**Mapping Strategies for Complex Data**

A Spatial and Numeric Data Services (SAND) Workshop

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# Where to Find Digital Instructions and Data

These instructions and the zip file of workshop data are available from CTools - at https://ctools.umich.edu . You have already been added to a site in CTools called Clark 2014 Workshops. It will appear either along the top of your window, or you may have to use the dropdown on the right side to scroll down to the bottom of your list of all sites.

Once you are in the Clark Workshops site, select Resources and open the “Mapping Complex Data” folder.

# A. Unzip the workshop data

Please download and unzip the data into your IFS space or use another location like your Desktop or a flash drive.

1. In the Clark 2014 Workshops CTools site, select Resources 🡪 Mapping Complex Data
2. Click on the file called complex\_data.zip
3. In the window that prompts you with what to do with the file, leave “Open” as the selection and click OK. The file will download to a temporary spot, and a window will open showing you the file
4. In the light blue bar just under the toolbar, click on “Extract all files”
5. In the “Extract all files” window, change the location of where the files will unzip by clicking “Browse”
6. Click on “Computer”, then scroll down until you can click on “uniqname (\\afs\umich.edu\user\...) (H:)” where uniqname is your uniqname
7. Click on “Private”
8. Click on OK, then click Extract. Your files will be unzipped into a folder in your IFS space, within the Private folder

This data is from the United States Census Bureau’s American Community Survey 2005-2009 5-year data.

# B. Normalizing/Creating New Fields

If we are simply normalizing one variable by dividing it by another variable (i.e. finding out the portion of income that is paid to rent) ArcGIS makes it very easy.

1. Right click on complex\_data\_counties
2. Select Properties and choose the Symbology tab
3. In the “Show:” box on the left hand side click on Quantities and then Graduated colors
4. Under the “Fields” box choose both your Value and Normalization (the one you will divide by) fields.
5. You can change around the colors and classification values at this point
6. Click OK to see the results

If you need to do something more complicated than simply normalizing you will have to create a new field in your table

1. Right click on complex\_data\_counties
2. Select Open Attribute Table
3. Under the Options menu (In the upper left of the Table window) select Add Field
4. Choose a name and type for the new field (Integers cannot have anything after the decimal place; Floats have numbers after the decimal place and a Double is just a longer Float)
5. Right click on the header of your new field and select Field Calculator. Click Yes in the warning box. You can then use any of your variables to create a new value.
6. After you select okay the field will be calculated and you can symbolize it normally

# C. Transparency

There are a few options for working with transparency in ArcGIS. First, you can simply set a layer to a solid transparency.

1. Right click on the complex\_data\_counties layer
2. Select Properties and choose the Display tab
3. You can set transparency here. A higher number will be less opaque.

Second, if we are symbolizing a categorical variable we can use a different numeric variable to control transparency. In order to this we have to calculate a row that will have values between 0 and 100 to set the transparency to.

1. Create a new field using the instructions in part B. In order to stretch the values between 0 and 100 use this formula: 100 \* ([value] – lowest\_value) / (highest\_value – lowest\_value). If you want to invert the transparency (so that the lower numbers are more transparent use this formula: 100 - 100 \* ([value] – lowest\_value) / (highest\_value – lowest\_value).
2. Right click on the complex\_data\_counties layer
3. Select Properties and choose the Symbology tab
4. In the “Show:” box on the left hand side click on Categories and then Unique Values
5. You can either add a categorical variable or just leave it at the default if you only want to see transparency
6. Under the Advanced menu in the lower right choose Transparency. You can then select the variable you made in step 1 to control the Transparency
7. Click Ok after choosing your field and then Ok again to see what it looks like

Third, you can use multiple layers in order to create masks that have the same effect as transparency.

1. Re-add the complex\_data\_counties layer, so that it is listed twice.
2. Make sure you are in the display tab in the left hand Layers box. Drag this new layer beneath the layer (with the variable transparency) you made in the previous section.
3. Click on the color box under the complex\_data\_counties layer that is partially transparent and change it to white (or you can use grey if you want to grey things out instead of white them out)
4. Right click on the second complex\_data\_counties layer
5. Select Properties and choose the Symbology tab
6. Symbolize normally using whatever quantity you want to show (for instance average gross rent)
7. You can adjust the colors and transparency level of the overlay to create a readable map

# D. Overlays

Transparency and multiple layers as explained above can be used to lay data on top of other data in a (sometimes) visually comprehensible way. One trick that can be helpful in this regard is importing symbology from another layer.

1. Inside the symbology window, click import
2. You can then choose what layer you want to use the symbology from and select it. You will then have the option to choose what variable maps to what variable in the new layer. Make sure you have not lost any data that is outside of the first layers classification set!

Another helpful thing to do is make your own color ramps. Especially since most of the default color ramps do not start at white, this can be helpful for overlaying data.

1. Inside the symbology window double click on the first color square
2. Set this color to whatever you want to the low value to be
3. Do the same for the high value.
4. With the high value selected. Ctrl-select the low value (so that both are selected).
5. Right click on one of the selected values and choose ramp colors. Under this same menu you can also choose to flip colors if you want to invert your color ramp.

# E. Subsetting Data

Sometimes the best way to deal with this time of data is to make multiple layers that depict the largest count by geography. This can be done through the selection menu.

1. At the top use the selection drop down menu to choose select by attribute
2. Make sure to select the layer that you want to work with and to choose as your method “create a new selection”
3. Write a formula to select the only places that have the maximum of all variables you want to map (e.g. var1 >= var2 AND var1 >= var3 – this will select only geographies where var1 is greater than the other two).
4. Click “OK”
5. Right click on the layer you are working on and under that selection menu choose “create new layer from selected features”
6. You can change the name of the new layer by slowly double clicking on it to allow you to edit the name (note this new layer is only a temporary layer that points to the original data—you can make it permanent by exporting it as a shapefile)
7. Repeat for all additional variables (e.g. var2 >= var1 AND var2>= var3); make sure to clear the selection (this button on the menu bar: Macintosh HD:private:var:folders:p3:c8dh5nlj5zl7v1mv35j2k05m0057x2:T:TemporaryItems:GUID-0DE2617C-183B-4224-B4BC-7B4BA52BD28A-web.png) between selections

# F. Dot Density

1. Right click on the complex\_data\_counties layer
2. Select Properties and choose the Symbology tab
3. In the “Show:” box on the left hand side click on Quantities and then Dot Density
4. Under “Field Selection” add the fields that you are going to show.
5. You can change the symbol color by double clicking on it.
6. You can also change the Dot Value and Dot Size in the lower left box.
7. Click okay to make the changes show up on the map.