

the HP 35s calculator

A Field Surveyor's Companion

Part 10—Distance Dependent Intersections

Distance dependent intersections are complimentary tools for the retracement surveyor. When contemplating intersection methods one should consider whether or not the values were actually measured in the field. Such might be the case with a radius point for example.

Last month we covered direction/direction intersection which is a well suited application for retracing linear measurements. Curve data is a derivative of the intersections of the tangent lines. Holding the bearing/bearing intersection of the monumented lines recreates a p.i. that places you very close to the position of the transit man during the original survey. The observed deflection between these intersected tangents IS THE REAL DELTA! Both ends of the curve are either found or replaced as originally set on these intersected lines. The retracement function is fulfilled through a recapitulation of physical evidence presented on the ground.

A strong application of distance/distance intersection is found among swing ties or cross ties physically measured from reference marks to monuments or from property corners to building corners. These are direct measurements from known points and a great demonstration of rope stretching to the Courts.

I don't think much in terms of direction/distance intersections in retracement work. There is a platted mirage at the "end lots" of a block that can appear like the intersection of a directional right-of-way line and an end lot distance. Exhaust without doubt every shred of physical evidence before using a direction/distance intersection. If itching and rash persist induce vomiting and call your physician immediately.



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A Few Thoughts On Constructing Radius Points

Distance/distance intersections often yield inconsistency among the ground evidence affixing curvilinear boundaries and create tension in the opinions of the paper minded surveyor. Considering the legacy knowledge that curves were originally placed on the ground by measuring the deflection angle, the tangent length, and the chord distance, evidentiary weight of a calculated radius point is severely disjointed from those implicit facts of conventional measurement. The original surveyor measured along the curve naturally shedding imprecision and error linearly through the curve. Neither his path nor measurements extended to a radius point. A computed radius offers zero contradictory evidence to upset the original work measured ALONG the line. The retracement surveyor will find more comfort in working lineally through the curve holding bona fide evidence found on the ground.

Please do not hesitate to send any comments, concerns, questions, or criticism to rls43185@gmail.com.

This Month's Program

Program L: Intersections includes routines for Direction/Direction, Direction/Distance, and Distance/Distance. The program operates by assuming a base line from the first point to the second point. Direction/Distance and Distance/Distance naturally have 2 solutions. The preferential solution may be defined as being left or right of the line facing the second point.

This month we will focus on Direction/Distance and Distance/Distance examples

Example Data And Running The Program

We will reference our previous data set as follows:

PNT	NORTH	EAST
1	4,680.20	4,917.12
3	5,267.15	5,517.46
4	5,267.06	5,186.98
5	5,000.00	5,000.00
1-5	N 14°31'45" E	330.36
3-4	S 89°59'04" W	330.48

DISTANCE/DISTANCE

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
XEQ yX ENTER	Y-reg : X-reg : INTERSECTIONS	Executes program {L} and displays program annunciator. note: the "L" key is between the square root and reciprocal keys. It is the "Y" raised to "X" function key.
R/S	Y-reg: X-reg: RCL POINT	Annunciator/reminder. RCL input to follow.
R/S	Y-reg: J? X-reg: default value	Prompt for first point number.
1 R/S	Y-reg : (1)= X-reg : 4,680.20 i 4,917.12	Display point info for review.
R/S	"RUNNING" then Y-reg : X-reg : RCL POINT	Annunciator/reminder. RCL input to follow.
R/S	Y-reg: J? X-reg: default value	Prompt for second point number.
3 R/S	Y-reg : (3)= X-reg : 5,267.15 i 5,517.46	Display point info for review.
R/S	"RUNNING" then Y-reg : X-reg : AZ-AZ PRESS 0	Prompt for Azimuth/Azimuth intersection. Directly press 0 R/S to proceed to AZ-AZ or hit any key(except zero) R/S to continue menu choices. The routine is set up with a default value that permits simply hitting R/S to continue.
ANY KEY R/S	Y-reg : X-reg : DS-DS PRESS 0	Prompt for Distance/Distance intersection. Directly press 0 R/S to proceed to DS-DS or hit any key(except zero) R/S to continue menu choices. The routine is set up with a default value that permits simply hitting R/S to continue.
0 R/S	Y-reg : X-reg : DIST-DIST	Annunciator DIST-DIST
R/S	Y-reg : X-reg : 1ST DIST	Annunciator/reminder. 1st point distance input to follow.
R/S	Y-reg : D? X-reg : default value	Prompt for distance from first point.
586.95 R/S	"RUNNING" then Y-reg : X-reg : 2ND DIST	The "RUNNING" may take a minute then annunciator for 2nd point distance.
R/S	Y-reg : D? X-reg : default value	Prompt for distance from second point.

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
600.34 R/S	"RUNNING" then Y-reg : X-reg : -LT OR +RT	Annunciator/prompt selecting the appropriate solution relative to the baseline. Left of the line is minus key - and right is plus key + . A default value will be displayed between keying + or - and R/S .
- R/S	Y-reg : X-reg : STORE PNT	Annunciator for point storage
R/S	Y-reg : J? X-reg : default value	Prompt for store point.
8 R/S	Y-reg : (8)= X-reg : 5,267.15 i 4,917.12	Display point info for review. *This is the left - solution as selected above. The right + solution is 4,666.96 i 5,503.92
R/S		Return to program top.

DIRECTION/DISTANCE

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
XEQ yX ENTER	Y-reg : X-reg : INTERSECTIONS	Executes program {L} and displays program annunciator. note: the "L" key is between the square root and reciprocal keys. It is the "Y" raised to "X" function key.
R/S	Y-reg: X-reg: RCL POINT	Annunciator/reminder. RCL input to follow.
R/S	Y-reg: J? X-reg: default value	Prompt for first point number.
1 R/S	Y-reg : (1)= X-reg : 4,680.20 i 4,917.12	Display point info for review.
R/S	"RUNNING" then Y-reg : X-reg : RCL POINT	Annunciator/reminder. RCL input to follow.
R/S	Y-reg: J? X-reg: default value	Prompt for second point number.
3 R/S	Y-reg : (3)= X-reg : 5,267.15 i 5,517.46	Display point info for review.
R/S	"RUNNING" then Y-reg : X-reg : AZ-AZ PRESS 0	Prompt for Azimuth/Azimuth intersection. Directly press 0 R/S to proceed to AZ-AZ or hit any key(except zero) R/S to continue menu choices. The routine is set up with a default value that permits simply hitting R/S to continue.

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
ANY KEY R/S	Y-reg : X-reg : DS-DS PRESS 0	Prompt for Distance/Distance intersection. Directly press 0 R/S to proceed to DS-DS or hit any key(except zero) R/S to continue menu choices. The routine is set up with a default value that permits simply hitting R/S to continue.
R/S	Y-reg : X-reg : AZ-DS	Annunciator AZIMUTH-DIST
R/S	Y-reg : X-reg : AZ FRM 1ST PNT	Annunciator/reminder. 1st point azimuth input to follow. The first point is always and only the azimuth point.
R/S	Y-reg : A? X-reg : default value	Prompt for azimuth from first point.
45.0000 YLS 8 R/S	Y-reg : X-reg : DIST 2ND PNT	Annunciator for 2nd point distance. The second point is always and only the distance point.
R/S	Y-reg : D? X-reg : default value	Prompt for distance from second point.
250 R/S	"RUNNING" then Y-reg : X-reg : DIST A-AZ PNT	Annunciator for resulting distance along azimuth line.

KEYSTROKE STEPS	RESULTANT DISPLAY	ACTION
R/S	Y-reg : 589.72 X-reg : 589.72	1st solution distance along azimuth line from POB.
R/S	Y-reg : X-reg : DIST B-AZ PNT	
R/S	Y-reg : 589.72 X-reg : 1,089.36	Y-reg is 1st solution distance. X-reg is 2nd solution distance.
R/S	Y-reg : X-reg : SAVE A=0 B=1	Annunciator/prompt to save "A" solution or "B" solution.
0 R/S	Y-reg : X-reg : STORE PNT	Annunciator for point storage
R/S	Y-reg : J? X-reg : default value	Prompt for store point.
9 R/S	Y-reg : (9)= X-reg : 5,097.20 I 5,334.12	Display point info for review. The 1st solution is shown. The 2nd solution is 5,450.49 i 5,687.41.
R/S		Return to program top.

Jason Foose is the County Surveyor of Mohave County Arizona. He originally hails from The Connecticut Western Reserve Township 3, Range XIV West of Ellicott's Line Surveyed in 1785 but now resides in Township 21 North, Range 17 West of the Gila & Salt River Base Line and Meridian.



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