The CEDRA Corporation's

COMMAND OF THE MONTH

A monthly information bulletin   **July 2009**

FEATURED COMMAND

The CEDRA Feature

Echo Tools

Application Description

So you've invoked ArcMap, and created a view displaying a multitude of impressive looking points, lines, curves and polygons depicting the database of your choice. The colors are many, and the feature symbols match them in number. You zoom-in on an area and all of a sudden you note a feature, the symbology of which, you do not recall or recognize. You look to the left of the map area and notice the multitude of layers and their symbology. You try to make a match to find which layer that feature belongs to, but given the number of layers and all of the classifications its virtually impossible to determine the correct layer.

Additionally, you notice two specific point features, say two property corners, and you want to know exactly how far apart they are from each other, and in which direction they are located. So you click at the measure tool at the top of the application window, its dialog box with its seven buttons appears, and then you click at each of the two points to get an approximate answer, however, you want an exact distance and the bearing as well.

Finally, you may wish to display certain geometric properties in addition to a feature's approximate coordinate values.

The CEDRA Solution

To address the above described applications, the CEDRA-AVseries user has at his or her disposal the two toolbars

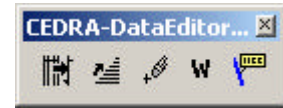
Figure 1
CEDRA-Echo-Tools Toolbar

shown in Figure 1 plus the Map Tips Tool, ▥, of the CEDRA-DataEditor toolbar, see Figure 2. In addition the relocation tool of the CEDRA-Relocation-Tools toolbar may be used as a feature echo/selection tool. All of these tools are a part of CEDRA-AVcad, which is at the core of all of the CEDRA-AVseries software products.

> **Command Of The Month bulletin**
>
> *This month's issue discusses how to echo, that is how to inform the user of certain geometric properties of a selected feature.*

The CEDRA-Echo-Tools on the right side of Figure 1 are the tools that appear within the CEDRA Tool Palette, while the CEDRA-Echo-Tools toolbar on the left side of Figure 1 is a stand-alone toolbar that is independent of the CEDRA Tool Palette. This toolbar contains the exact same tools as those of the former, but with an additional tool at its right-most end.

The Map Tips Tool, ▥, in the CEDRA-DataEditor toolbar is the right-most tool in Figure 2. Its function and use have been addressed in the November 2007 issue of this newsletter and may be

The Map Tips Tool ⟵

Figure 2
CEDRA-DataEditor-Tools
Toolbar

found at **http://www.cedra.com/** by clicking at the **[Command of the Month]** button in the upper left side of said web page.

Determining a Feature's Layer

If a user clicks at most any of the available CEDRA tools, and then clicks at a feature, the user is presented with a query dialog box (see Figure 3) asking for the verification of the selected feature. The layer to which the selected feature belongs to is included in that dialog box.
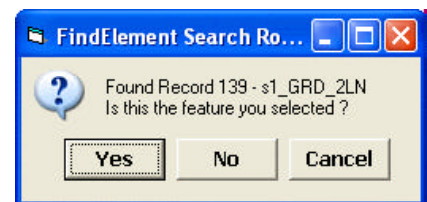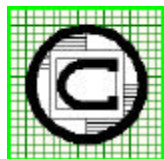

Figure 3
Typical Feature Confirmation Query
Dialog Box

However, some tools are a bit particular in that they respond only when a specific type of feature, say a line or point feature has been selected. Thus to play it safe use the ⟍ *Move Feature Tool* of the CEDRA-Relocation-Tools toolbar, as it

responds to all feature types. If the identification of the layer of the feature is the only interest, respond to the query with a click at the Cancel button.

1. Echo the Distance, Direction and Slope Between Two Points

If a user wishes to determine the exact distance and direction between two points (see Figure 4), the ⊕ *Echo direction and distance between two points* tool should be used. With this tool the user is able to echo the:
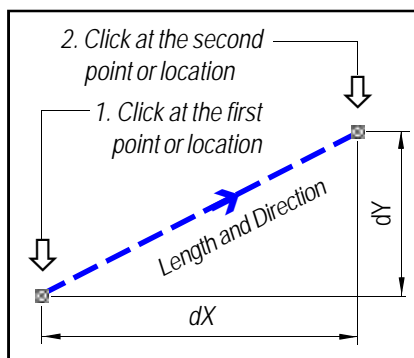

Figure 4
Echo Between 2 Points

• Length and direction of the implied line between two user selected points.

• Coordinates of each of the two points.

• Cartesian x, y and z displacements between the two points.

• Slope between the two points.

Said two points may be point features, polyline or polygon vertices, endpoints of a feature, or any random click. The direction is displayed in degrees, minutes and seconds to a tenth of a degree, and is expressed as an azimuth, bearing and Cartesian rotation.

When selecting a point or an endpoint, this tool snaps to the nearest feature, if there is one, in accord with the setting of the point snapping property as set with the [AVcad Properties...] command.

Regarding the slope information that is displayed in the resultant message box, it should be noted that this is a special ability provided by the CEDRA-AVseries software for a three dimensional database. If elevations are not being used, the default elevation of a point or endpoint is 99999.0 denoting that elevations are not desired.

The units of measure in which distances are echoed are in accord with the setting of the Display Units property within the {View} [Data Frame] properties dialog box. Coordinates are displayed in accord with the Map Units property of said dialog box.

To use this tool, the user should:

➤ 1   **Click** at the ⊕ *Echo direction and distance between two points* tool.

➤ 2   **Click** in the ArcMap display at a:
   • Point,
   • Endpoint of a line, polyline or curve,
   • Vertex of a polyline, curve or polygon, or
   • At any random click to define the first or start point.
   Refer to Figure 4.

➤ 3   **Repeat Step 2** to define the second or end point of the implied line, and display the information message box of Figure 5.

Figure 5
Echo Information
Between Two Points

➤ 4   **Peruse** the information.

➤ 5   **Click** at the **OK** button to close the window.

The command remains active to repeat from Step 2.

2. Echo the Geometric Data of a Feature

Whenever the user wishes to display the exact geometric properties of a point, single line, polyline or polygon feature (refer to Figure 5), the ⊕ *Echo geometric data of an element* tool should be used.

Regarding line features, the CEDRA-AVseries user is reminded that although:

• All lines are treated as ArcGIS polylines, the CEDRA-AVseries database distinguishes between lines that connect two points without
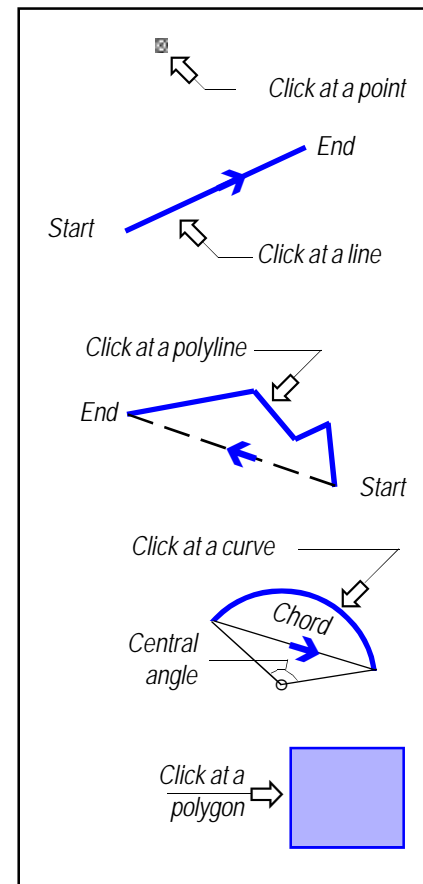

Figure 6
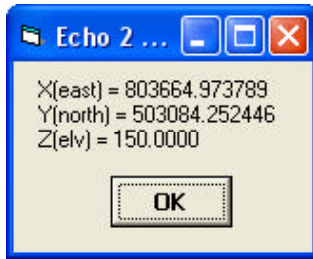**Echo Geometric Properties**
of Features

Figure 7
Geometric Properties of
Point features

Figure 8
Geometric Properties of
Line Features

Figure 9
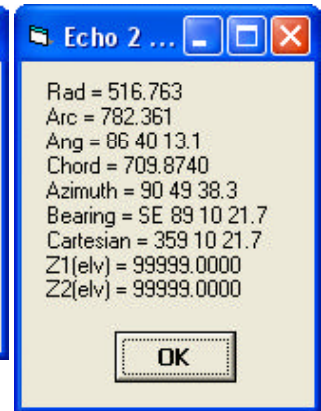Geometric Properties of Polyline
Features

Figure 10
Geometric Properties of
Circular Curve Features

Figure 11
Geometric Properties of
Polygon Features

any in-between vertices (two-point lines), and polylines (lines comprised of three or more vertices).

- All circles, circular arcs, spirals, ellipses, quadratic and cubic curves are saved as polylines, however the CEDRA-AVseries database distinguishes between them with certain special attribute fields. For example, a circle or arc will have an attribute that contains the radius that is associated with the feature.

With this tool the user is able to echo the:

- X, Y and Z coordinates of a point feature.

- Length and direction of a two-point line, as well as the elevation of each endpoint of said line.

- Total length of a polyline, as well as the length and direction from the start point to the end point of the polyline, and the elevation of each endpoint of said polyline.

- Radius, arc length, central angle, chord length and direction of a circular arc, and the elevations of the endpoints of said arc.

- Perimeter, area and elevation of polygons.

The direction is displayed in degrees, minutes and seconds to a tenth, and is expressed as an azimuth, bearing and Cartesian rotation. The area of a polygon is displayed in square feet (square meters) and acres (hectares).

When selecting a point or endpoint, this tool snaps to the nearest feature, if there is one, in accord with the setting of the point snapping property as set with the [AVcad Properties...] command.

To use this tool, the user should:

➤ 1   **Click** at the 🔁 *Echo geometric data of an element* tool.

➤ 2   **Click** in the ArcMap display at a point, two-point line, polyline, curve or polygon. Refer to Figure 6.

If the feature selection click is made where there is no nearby feature, the program informs the user in the status bar to select a feature. In this case repeat Step 2.

➤ 3   **Confirm, or not** the selection as indicated with Figure 1.

Having confirmed the selected feature, the program displays the appropriate information message box of Figures 7 through 11.
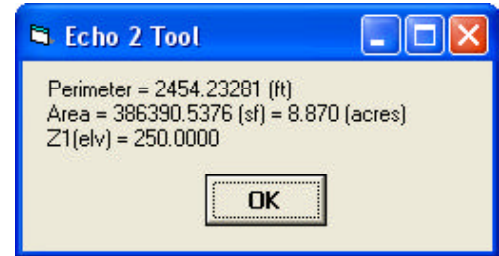
➤ 4   **Peruse** the information.

➤ 5   **Click** at the **OK** button to close the window.

The command remains active to repeat from Step 2.

3. Echo the Angle Formed by Three Points

At times it may be of interest to a user to determine the angle that is formed by three:
- Point features,
- Polyline endpoints, or
- Polyline or polygon vertices (see Figure 12).

To do so, the user should click at the 📐 *Echo the angle formed by three points* tool.

With this tool the user is able to click at three locations in the ArcMap display and echo the:

- X, Y and Z coordinates of each location.

- Length between the first and second location clicks.

- Length between clicks 1 and 2 and clicks 2 and 3.

- Central, external and deflection angles formed at the second location click by the other two location clicks. Interior and exterior arc lengths formed by a radius equal to the length between the first and second location clicks using the second location click as the center of an implied circular arc. Refer to Figure 12.
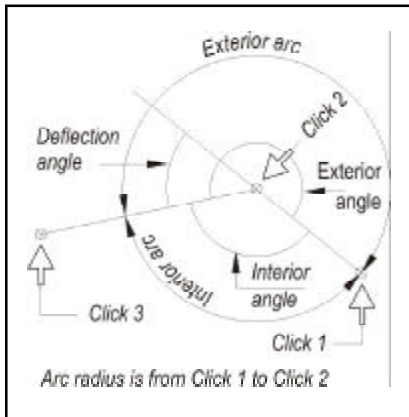

**Figure 12
Echo of Angle Formed by Three Points**

The angles are displayed in decimal degrees as well as in degrees, minutes and seconds to a tenth. The location of the three clicks may be at any point, endpoint, vertex or at any random location in the ArcMap display.

When selecting a point or endpoint, this tool snaps to the nearest feature, if there is one, in accord with the setting of the point snapping property as set with the [AVcad Properties...] command.

To use this tool, the user should:

➤ **1** **Click** at the 📐3 *Echo the angle formed by three points* tool.

➤ **2** **Click** in the ArcMap display at a point, endpoint, vertex, or anywhere in the display to denote the start point of an implied arc.

➤ **3** **Click** in the ArcMap display at a point, endpoint, vertex, or anywhere in the display to denote the center of an implied arc.

➤ **4** **Click** in the ArcMap display at a point, endpoint, vertex, or anywhere in the display to denote the end point of an implied arc.
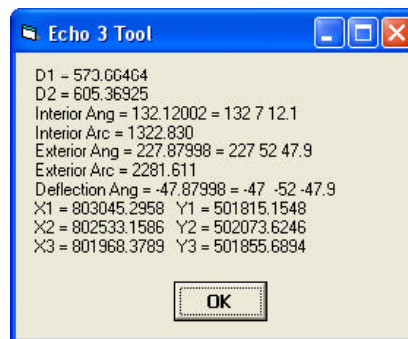

**Figure 13
Geometric Properties formed by Three Clicks**

A dialog box similar to that shown in Figure 13 will be displayed.

➤ **5** **Peruse** the information.

➤ **6** **Click** at the **OK** button to close the window.

The command remains active to repeat from Step 2.

4. Echo the Area and Perimeter of a String

Occasionally a user may wish to determine the perimeter and area of a polygon that is developed on the "fly" as they say, and not of an existing polygon. Shown in Figure 14 is a string of fea-

tures comprised of a polyline (shown in light blue), two two-point lines (shown in dark blue, and a circular arc (shown in brown), and forming a closed figure. To compute the area and perimeter of this figure, on the fly, the user may use the 🅰 *Echo area and perimeter of a string of features* tool.
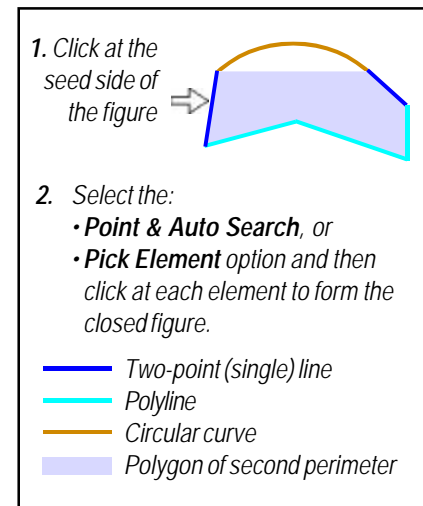

**Figure 14
Polygon of String of Elements**

With this tool the user may echo the area and perimeter of a closed figure comprised of a series of features defined in a manner similar to that of the 📐 *Establish offset element strings* tool. That is, the closed figure may be defined by clicking at the start feature (seed side) of the closed figure (feature string) and then selecting (see Figure 15):

- The *Point & Auto-Search* option to have the program trace the remaining sides of the figure, or

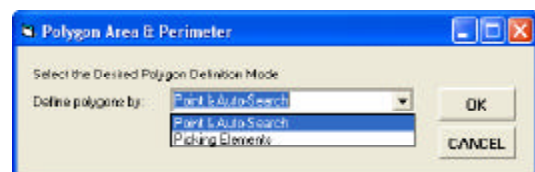- The *Pick Elements* option to have the user select each side individually.

**Figure 15
Method of Feature String Definition**

In addition to the display of the perimeter and area of the overall closed figure, the program displays another perimeter which is referred to as the *Sum of Segments in Distance Units.* If the closed figure contains any circular arcs, such as that shown in Figure 14, the latter value represents the perimeter of the figure comprised by the chords of the arc, that is, the perimeter of the blue area shown in Figure 14. If the closed figure is comprised of lines and polylines, both perimeter values will be the same.

This tool command makes use of the CEDRA-AVcad point snapping property.

To use this tool, the user should:

➤ 1   **Click** at the ⊞ *Echo area and perimeter of a string of features* tool.

➤ 2   **Click** in the ArcMap display at a line, polyline or curve feature to display the query dialog box of Figure 15.

➤ 3   **Scroll** down in the *Define Polygons by:* choice list, and select the:
   • *Point & Auto-Search* option to have the program trace the remaining sides of the figure,
   or
   • *Pick Elements* option to have the user select each side individually.

➤ 4   **Click** at the **OK** button to confirm the selection and continue,
   or
   click at the **Cancel** button to abort the command

Figure 16
Area and Perimeter of a Closed Figure of Elements

Having selected one of the two options, and clicked at the *OK* button, the operation for selecting the string of elements is the same as that of the ⊞ *Establish offset element strings* tool.

Upon confirmation of the string of elements that forms a closed figure, the program displays the information message box of Figure 16 containing the area of the overall figure is displayed in square feet (square meters) and acres (hectares), and the two perimeters, both of which are displayed in feet (m).

➤ 5   **Peruse** the information.

➤ 6   **Click** at the **OK** button to close the window.

The command remains active to repeat from Step 2.

5. Echo the Plus and Offset of a Point along a String

Now consider the case in which a user wants to know how far along a line, and how far away from it is a point located. The line could be a single line, circular arc or polyline, or a string of lines, arcs and polylines, and the point could be a point feature or an endpoint of a line feature.

Shown in Figure 17 is a string of features defined in a manner similar to that of the preceding tool . The start and the end of the string is dependent upon which feature is selected to be the seed feature. For this, refer to the note in Figure 17.

The offset distance of the point from the string is positive, if the point is to the right of the string, and it is negative if the point is to the left of the string. Again referring to the note of Figure 17, if the seed feature happened to be the other end of the string, the signs of the offset distances would be reversed.
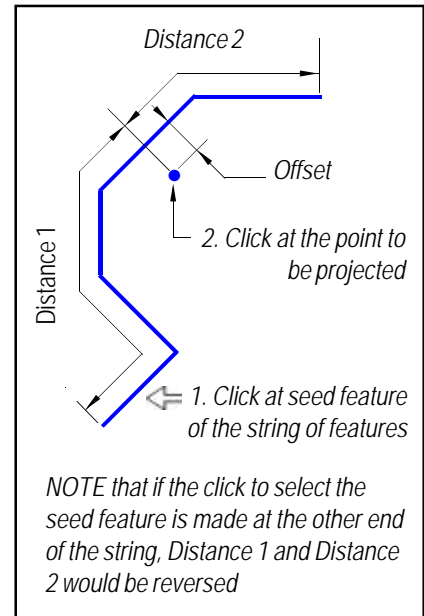

Figure 17
Plus and Offset from a String of Features

To compute the plus and offset distance of a point from a string of features the user should use the ⊟ *Echo the plus and offset of a point along a string* tool.

To use this tool the user should select the string of features in a manner similar to that of the ⊞ *Establish offset element strings* tool. That is, the string may be defined by clicking at the start feature (seed side) of the string and then selecting the:

• *Point & Auto-Search* option to have the program trace the remaining sides of the figure.

• *Pick Elements* option to have the user select each side individually.

• *Single Element* option if the string is to be comprised of only one feature.

The user may then select the point or endpoint for which the plus and offset distances are needed. To compute these two distances, the program projects the selected point or endpoint on each feature of said string.
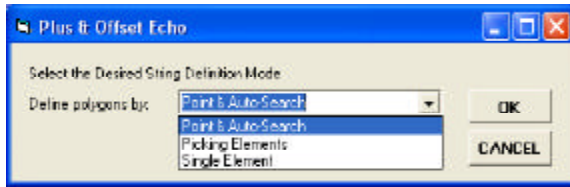
Figure 18
Method of Feature String Definition

This tool command makes use of the CEDRA-AVcad point snapping property.

To use this tool, the user should:

➤ **1**   **Click** at the ⊤ *Echo area and perimeter of a string of features* tool.

➤ **2**   **Click** in the ArcMap display at a line, polyline or curve feature to display the query dialog box of Figure 18.

➤ **3**   **Scroll** down in the *Define Polygons by:* choice list, and select the:
  • *Point & Auto-Search* option,
    or
  • *Pick Elements* option,
    or
  • *Single Element* option.

➤ **4**   **Click** at the **OK** button to confirm the selection and continue, or
    click at the **Cancel** button to abort the command

Having selected one of the three options, and clicked at the *OK* button, the operation for selecting the string of elements is the same as that of the 🔲 *Establish offset element strings* tool.

Upon confirmation of the string of elements, the user is informed in the status bar to select the point to be projected.

➤ **5**   **Click** in the ArcMap display at a point, endpoint or vertex of

a line, polyline, curve or polygon feature, or anywhere in the ArcMap display to project the selection click, or the endpoint or vertex nearest to the selection click onto the selected string of features and display the information message box of Figure 19.

Figure 19
Plus and Offset from a String of Features

Regarding this information message box reference is made to Figure 17 regarding the two distances. In this information message box the user should see the following information regarding the given string and point:

• The **Plus** distance corresponds to Distance 1 of Figure 17. That is the distance of the point of projection of the given point from the start point of the string, said start point being the endpoint of the seed feature.

• The **Offset** distance is the normal offset of the selected point from the string (positive to the right and negative to the left of the string).

• The **String Length** is the total length of the string.

• The **Distance from EndPoint** corresponds to

Distance 2 of Figure 17, and it is the supplement of the Plus distance. That is **Plus + Distance from EndPoint = String Length**.

➤ **6**   **Peruse** the information.

➤ **7**   **Click** at the **OK** button to close the window.

The command remains active to repeat from Step 5, where another click can be processed on the selected string.

Note:

When using the Pick Elements option, the string is terminated by selecting the last feature in the string a second time. A feature that is selected twice denotes the end of the string definition.

Summary

The CEDRA-Echo-Tools toolbar, together with the 🔀 *Move Feature Tool* of the Relocation Tools toolbar and the Map Tips Tool, 📝, in the CEDRA-DataEditor toolbar provide the user a variety of methods to quickly display geometric information about features and their relationship of one to another.

As always, should the reader have any suggestions on functionality that should be featured in Command of the Month, please feel free to forward them on to us.

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