

The CEDRA Corporation's COMMAND OF THE MONTH

A monthly information bulletin

June 2008

FEATURED COMMAND
A Special Line
Generation Tool



Application Description

We recently encountered a deed which described a parcel that began at a certain point, then traversed along a series of courses with bearings and distances until it came to what we will call point A. The parcel description proceeded as follows:

*“thence in a northeasterly direction a distance of 400 feet more or less to a point;
thence along a course of southeast 46 degrees, 50 minutes and 20 seconds a distance of 380 feet to a point;
thence in a southwesterly direction a distance of 600 feet more or less to a point;”*

which point let us call point B, and thereafter the parcel description continued with bearings and distances to the point of beginning.

Because of the vagueness of the 400 and 600 foot long courses, the deed cannot be transcribed in one pass with metes and bounds. Therefore, one has to start from the point of beginning, and proceed in one direction to locate point A, and the start from the point of beginning again and proceed this time backwards to locate point B.

At this point of the parcel transcription we have the condition presented in Figure 1. That is, we know the coordinates of A and B, the distance and direction of CD, and the distances AC and DB. Since we know the coordinates of A and B, we can inverse between them and find the distance and direction of BA. In essence we have a tetragon of which

we know its four sides, but none of its angles.

The CEDRA Solution

The solution to this problem would have been greatly facilitated had the deed described the 400' and 600' courses as being parallel. Had this been the case, the tetragon would have been at trapezoid with the CD course being its height, thus producing two right angles.

Since this is not the case, and since no one of the tetragon angles can be found, an iterative process tool has been created to solved this problem.

This tool is located at the bottom of the CEDRA-Line2-Tools toolbar shown in Figure 2.

Command Of The Month bulletin

This month's issue discusses the use of a new tool that generates a line by intersecting two circular curves with a known bearing and distance.

As indicated in Figure 3, there are two possible solutions. Therefore, the program makes an initial assumption, and asks the user for confirmation. If the user rejects the first solution, then the program tries to create the alternate solution.

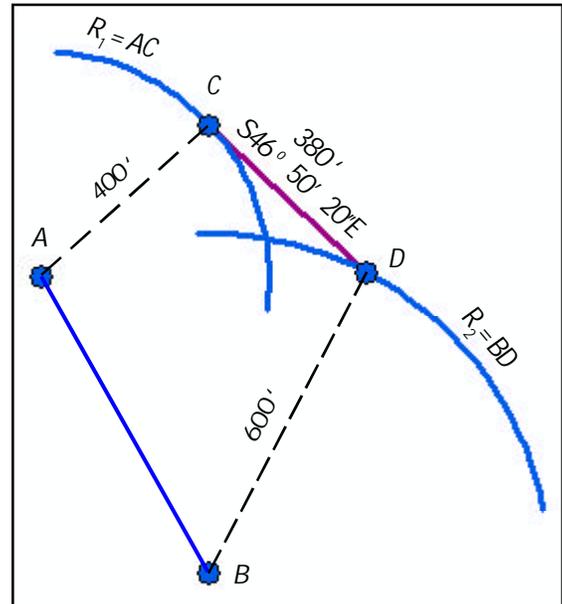
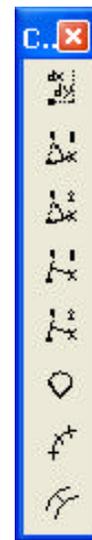
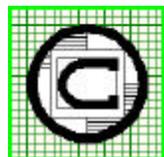


Figure 1
The Tetragon Problem



- Lines with dX and dY with or without traversing
- Lines with angle and distance from a baseline - Two point picks
- Lines with angle and distance from a baseline - Three point picks
- Lines with plus and offset along a baseline - Two point picks
- Lines with plus and offset along a baseline - Three point picks
- Draw radial lines to the PC and PT of an arc
- Degenerate a curve into chord line segments and ticks
- Intersect two curves with bearing and distance

Figure 2
The CEDRA-Line2-Tools Toolbar



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Use of the Tool

To use the  [Intersect two curves with bearing and distance] tool, the user should first create the points A and B transcribing the courses as described in the preamble to this problem with the aid of the appropriate CEDRA-AVcogo tools. Optionally the user may create a circle about points A and B with the corresponding radius. Having done this, the user should.

➤ **1** Click the  [Intersect two curves with bearing and distance] tool.

➤ **2** Click in the ArcMap display at a point or at a circular.

If this feature selection click is:

- Not made near any feature, the user is prompted in the status bar to select the first curve, in which case repeat the above step.
- Made at a feature, the conventional CEDRA feature confirmation query box is displayed.

➤ **3** Confirm, or not the selection.

If confirmation is given to any feature type other than that of a point or circular arc, the user is prompted in the status bar to select the first curve, in which case repeat Step 2.

At this point, the operational steps deviate depending on whether a point or a curve has been selected.

- If a point feature has been selected, continue with the next step.
- If a circular curve has been selected, go to Step 6 below.

➤ **4** Enter in the *Enter Curve #1 Radius - ft (m)*: data field the **length** of the first course of which the distance, but not the direction, is known, see Figure 4.

➤ **5** Click at the **OK** button to continue, or click at the **Cancel** button to abort the command.

➤ **6** Repeat Steps 2 and 3, and possibly Steps 4 and 5 if appropriate, to specify the second course of which the distance, but not the direction, is known.

Having specified both courses of which their length are known, the multi-input dialog box of Figure 5 is displayed to introduce the course having a known length and direction.

It should be noted that when specifying the direction of this course, it should follow the rotational direction of the selection of the preceding two courses. For example:

- If the course AC (see Figure 1) is selected first, and the course DB (see Figure 1) is selected second, thus proceeding in a clockwise rotation, then the direction of the CD course should be from point C towards point D.
- If the AC and DB courses are selected in the reverse sequence, then the direction of the CD course should be from point D towards point C.

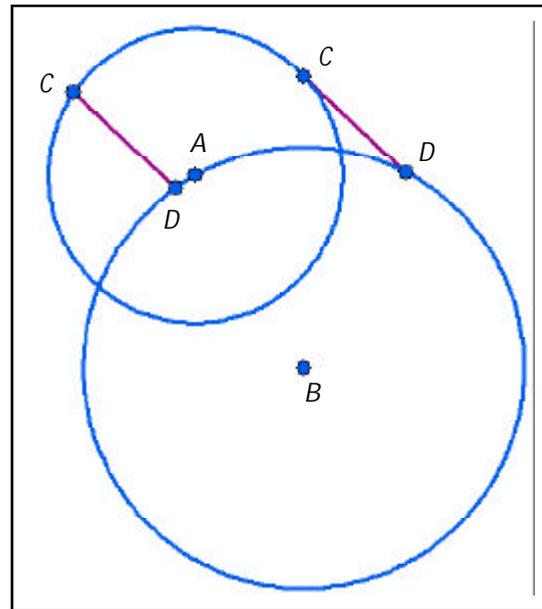


Figure 3
Two Alternate Solutions

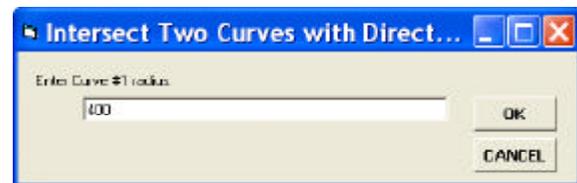


Figure 4
Input Dialog Box to Specify a Curve Radius

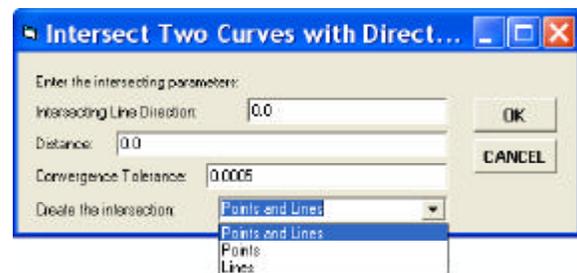


Figure 5
Input Dialog Box for the Entry of the Known Course

➤ **7** Enter in the *Intersecting Line Direction*: data field the **direction** of the course having the known direction and length noting the preceding commentary.

➤ **8** Enter in the *Distance - ft (m)*: data field the **length** of the course having the known direction and length.

- **9** Enter in the *Convergence Tolerance*: data field the desired **tolerance** at which the iterative process is to stop, or **Accept** the displayed **default** value.

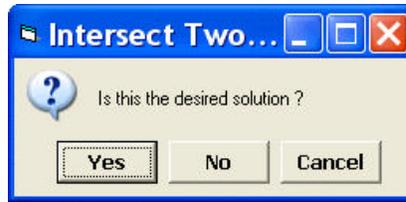


Figure 6
Query to Accept a Solution

- **10** Scroll down in the *Create the intersection*: data field, and select the:
 - **Lines** option to create the lines that represent the courses AC, CD and DB of Figures 1 and 3.
 - **Points** option to create point features at the C and D points of Figures 1 and 3.
 - **Points and Lines** to create both points and lines as identified above.
- **11** Click at the **OK** button to continue, or **click** at the **Cancel** button to abort the command.

Having clicked at the *OK* button, the program computes the first of the two solutions, and displays two small red crosses at the location of the said points C and D denoting their location. In addition the program displays the query dialog box of Figure 6 asking whether their position is desirable, or not.

- **12** Click at the **Yes** button to accept the solution and display the specified points, lines or both, or **click** at the **No** button to cause the program to try the other solution and display again the query dialog box of Figure 6, or **click** at the **Cancel** button to abort the command.

Clicking at the *No* button repeats the query until the *Yes* or *Cancel* button is clicked.

Note that depending on the position of points A and B, the size of courses AC and DB, and the length and direction of course CD, a solution may not converge within the specified tolerance, and number of trials imposed by the program.

The maximum number of trials is fixed at 8000. This value should be sufficiently large enough to determine a solution, provided one exists. Convergence is based upon the computed distance being within the user-specified tolerance of the user-specified distance. In equation form this is represented by:

$$\text{Abs}(\text{userDis} - \text{aDis}) \leq \text{userTol}$$

where, *userDis* is the length of the course entered by the user in the data field to the right of the *Distance* label in Figure 5, and *userTol*, the convergence tolerance, see Figure 5.

Notes

- a. The point and line features created by this tool are stored in the current active layer.
- b. If a solution can not be determined a warning message to this effect is displayed. In this case, check the bearing and distance values specified in Figure 5, or alter the convergence tolerance value, increasing the value.

Summary

This tool has been recently added and users with a software support agreement should check with The CEDRA Corporation on how to obtain a software update so as to be able to use this new tool.

Users coming across geometric problems that are not easily solved with the tool already present in CEDRA software should feel free to discuss these problems with CEDRA. More than likely a tool can be modified, or as in this case, created to handle the particular situation.

As always, should the reader have any comments or suggestions they should feel free to forward them 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.

