# Mapping Transects Based on GPS Points, Azimuth, and Distance in ArcView 3.2

This instruction set will help you produce polyline themes to map transects based on extending a line from GPS points based on a specified distance and azimuth. In the example given here two methods are shown:

- Two endpoints are connected;
- A center point location is extended 50 meters in opposite directions.

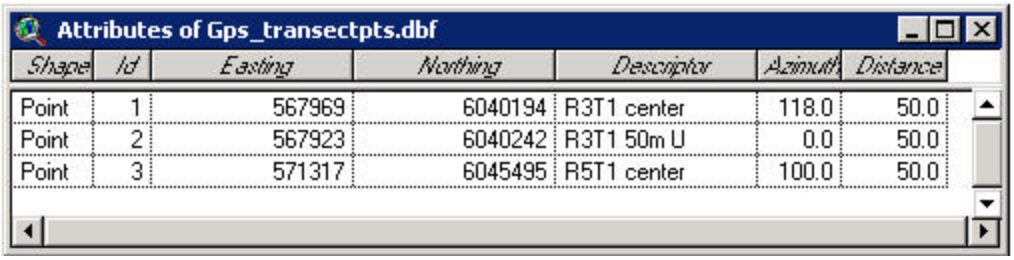
These instructions may be adapted for any application where you need to find out the distances and/or bearings (azimuths) among point features, but apply specifically to mapping transects from endpoints and center points provided by GPS coordinates. The following is meant to guide you through the five-step process using ArcView and the appropriate extensions:

A. Establish an ArcView project with appropriate extensions
B. Create themes from the GPS point data
C. Determine the distance and azimuth between two points and create a polyline theme for the transect between two endpoints
D. Create a polyline theme for a transect extended from a center point

The example file names used here are:

## ORIGINAL DATA THEMES

**Gps_transectpts.dbf** a dBase file containing XY information (i.e. Easting, Northing) with ID, Azimuth, Distance, and Descriptor fields



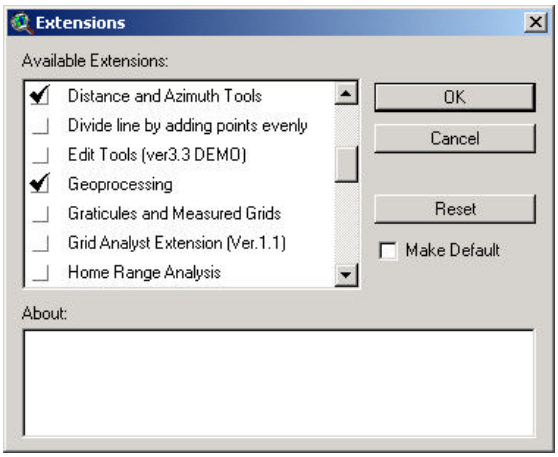

| Shape | Id | Easting | Northing | Descriptor | Azimuth | Distance |
|---|---|---|---|---|---|---|
| Point | 1 | 567969 | 6040194 | R3T1 center | 118.0 | 50.0 |
| Point | 2 | 567923 | 6040242 | R3T1 50m U | 0.0 | 50.0 |
| Point | 3 | 571317 | 6045495 | R5T1 center | 100.0 | 50.0 |

## CREATED DATA THEMES

**R3T1.shp** a point shapefile resulting from selecting two endpoints
**R3T1connect.shp** a polyline shapefile resulting from connecting R3T1.shp
**R5T1.shp** a point shapefile resulting from selecting the center point
**R5T1extend.shp** a polyline shapefile resulting from extending 50 meters outward from R5T1.shp

## *A. Establish an ArcView Project and Activate Required Extensions*

When launching a new view in an ArcView project, it's always a good idea to set your map and distance units straight away, before adding themes.




1. Open ArcView and create a new project with a new View. Do not add data at this time
2. Highlight the View window
3. Choose FILE → SET WORKING DIRECTORY
4. Enter the path to where the data will be stored
5. Choose VIEW → PROPERTIES and set Map Units and Distance Units (e.g. meters, if your .dbf file of point locations are UTM coordinates)
6. Choose FILE → EXTENSIONS
7. Click on the check box next to the following extensions:
   - **Distance and Azimuth Tools**
   - **Geoprocessing**
   - **Nearest Features**
8. Click OK
9. Choose FILE → SAVE PROJECT AS… enter a name and save the project into the working directory

*You may need to navigate to your personal directory since the default directory may not be the directory in which you want to store your data.*

## *B. Create Themes from the GPS Point Data*


### Part 1: Add Event Theme of All Point Data

Any new point theme based on a table of XY data can be created in this manner. In this case, **Gps_transectpts.dbf** has Easting as the X field, and Northing as the Y field.

1. Highlight the Project window
2. Choose PROJECT → ADD TABLE from the Project menu

3. From the Add Table window navigate to the directory where your .dbf table file is stored
4. Choose the proper file type under List Files of Type: (e.g. dBase *.dbf)
5. Select your file (e.g., **Gps_transectpts.dbf**) and click OK
6. Highlight the View window
7. Choose VIEW → ADD EVENT THEME
8. Under Table select your point file: Animal.txt
9. Select the X (e.g. Easting) and Y (e.g. Northing); Click OK

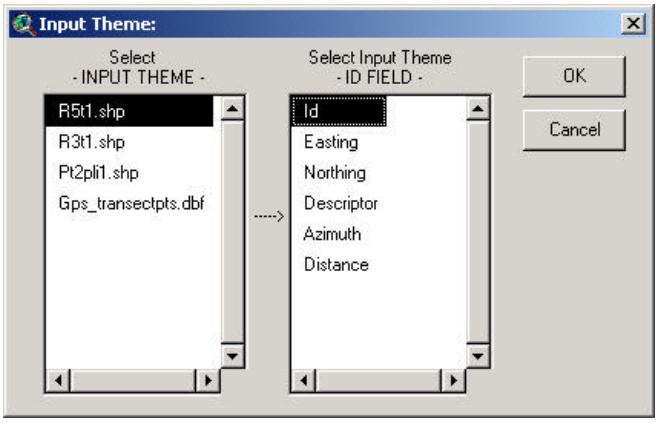
*A new point theme is added to the view. Display the points by checking on the box next to the theme name in the View window.*

### Part 2: Convert Selected Point Data to Shapefiles

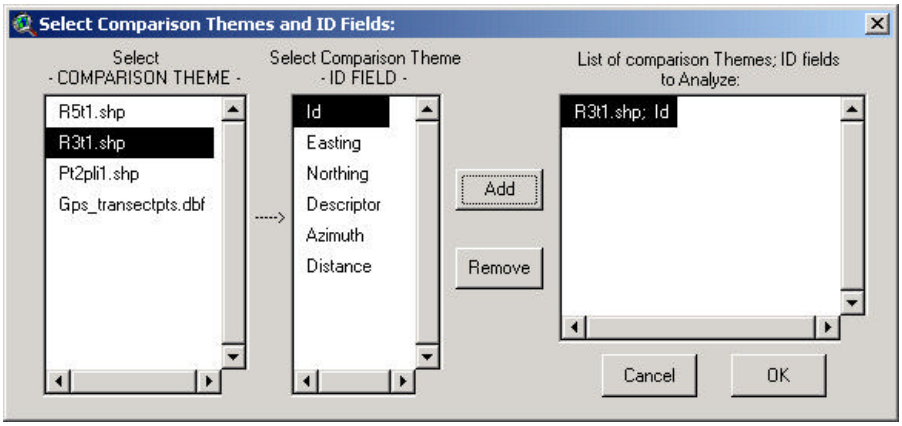
In this step, you will separate out the point features for making different types of transects.

10. Use the SELECT FEATURE tool, or interactively select the points of interest from the table.
11. Select the single center point having the Descriptor attribute "***R5T1 center***"
12. Choose THEME → CONVERT TO SHAPEFILE…
13. In the next menu assign a directory and name for the point shapefile that will be created (e.g. **R5T1.shp**); Click OK
14. Deselect the point by choosing THEME → CLEAR SELECTED FEATURES
15. Select the two end points having Descriptor Attribute "***R3T1***"
16. Convert to shapefile in the same manner as above, but give this new file a new name (e.g. **R3T1.shp**)

## *C. Determine the Distance and Azimuth Between Two Points and Create a Polyline Theme for the Transect Between Two Endpoints*



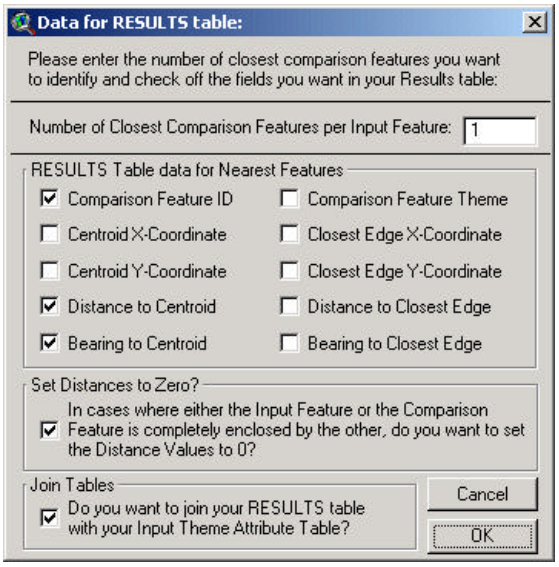

1. Make **R3T1.shp** the active theme
2. Click on the NEAREST FEATURES icon
3. Select the input theme (**R3T1.shp**) and ID field (Id); Click OK
4. Select the comparison theme (**R3T1.shp**) and ID field (Id); Click Add then click OK

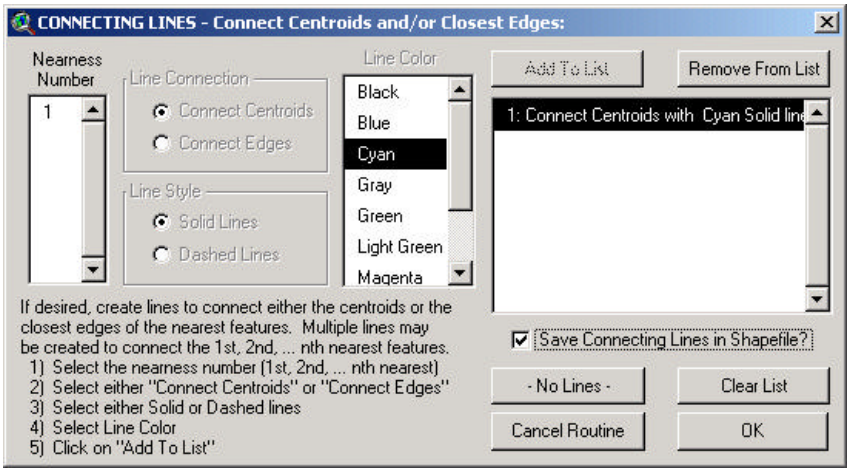



5. In the next menu check off the fields you want:
    - *Comparison Feature ID*
    - *Distance to Centroid*
    - *Bearing to Centroid*
    - And select that you want to *Join Tables*;

    Click OK
6. In the next menu select the following:
    - Nearness Number *1*
    - Leave everything as defa ult and select a line colour
    - Click on the “Add to List” button
    - Check “Save Connecting Lines in a Shapefile?”

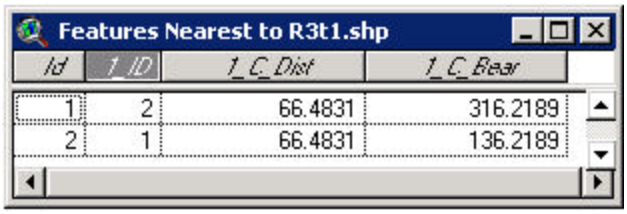
    Click OK



7. Provide a new name for the results table (e.g. **r3t1result.dbf**) and for the new polyline shapefile (e.g. **r3t1connect.shp**)

*The results table shows the distance between the two points ID 1 and ID 2 (**1_C_Dist**); this is the same for between each point feature. The azimuth or bearing (**1_C_Bear**) differs between features because of the difference in direction.*

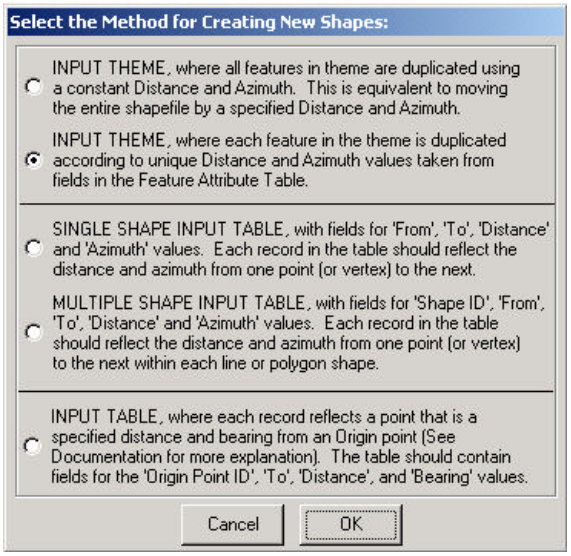


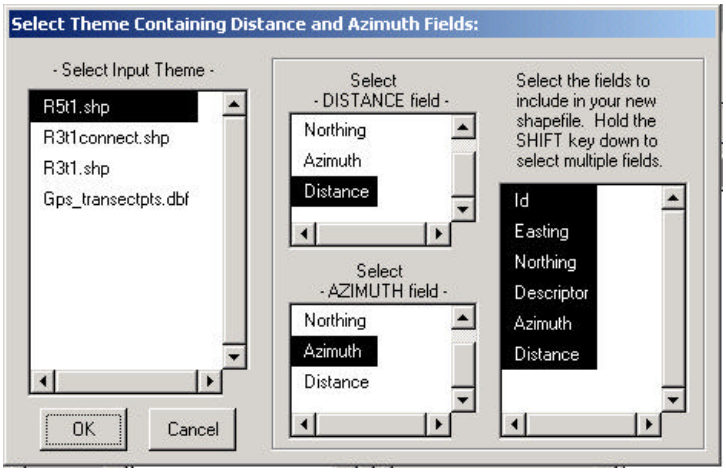

## *D. Create a Polyline Theme for the Transect Extended From a Center Point*

There are three parts and two different methods to this part, which can be used interchangeably: the first is where you extend the transect to a point given by the Distance and Azimuth fields in the attribute table to create the first endpoint; the second is where you specify the Distance and Azimuth to get the opposite endpoint; and the third is where you combine the two endpoints so you can connect the transect.

### Part 1: Create First Endpoint – Extend the Transect Based on Distance and Azimuth Fields in The Attribute Table

1. Make **R5T1.shp** the active theme (you may need to display and zoom in)
2. Click on the DISTANCE/AZIMUTH TOOLS button 
3. Select INPUT THEME where Distance and Azimuth are taken from the attribute table (default); Click OK
4. Select the Input Theme (e.g. **R5T1.shp**), Distance and Azimuth fields, and any of the original table's fields you want included in the new shapefile; Click OK

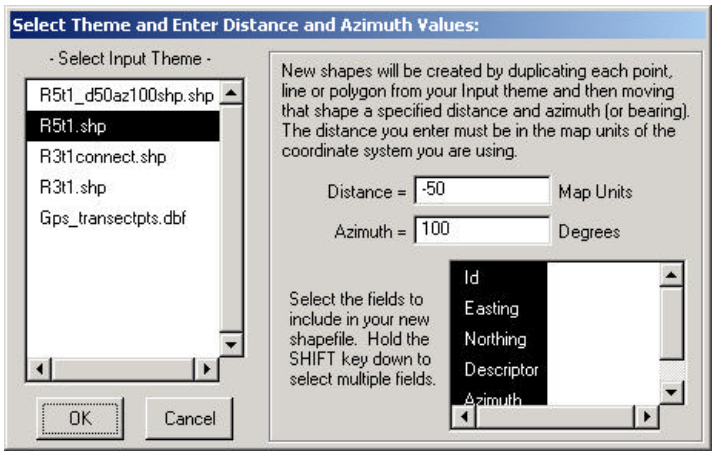





5. In the next menu provide a name for the new point shapefile (e.g. **r5t1_d50az100.shp**)

## Part 2: Create Opposite Endpoint – Extend the Transect Based on Specified Distance and Azimuth

6. Make **R5T1.shp** the active theme again
7. Click on the DISTANCE/AZIMUTH TOOLS button
8. Select INPUT THEME where Distance and Azimuth are specified (first choice in the menu); Click OK
9. Select the Input Theme (e.g. **R5T1.shp**) and enter the following:
    - Distance = ***-50*** (so the distance is extended in the *opposite* direction to the first endpoint; works the same as adding 180 degrees to the original azimuth)
    - Azimuth = ***100***
    - Select any of the original table's fields you want included in the new shapefile
    - Click OK



10. In the next menu provide a name for the new point shapefile (e.g. **r5t1_d-50az100.shp**)

*Display all three point shapefiles by making all three active (hold the shift key and click on each theme name); and then clicking on the Zoom to Selected Themes button.*

## Part 3: Combine the Endpoints into One Shapefile

11. Choose VIEW → GEOPROCESSING WIZARD
12. Select MERGE THEMES TOGETHER and click Next >>
13. Select both the new shapefiles you just created in Parts 1 and 2 (e.g. **r5t1_d50az100.shp** and **r5t1_d-50az100.shp**)
14. Specify the output file name (e.g. **R5T1extend.shp**)
15. Click Finish

*Now you can create the polyline theme using the NEAREST FEATURES tool as in **Part C**.*