Measuring Distances Between Centroids using ArcView 3.2

This instruction set shows you how to make automated measurements of distances between centroids. In the example given here, map polygons are the original data themes provided for the geoprocessing and calculation of the distance matrix

These instructions may be adapted for any application where you need to find out how far particular polygons centers are from each other, but apply specifically to obtaining the pair wise distances between the subunits of a polygon map. The following is meant to guide you through the five-step process of obtaining the polygon centroids and distances, using ArcView and the appropriate extensions:

A. Establish an ArcView Project
B. Create map polygons by table editing and dissolving
C. Determine the weighted centroids
D. Edit the table
E. Calculate the distances between centroids

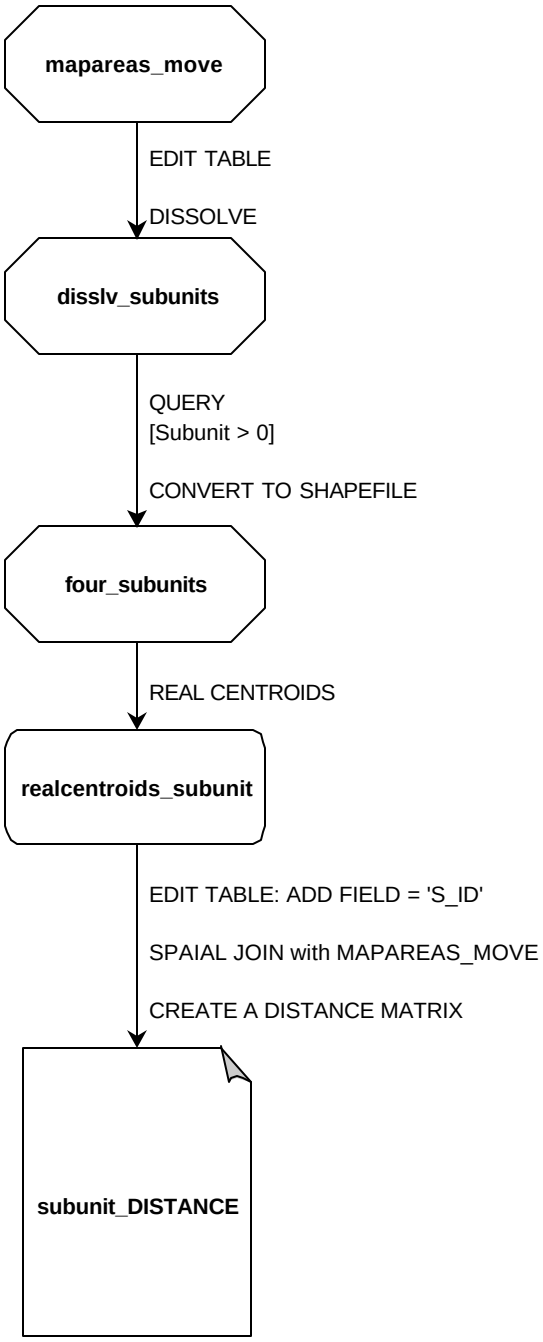
The example file names used here are:

ORIGINAL DATA THEMES

Mapareas_move.shp a polygon shapefile containing the subunits

CREATED DATA THEMES

Subunits.shp	a polygon shapefile resulting from editing the table of Mapareas_move.shp and All_season1_lscvkernels.shp
Disslv_subunits.shp	a polygon shapefile resulting from dissolving Subunits.shp based on the Subunit attribute
Four_subunits.shp	the extraction of the four subunit polygons from Disslv_subunits.shp
Realcentroids_subunits.shp	the point shapefile resulting from calculating the real (bary weighted) centroid of Four_subunits.shp
Distance_realsubunits.dbf	A dBASE table generated from the Distance Matrix on the Realcentroids_subunits.shp point theme



A. Establish an ArcView Project

It is assumed that you are already familiar with basic GIS functions in ArcView (displaying themes and editing tables) and that you have already assembled your polygon map layer.

1. Establish your ArcView project (i.e. add the required data themes to a View, set the map and distance units in View Properties, set the Working Directory, etc.)
2. Choose FILE → EXTENSIONS and add the following extensions:

Geoprocessing Wizard
Real Centroid
Distance Matrix of Point Features

B. Create Map Polygons by Table Editing and Dissolving

Part I: Table Editing

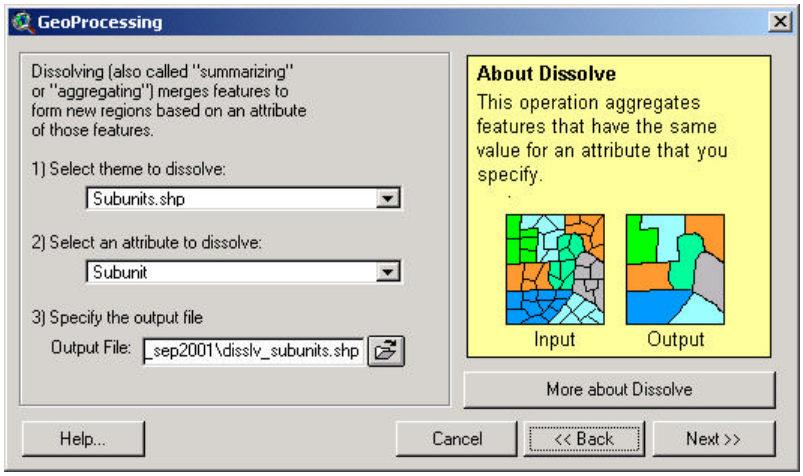
1. In FILE → MANGAE DATA SOURCES… make a copy of **Mapareas_move.shp** and rename it to **Subunits.shp**
2. Add **Subunits.shp** to the View and make it the active theme
3. Choose TABLE → START EDITING
4. Change any of the island polygons within the major subunits to the same *Subunit* attribute code as the surrounding polygons

While the table and view are open, use the Select Feature tool in the View to click on the island polygons. ArcView interactively highlights the polygon in the view and the record in the table. This interactive selecting is useful to determine which records to modify.

5. Choose TABLE → STOP EDITING and click '*Yes*' to save edits
6. Close the table and open the View

Part II: Dissolving Polygons Based on Attributes

7. Choose VIEW → GEOPROCESSING WIZARD
8. Select *Dissolve features based on an attribute*; Click Next
9. Select theme to dissolve – *Subunits.shp*
10. Select an attribute to dissolve – *Subunit*
11. Specify a directory and name for the new polygon theme that will be generated (e.g. **Disslv_subunits.shp**); Click Next
12. Ignore the next window and click Finish



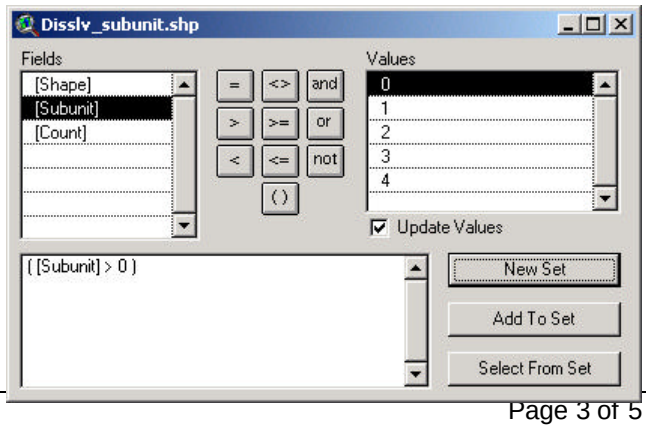
13. Add the new theme to the View

C. Determine the Weighted Centroids

Real centroids are based on bary weighting of the polygon shape (as opposed to the geographic extent based on the coordinates). The Real Centroids extension cannot handle polygons containing islands (that is why you needed to recode attributes in the *Subunit* field before dissolving). However, *Subunit* 0 encompasses the other 1, 2, 3, and 4. To remove this polygon, simply select the other four and convert to a new shapefile and then the centroids can be generated.

Part I: Isolate the polygons of interest

1. Make **Disslv_subunits.shp** the active theme
2. Choose THEME → QUERY
3. Select [*Subunit* > *0*] and click Add to New Set
4. Choose THEME → CONVERT TO SHAPEFILE…
5. Specify a directory and name for the new polygon theme that will be



generated (e.g. **Four_subunits.shp**); Click OK

Part II: Generate centroids

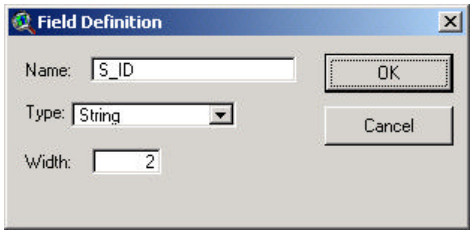
6. Make **Four_subunits.shp** the active theme
7. Click on the Real Centroids button 
8. Highlight the new point theme **Realcentroids.shp**
9. Choose THEME → CONVERT TO SHAPEFILE…
10. Specify a directory and name for the new polygon theme that will be generated (e.g. **Realcentroids_subunits.shp**); Click OK

D. Edit the Table

Table editing must be performed since a string field is required as the ID field used in the matrix that calculates distances between centroids in Part E.

1. Open the ***Attributes of Realcentroids_subunits.shp*** table
2. Choose TABLE → START EDITING
3. Choose EDIT → ADD FIELD…
4. Add a String field named '*S_ID*' with a width of 2
5. Click on the Edit Tool and then click on the first empty *S_ID* cell
6. Enter the following to correspond to the Subunit field:

Subunit	S_ID
1	aa
2	bb
3	cc
4	dd

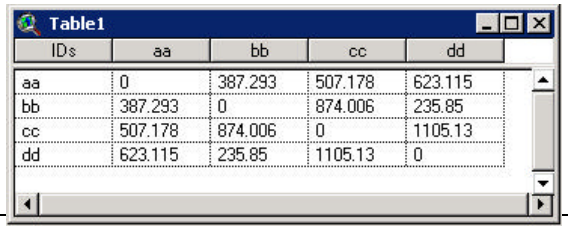


7. Choose TABLE → STOP EDITING
8. Save and close the table

E. Calculate the Distances Between Centroids

1. In the View window, click on the Create a Distance Matrix button 
2. Select **Realcentroids_subunits.shp** as the input theme
3. Select *S_ID* as the ID field
4. Specify a directory and name for the dBASE table that will be generated (e.g. **Distance_realsubunits.dbf**); Click OK

Table 1 *will open to show you what your distance matrix looks like. You can open the* ***Distance_realsubunits.dbf*** *table in Excel to do any manipulations.*



IDs	aa	bb	cc	dd
aa	0	387.293	507.178	623.115
bb	387.293	0	874.006	235.85
cc	507.178	874.006	0	1105.13
dd	623.115	235.85	1105.13	0