Spatial Adjustment of Vector Data using ArcMap 9

Introduction

If two datasets have a defined coordinate system but are in different projections, ArcMap has the ability to re-project on the fly so that the two datasets can be used together. But this is not possible if one of the datasets does not have a defined coordinate system. This, in turn, leads to problems when dealing with data that must be aligned. In order to assign proper coordinates to a pre-existing vector dataset it must be spatially adjusted. This guide will cover two ways in which this process can be accomplished.

The first method makes use of the Spatial Adjustment toolbar and is very similar to georeferencing a raster dataset. The second method involves using the Move command from the editor toolbar. Using Move only works if the data does not need to be scaled, skewed, or rotated in any way.

This guide will make use of two types of data. The first is an ortho-photo of the Kitchener/Waterloo/Cambridge tri-city area. This file has a known coordinate system (UTM 17N NAD83) and is therefore going to be used as our control layer. The second file is an outline of the buildings on campus with no coordinate system.

Adjustments using the Spatial Adjustment toolbar

1. Click on File→Add Data and select the control layer.  
   Note: The control layer is the layer with the known coordinates
2. Click on File→Add Data and select the dataset to be adjusted
3. Turn on the Editor toolbar by clicking on View→Toolbars→Editor. Begin editing the dataset by selecting Editor→Start Editing
4. Turn on the Spatial Adjustment toolbar by clicking on View→Toolbars→Spatial Adjustment
5. Make sure the projection of the data frame is the same as the control layer. Right-click on Layers ➔ Properties ➔ Coordinate System and select the appropriate definition.

6. Click on the New Displacement Link button to start adding links between the two datasets.

7. Zoom to the unreferenced dataset and select a location by left-clicking. Zoom to the control layer and select the same location. This will create a link between the two datasets.

   Tip: Use the magnification tool Window ➔ Magnification in order to achieve a more accurate link.

8. Repeat Step 7 until enough links have been created (the number of links will depend on the size and type of features present in the dataset).
9. Note the RMS error in the **Spatial Adjustment**Æ**Links**Æ**View Links Table** dialogue. The RMS error is a measure of accuracy and a lower number is better. Typically an RMS error of less than or equal to half the pixel size of the control layer is acceptable, however, it is somewhat subjective. Use your own discretion when dealing with error levels

10. Once all the links have been created and the RMS error is at an acceptable level, the adjustment can be made. Click **Spatial Adjustment**Æ**Set Adjust Data** and specify the dataset(s) to be transformed

11. Click on **Adjustment Methods** and select the method that best fits the type of transformation required. Typically, the Affine transformation is most often used and will handle shifting, scaling, skewing, and rotations

12. Click on **Spatial Adjustment**Æ**Adjust** to begin the transformation

![Figure 3: After adjustment (UW Buildings)](image)

13. If the adjustment is not satisfactory return to Step 7 and create more links, otherwise click **Editor**Æ**Save Edits** followed by **Editor**Æ**Stop Editing**. The unreferenced dataset will now have coordinates.

14. A final step would be to export this data using the projection of the **data frame**. Right click on the newly transformed dataset and select **Data**Æ**Export Data**. Ensure that the **Export** field is set to **All features** and the **Output** path and filename are defined

15. Click **OK** and the data will be saved using the proper projection and coordinates
Adjustments using the Editor toolbar

1. Click on **File**→**Add Data** and select the control layer.
   
   *Note: The control layer is the layer with the known coordinates*

2. Click on **File**→**Add Data** and select the dataset to be adjusted.

3. Make sure the projection of the data frame is the same as the control layer. Right-click on **Layers**→**Properties**→**Coordinate System** and select the appropriate definition.

4. Turn on the **Editor** toolbar by clicking on **View**→**Toolbars**→**Editor**. Begin editing the dataset by selecting **Editor**→**Start Editing**.

5. Right-click on the unreferenced dataset and select **Selection**→**Select All**.

6. Click on **Editor**→**Move** and close the **Delta X,Y** dialogue box. Move the cursor overtop of the selected dataset, click and drag the selection overtop of the same feature in the control layer. This may take a few tries at different extents to achieve an exact match.

7. Once a match is made, click **Editor**→**Save Edits** followed by **Editor**→**Stop Editing**.

8. A final step would be to export this data using the projection of the **data frame**. Right-click on the newly transformed dataset and select **Data**→**Export Data**. Ensure that the **Export** field is set to **All features** and the **Output** path and filename are defined.

9. Click **OK** and the data will be saved using the proper projection and coordinates.

10. Repeat from step 4 for any additional datasets.

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