing Baseline Direction.
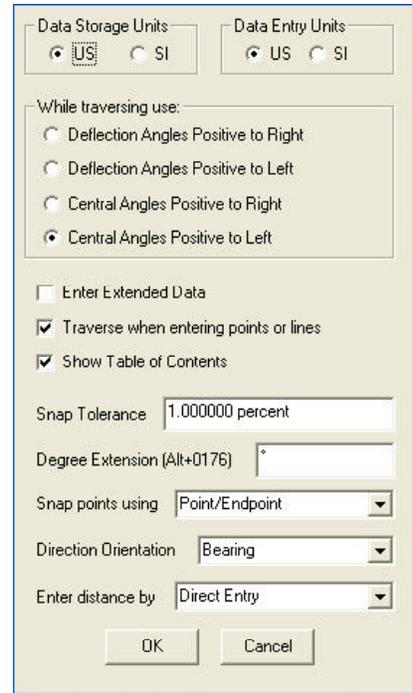
Figure 5
AVcad Properties Dialog Box

This can be done since both control points (D and E) are in the same view.

- Click sequentially at points F and G to define the New Control Point and New Baseline Direction.

  Again, this can be done since both control points (D and E) are in the same view.

- Click at the *Transformation* 🔧 tool to display the choice list box of Figure 2, scroll down, select the *Transform Features* option, and then click at the *OK* button to display the query box of Figure 6.
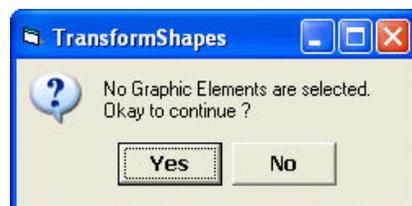
Figure 6 - Selection Of Graphics

- Click at the *Yes* button to display the dialog box of Figure 7.

- Review the contents of the data fields of this dialog box noting the following:
  - The top two data fields contain the X and Y coordinates of the Existing Control Point D.

  - The next data field contains the rotation angle.

  - The next two data fields contain the X and Y scales. These two values should be 1.0. If not, enter 1.0 in each one of them.

  - The next two data fields contain the coordinates of the New Control Point. If desired, they can be changed at this time.

  - The last two data fields contain the Cartesian direction of the Existing Baseline Direction and the New Baseline Direction. These are for information purpose only. Altering these values has no effect on the transformation.

- Click at the *OK* button.

The chairs have now been transformed and an information message appears in the status bar area.

We will next do the same for the conference table in a slightly different manner. This method should be used when the points to be selected in defining the existing baseline and new baseline endpoints are very close to other points thus necessitating zooming-in by changing views to facilitate the selection of the points.

- Click at the layer in the TOC that contains the conference table features to be selected.

- Click at the *Select Features* tool, and make a rectangle to select the conference table.

 For our current example the zooming-in and back instructions below

Figure 7 - Transformation Dialog Box

are not necessary, but they are presented for the cases in which they may be necessary.

- Click at the *Zoom-in* tool and zoom-in about point D.

- Click at the *Transformation* tool to display the choice list box of Figure 2, scroll down, select the *Pick Baseline Point 1* option, and then click at the *OK* button.

- Click at point D, and then click at the *Go Back To Previous Extent* tool.

  In continuing with this example, we will forgo the zooming-in and back since that is not necessary.

- Click at the *Transformation* tool to display the choice list box of Figure 2, scroll down, select the *Pick Baseline Point 2* option, and then click at the *OK* button.

- Click at point D.

- Click at the *Transformation* tool to display the choice list box of Figure 2, scroll down, select the *Pick New Baseline Point 1* option, and then click at the *OK* button.

- Click at point F.

- Click at the *Transformation* tool to display the choice list box of Figure 2, scroll down, select the *Pick New Baseline Point 2* option, and then click at the *OK* button.

- Click at point G.

- Click at the *Transformation* tool to display the choice list box of Figure 2, scroll down, select the *Transform Features* option, and then click at the *OK* button.

- Click at the *Yes* button to display the dialog box of Figure 6.

- Review the contents of the data fields, and click at the *OK* button.

The conference table has now been transformed (see Figure 8).

Note that:

- In selecting the above four points (D, E, F and G), the sequence in which they are defined is not important. They can be defined in any sequence.

• The selection of the features to be transformed may be made at the start of the transformation operation, as was done above, or just before the selection of the *Transform Features* option of the Transformation tool

It is important for ArcGIS users to note that when working with the Transformation tool on a group of features that are assigned to different datasets, the features of each dataset should be transformed individually. *If not, then the Undo command will not be functional on all feature datasets*.

4.　Another Transformation

We will now demonstrate the use of the tool that we called the TRS ⊕ tool in the introduction. For this, we will select the chair that is located south of the closet, which we will translate, rotate and scale.

• Click at the layer in the TOC that contains the chair features to be selected.

• Click at the *Select Features* ⊡ tool, and make a rectangle to select the chair.

• Click at the ⊕ TRS tool to display the dialog box of Figure 9.
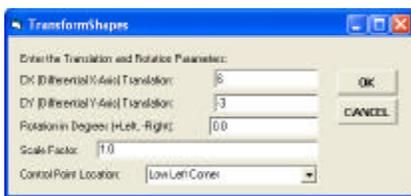
Figure 9 - TRS Transformation Dialog Box

• Enter the data below in the indicated data fields:
  • *DX (Differential X-Axis) Translation:*　6
  • *DY (Differential Y-Axis) Translation:*　-3
  and then click at the *OK* button to move the chair 6 feet to the east and 3 feet to the south. After the
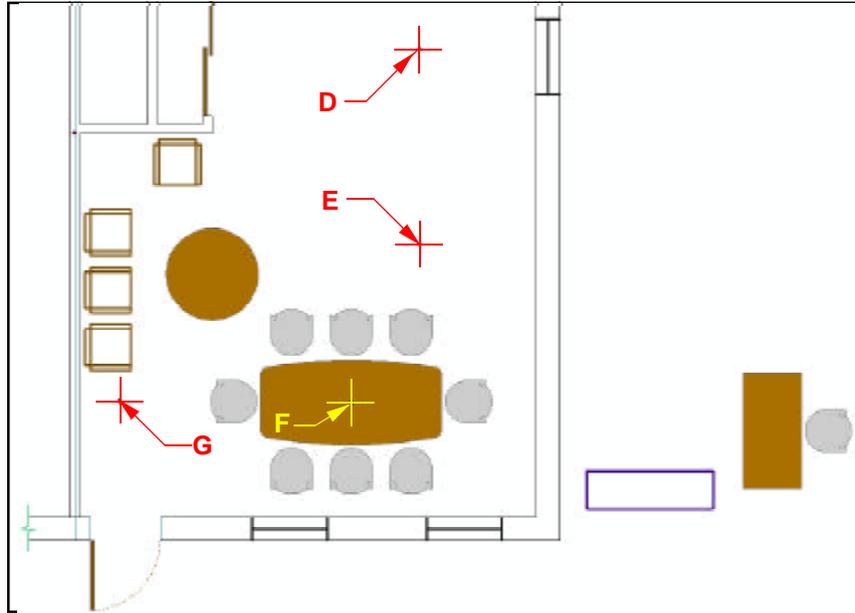

Figure 8 - Transformed Conference Table And Chairs

chair has been transformed, the chair remains selected and the dialog box of Figure 9 is re-displayed with the data previously entered as the new default values.

• Enter the data below in the indicated data fields:
  • *DX (Differential X-Axis) Translation:*　0
  • *DY (Differential Y-Axis) Translation:*　0
  • *Rotation in Degrees (+left, -Right):*　45

• Accept the *Scale Factor* of 1.

• Scroll down in the *Control Point Location:* choice list data field, select the *Upper Left Corner* option, and then click at the *OK* button.

The chair now is not translated, but rather it is rotated counterclockwise 45 degrees. Again the feature remains selected and the dialog box is re-displayed.

• Enter the data below in the indicated data fields:
  • *Rotation in Degrees (+left, -Right):*　0
  • *Scale Factor:*　2

• Scroll down in the *Control Point Location:* choice list data field, select the *Center* option, and then click at the *OK* button.

The chair now remains in its last position, but it is doubled in size.

Summary

The above examples have demonstrated a few ways for relocating, rotating and scaling features, or groups thereof. Having perused this bulletin, the user may follow the above steps in a personal application.

Furthermore, the floor plan used in these demonstrations imply that CEDRA-AVcad in an ArcGIS® or ArcView® GIS environment may be used as a drafting tool on its own, or to augment conventional GIS applications. Additional CAD applications will be addressed in future bulletins.

If you have a request for Command Of The Month, feel free to phone, fax or e-mail your request to The CEDRA Corporation.