ShapeWarp 2.1

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Sept. 13, 1998 Version 2.2- I fixed a problem I found it seems in version 2.1 I forgot to remove the menu item in the install script. I have also changed the GCP icon markers. They are no longer boxwithdot and the painted X. Now GCP's that are ON are marked with a RedCrossHair and GCP's that are OFF are marked with a BlueCrossHair.

Version 2.1 has some problems fixed that were discovered in version 2.0. Version 2.1 also adds a menu choice "ShapeWarp" on the Project GUI. This menu choice provides 2 items ShapeWarp Session and Import table. The ShapeWarp Session choic has exactly the same function as the RedDiamond button on the Project Button Bar. The Import table item is new to this release. It will allow you to import a table and specify the either the From coordinates, To Coordinates or both.

An ArcView 3.0 Extension for Warping Feature Themes from an unknown Datum/Projection to a known Datum/Projection. ShapeWarp 2.1 has many useful features such as a ROAM window, Snapping, Compute from which will calculate the from Ground Control Point after you have 3 GCP pairs, a batch mode for similar data sets, and many other enhancements.

Notice

This extension ShapeWarp 2.1 is being provide by the author free of charge on the ESRI Web site www.esri.com. You may not re-distribute it to others or place it on your own web without the prior consent of the author. The author wants to keep the distribution from one site so that a version control can be maintained.

 The author is not responsible for any damages ShapeWarp 2.1 may cause to your system. The author is not responsible for any data loss due to using the Shape Warp extension.

This extension was a joy to write and I hope you can make exellent use of it as I have. I do not anticipate many "bugs" in the extension for I have tested it considerably. In the event that you do find a problem with the extension let me know with the exact nature of the problem and I will correct the problem if possible.

If there is a problem in the documentation let me know. If you would like to help create better documentation then please do.

Let me know if you like the extension. I do not hear from many people who use the code that I write. If people like what I am doing and would like to see more FREE stuff then let me know

what kinds of ArcView applications you would like. In my spare time I will try to implement them if I am interested by them and have the time.

All in the good Spirit of Sharing.

Enjoy Enjoy.   -peace K.

Installation

This extension was created using Dialog Designer extension and thus requires the files avdlog.dll and avdlog.dat. The avdlog.dll needs to be placed into your $AVBIN directory. This directory is the Bin32 directory if you have not changed $AVBIN from the default.
The avdlog.dat file needs to be placed into your Lib32 directory.

Place the ShapeWarp.avx file into your Ext32 directory then start ArcView GIS and choose from the menu File - > Extensions and check the ShapeWarp 2.1 extension to enable it.

Getting Started

Before you begin a ShapeWarp session make sure you save all your work and then start a new project. ShapeWarp removes all existing documents from the project, thus if you start the session with existing work present you will loose these documents.

To begin a ShapeWarp session press the RedDiamond button located on the Project Button Bar.

Setting a Projection
You will be asked if you would like to set the Projection for the TO View. The TO View is where the themes are located that you want to warp to. The FROM view is where the themes that you would like to warp are located. If your TO themes are in decimal degrees and you would like to warp the FROM themes to something other than decimal degrees then you should specify the projection that you would like to warp to. If your data is in something other then decimal degrees then you should not set a Projection. If you find that you set a projection and you decide against it then you can hit cancel in the Projection Dialog Box. You will be ask to confirm setting the projection.

Picking the themes for the views
Once the Projection is set you will be ask to enter the themes you would like to warp. These are the themes that will go into the FROM View. You can only pick valid Point, Line, and Polygon themes for the FROM View. Even though you do not know the Datum/Projection of these themes, they should be in the same unknown Datum/Projection. Next you will be ask to pick the TO themes which are the reference themes you would like to warp to. These themes will go into the TO and TO ROAM Views. Themes for the TO and TO ROAM Views can be any valid Feature, Image, or GRID theme.

Selecting the Ground Control Point table (GCP)

Next you will be ask if you would like to use an existing table. You may use any valid table that is created with this extension as long as the data in the table match the TO and FROM themes. If you have an existing table you would like to use then select YES from the message box and then select the existing table from the file dialog. If you do not have an existing GCP table then select NO from the message box and then using the file dialog select the directory and name for the new table.

The Main Views

You should now see the following screen. (your data will be different then what I am using here for an example).

The example data I am using here is the ESRI supplied data of Mexico. The themes used in the TO Views are Roads.shp and Rivers.shp. The from view is a re-projected version of these two themes. I re-projected into a Lambert projection for the example. As you can see from the TO and FROM views the themes are totally different.
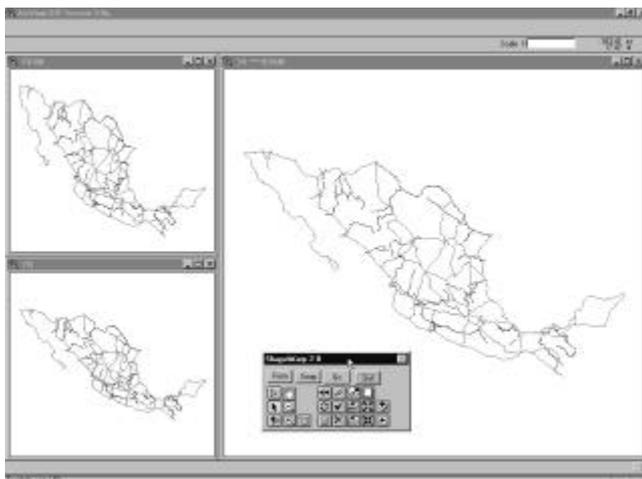
All of the Normal Menus, Buttons, and Tools are removed. The need Buttons, and Tools are provided on the Dialog you see near the bottom center of the example.

The large View on the right is the TO***ROAM View. This view is provide for easy zooming and panning the two view. Zoom operations performed on the TO ROAM view does not affect it, but it does affect the TO View located in the bottom left hand corner. Thus if we use the zoom in tool and drag a box in the ROAM View then the zoom takes place in the TO View. The top left view is the FROM VIEW which contains the feature themes you would like to warp.

The Dialog looks like the following
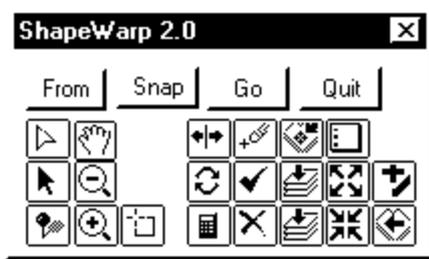
Discussion of all the Buttons and Tools

Menu

As explained at the top of this document a menu choice ShapeWarp has been added to the Project GUI. The choice ShapeWarp Session is exactly the same as the RedDiamond button on the Project ButtonBar. The choice Import Table will allow you to import the TO coordinates, FROM coordinates or both. To import a table just choose the menu item and you will be asked to give the name of the dbase table you would like to import. You will also have to designate a new name for the new table. You will be shown a list of the fields in from the import table and will be required to pick the fields you would like to use for the TO X, TO Y, FROM X, FROM Y coordinates. If you only want to import just the TO coordinates then pick them and when you are asked to pick the FROM coordinates choose the list choice NONE. The same thing goes if you only want to import the FROM coordinates just specify NONE for the TO coordinates. The new table will be created with the correct field names and will be filled out with the correct values. If you choose NONE for the TO or FROM fields the records for those fields will be filled out with 0.000. NOTE - if you specify a field for TO X then you must specify a field for TO Y. The same goes for FROM X and Y. This is not checked for in the code and if you don't watch it you will end up with the X coordinates filled out for either the TO or FROM and the Y coordinates will be 0.0000.
The table will be opened and displayed and you may edit it if need be. If you only specify the TO or FROM coordinate then the other either TO or FROM will be 0.000 for both X and Y. ShapeWarp uses this to know that you only have the coordinates for the To or From themes. When you use this table in a ShapeWarp session the 0.000 coordinates will be changes so that they display in the view horizontally across the top half of the view. You may then use the move tools as explained below to move the GCP's to the correct positions.

TOOLS
 This tool is the GCP Selection Tool. With it you drag a box around a GCP which selects the point. You can then perform other operations on the selected GCP (i.e. move it, delete it, or turn it off).
 This tool is the Move GCP Tool. Once a GCP in the TO or FROM View is selected, using this tool you can click on the new position for the point and it will be moved to the newly selected point.

This is the GCP PickTool. You use this tool to pick the GCP's in the TO and FROM Views. You must always pick a GCP in the TO View first followed by picking a GCP in the FROM View.

The Zoom In, Zoom Out, and Pan Tools. These work exactly as they normally do with one exception. When you zoom on the TO ROAM View the zoom takes place on the TO View. You cannot Pan on the TO ROAM View.

The Feature Select tool. Works the same as it normally does. Great for selecting a feature in the TO ROAM View and then choosing the Zoom to Selected button. The zoom will take place in the TO View.

BUTTONS

Toggle Table Of Contents Button. I am sure you noticed the views are not showing the TOC. Pressing this button will toggle them open so that you may change colors etc . . . on the themes. Pressing it again will close the TOC.

Toggle View Button. This button will toggle the views from the main views to the GCP table and back.

Calculate RMS Button. This button will calculate the required polynomial and RMS for the chosen GCP's. For a first order fit you need at least 3 GCP's, 6 GCP's for a second order, and 10 GCP's for a third order.

Delete multiple GCP's Button. Choosing this button you will be displayed a dialog that allows you to pick one or more GCP's and delete them.

Toggle GCP's ON/OFF. Sometimes you may not want to delete a GCP you may just want to turn it off. This button allows you to do that by picking the GCP's you want to turn on or off.GCP's that are ON look like a RedCrossHair. GCP's that are OFF look like an BlueCrossHair.

Delete a Single GCP Button. With this button, after using the Select GCP tool to select a GCP, then you press this button to delete the single GCP.

These are standard ArcView Buttons Zoom to Selected, Zoom to Theme, Zoom to Extents, Select None, Zoom Out, Zoom In, Add Themes, and Zoom to Previous. These buttons work as normal. When zooming on the TO ROAM view the actual zoom will take place in the TO View. Zoom Out, and Zoom In only work with the TO and FROM Views as does Zoom Previous. As of release 2.1 you may now add themes to any of the views.

Compute From GCP button. After you have at least 3 GCP's selected and then you select the point for the TO View on the next, you can then use this button to Calculate and add the point in the FROM View. The point will be added and the From view will be centered on the new point. The point will only be close you will still need to make adjustments to its position by moving it.

The Warp themes button. After you have chosen all your GCP's and are happy with them and calculated the fit equation/RMS, then you can use this button to go ahead an create the new warped themes. Once you press this button you will be asked for the names for the new themes.

For every active theme in the FROM View you will be ask to input the name for the new output warped theme. The themes will be created and you can then add them to the TO ROAM View to look at the fit. This has been updated in 2.1 and will now process every active theme instead of every theme.

 This button allows you to quit the ShapeWarp session.

 The Snap Dialog Button. This button was saved for last because it has it own dialog.
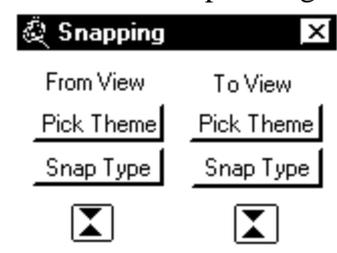
Notice there are two sets of identical Buttons and tools on this dialog one for the FROM VIEW and one for the TO VIEW.

The Pick Theme button allows you to specify which theme you would like to snap to.

The Snap Type button allows you to specify how you want the snapping to take place. The choices are None, To Closest Vertex, To Closest Boundary, To Closest EndPoint, and To Nearest Intersection. The Tool at the bottom is the Snap Tolerence tool which allows you to set the Snap Tolerence. If you want to use snapping you must choose a theme, type and tolerence for both the FROM View, and TO View.

Example Session

After picking my TO and FROM themes as noted above with the Mexico data, we begin the process by setting up snapping for both the TO and FROM Views. First we zoom in on an road intersection in both the TO and FROM Views. Next we choose the Snap button to set up snapping and in this example I choose the roads.shp them for both TO and FROM Views for the theme to snap to. Now I choose snap to Vertex for the snap type although snap to intersection could have been used, I want to snap to endpoints also. You can change the snap type anytime you choose. Finally I set the snap tolerence for both views by dragging a circle in the view the distance I want snapping to take place.

Next I Choose the ZoomIn Tool and on the TO ROAM view we drag a box around a road intersection. In this example, even though I have rivers and road loaded, I am going to use roads for picking my control points.

Now I pick the the GCP Picktool and and click on the TO View at the intersection where I want to set a point. Now I zoom to the same location in the FROM View and using the GCP Picktool I click where I want the point to be located. Snapping should occur for both views if you click within the snap tolerence distance by the chosen vertex.

I repeat this two more times by picking a GCP in the TO View and then picking a GCP in the FROM View.

Now things become easier because we can use the Compute From button. I pick my next point in the TO View and then press the Compute From button and the From GCP is calculated and placed into the FROM View and centered. Now keep it in mind the point will not be perfect but will be fairly close. Now I may need to zoom out a bit and then I choose the GCP Select tool and select the newly created computed GCP. Next I choose the Move GCP tool and while the point is selected I click where the point should be and it is moved to the new position. If snapping is on the it will snap to the closest vertex. NOTE The Compute From will compute points closer and closer to where they should actually be as the number of points increase. As soon as you have 6 or more GCP's the point should be very close although you should always move them to there correct position.

Now I repeat the above procedure lots of times being careful to pick points all over the view and not concentrating them in one place. If you do concentrate them in one area only the the fit will be good in that area but not so good in the rest of the theme.

When all of the points are chosen then you may calculate the RMS by pressing the Calculate RMS button. In this example I am choosing a third order polynomial for the fit. Keep in mind you need at least 3, 6, and 10 points for 1st, 2nd, and 3rd order fits respectively. In reality you should choose at least two times as many. The more GCP's the better the fit.

Here is what you should see at this point.
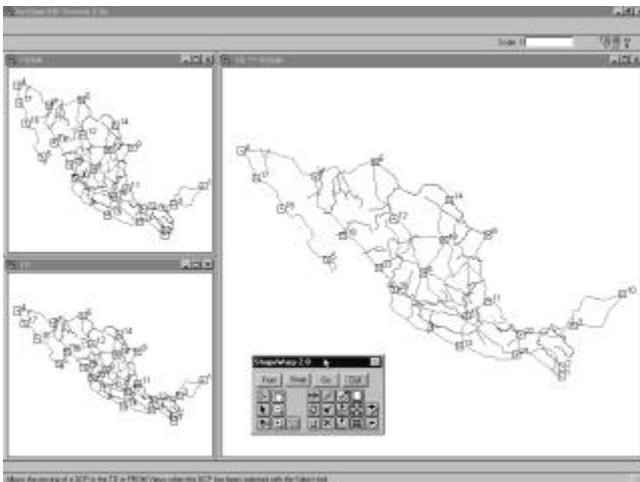
Notice how I have spaced the control points all about the view and especially included points around the perimeter of the theme.

Now I can toggle the view to the GCP table by press the Switch button and I can examine the RMS of each control point. If the RMS value is high in a particular point then I can turn it off by pressing the check button and picking the control point I would like to toggle off. Or I could delete the point if so desired by using the correct button. A control point that is turned off is not used to calculate the total RMS or the fit equation. If you turn a point off then the old RMS value will stay the same but will not be used. In this example I am satisfied with where the control points are.

Now I am ready to create the new warped themes and I do this by pressing the GO button. I am asked the names of the new output themes. In this case there are two themes in the FROM View so I will have to input two names for the two new warped themes. Next I am ask if I would like to create a Report answer either Yes or No. If you answer Yes then you will be ask the filename you would like to save the report to. Now after a few minutes the shapes will be written to disk and I can add them to the TO ROAM View to see how well the fit is.

Here is the final outcome.
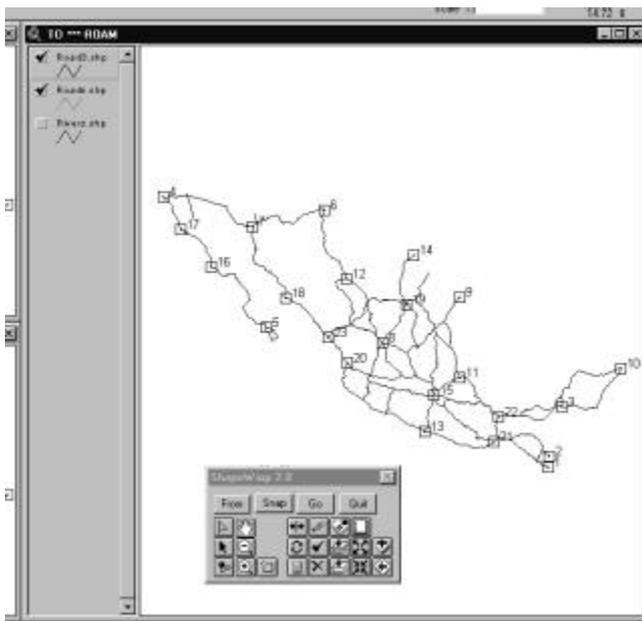
In this image I have added the newly created theme called roads3.shp to the view and turned off the rivers.shp theme. You may not be able to see it very well in this image but the new fit is dead on. You may now quit the session or you may add some more points and recalculate the RMS and the make a new warped theme.

This has just been a quick example of how to use this extension. You should make yourself a couple of datasets and experiment with the extension so that you will become familar with the extension.

I enjoyed writing this extension very much and hope you can make exellent use of it. If you find any problems with it let me know and I will try to correct the problem. I do not anticipate many problems with the extension.

        -peace K.

Kenneth R. McVay