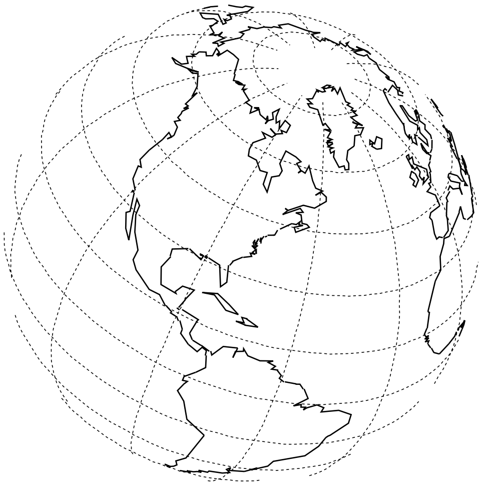
Sense of Place



User's Manual, Version 1.0

Project **GeoSim**
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Chapter 1

Introduction

This manual describes **Sense of Place**, an interactive simulation program developed for use in geography courses. **Sense of Place** was developed as part of **Project GeoSim**, a multidisciplinary effort involving members of the Departments of Geography and Computer Science at Virginia Tech to develop computer-aided instruction (CAI) modules for teaching introductory geography to first year college students A **Project GeoSim** instruction module typically consists of two parts: a multimedia tutorial of background information about the geography concepts involved in the lesson, and a simulation program that allows students to apply, experiment with, and enhance the knowledge they have gained.

The main goal of **Sense of Place** is to allow users to gain a sense of the characteristics of U. S. counties by examining statistical data via a variety of simple data visualization techniques. Currently, **Sense of Place** makes use of three visualization techniques: choroplethic mapping, plotting statistical distributions, and tabular representation. However, **Sense of Place** is also designed so that other techniques may be added in the future.

Each visualization technique is incorporated into a *view*. There are typically two views on screen at a time. In short, a view comprises a particular visualization technique and the user interface tools associated with it. The services these tools provide include easy ways of moving from one view to another. For example, once a user finds the symbol for a division in one view, he or she can click on it to find that division in the accompanying view.

The visualization tools in **Sense of Place** can be used to evaluate counties in terms of either raw statistical data, or user-created *metrics*. A metric is a statistical standard composed of target values for a set of statistics. **Sense of Place** determines a score for each county based on how close its values are to the user's targets. Metrics can be created for a variety of purposes. For example, a user can create a metric that specifies the characteristics of his or her "dream" home or travel destination, or a metric that identifies the important qualities of a successful business location.

We use the term "county" rather broadly to refer to counties, parishes, and burroughs, as well as cities which are are politically independent of any county, since their data would otherwise go uncounted. This is true, for example, of all cities in Virginia, as well as Washington, D.C.

1.1 Characteristics of Geographical Data

Each visualization technique used in **Sense of Place** was chosen to show certain aspects of the data associated with geographical divisions. Some of these aspects are inherently geographical. For instance, geography is unique among disciplines in its concentration on the spatial characteristics of data. Other aspects of geographical data are common to other disciplines. For example, the distributions associated with variables are of interest to all fields of statistical study. It would be difficult to present all of these aspects with one data representation technique. Therefore, we have incorporated several visualization tools into **Sense of Place**: maps, distribution plots and tables.

Chapter 2 presents a tutorial introduction to the operation of **Sense of Place**. You are encouraged to run through the program as you read it.

Chapter 2

Sense of Place Tutorial

2.1 Starting Sense of Place

To start **Sense of Place** on a DECstation, SPARCstation, or MS-DOS PC, type `snsplace` at the command prompt, and hit the return key. To start **Sense of Place** on a Macintosh, open the folder labeled exe in the snsplace folder, and double-click on the icon labeled snsplace. The screen should appear as shown in Figure 2.1 when you start **Sense of Place**.

Figure 2.1 draws attention to several important screen areas. The various **Sense of Place** data visualization techniques are presented in the top and bottom view slots. Context-sensitive hints

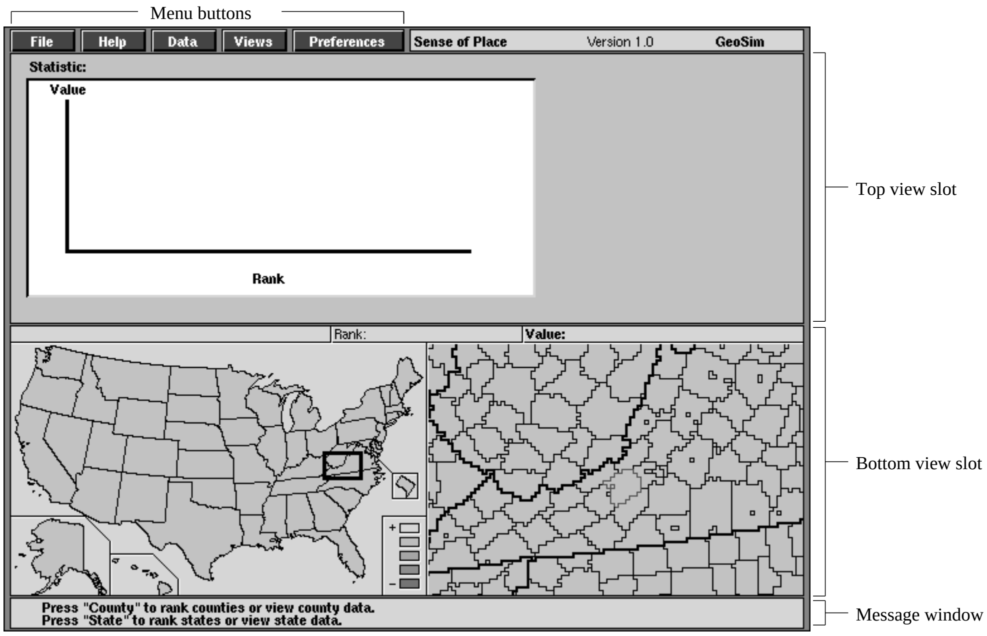


Figure 2.1: Initial screen layout

about how to use **Sense of Place** are shown in the message window. The menu buttons are used to access popup menus which are used to control the program.

When you start **Sense of Place**, the top view slot shows the Graph View, and the bottom view slot shows the Map View. Note that there is no data shown in either view when the program begins. Thus, there is only a pair of axes in the Graph View, and all states and counties are colored gray in the Map View. Section 2.2 describes how you can select data for viewing.

2.2 Selecting Data

To select county data for viewing, press Data in the row of menu buttons at the top of the screen. This button causes a popup menu to appear when pressed. This menu is shown in Figure 2.2. Press Data now to access the menu. The items in the menu are listed alphabetically. Each item tells **Sense of Place** to perform some service for you. The service that corresponds to each item is described in the following list.

- Examine variable by county allows you to select a single variable. Once you select a select a variable, **Sense of Place** shows you its values for every county.
- Find county on graph allows you to locate the datum for a county in the Graph View. This item is not active when the program first starts, because there is no data shown in the Graph View. The item is printed in gray to show that it is inactive.
- Find county on map allows you to locate a county on the county map in the Map View. This item *is* active when the program starts, because counties can be shown on a map even when it is not showing data.
- Rank counties allows you to select a set of variables for a *ranking metric.* A ranking metric consists of a set of target values (one for each selected variable) used to evaluate counties.

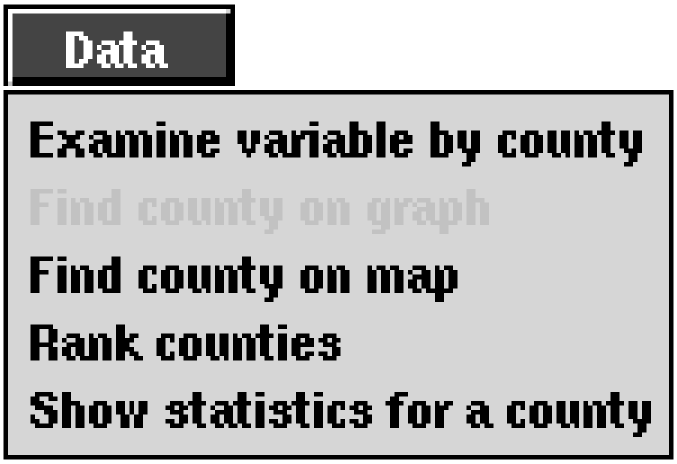


Figure 2.2: Data menu

Each county is given a *metric score* which reflects how close its statistical values are to the target values.

- Show all statistics for a county allows you to select a single county. Once you select a county, **Sense of Place** shows you a list of all statistical values in our database for that county.

To get a better idea of what the items in the county menu do, try using each of them. Each of the following sections will walk you through the use of one of the items on the county menu.

2.2.1 Examine variable by county

When you select this item, the list window shown in Figure 2.3 will appear. The window contains two list areas. On the left is the subject list area. This area will contain a list of statistical subjects from which to choose. On the right is the variable list area. It is blank when the window first appears. When you select a subject, the variable for that subject are listed in the variable list area.

Note that the subjects and variables you see on your screen may not be the same as the ones in Figure 2.3, since the list of variables is dynamic. Since there are more items than can be shown at one time in the limited screen space available, the lists are scrollable. The arrow buttons move the list up or down one item at a time. Try pressing the down arrow button, and then the up arrow button now to see how they work.

The arrow buttons will allow you to go to any item on the list, albeit rather slowly. If you want to go faster, use the scroll bar. To use the scroll bar, place the mouse cursor over the gray scroll button, hold the mouse button down, and drag the scroll button up or down as desired. Try this now to see how it works.

Once you have found the item you want, place the mouse cursor over it and press the mouse button once to select it. When you select an item, it is highlighted in the list and echoed in the

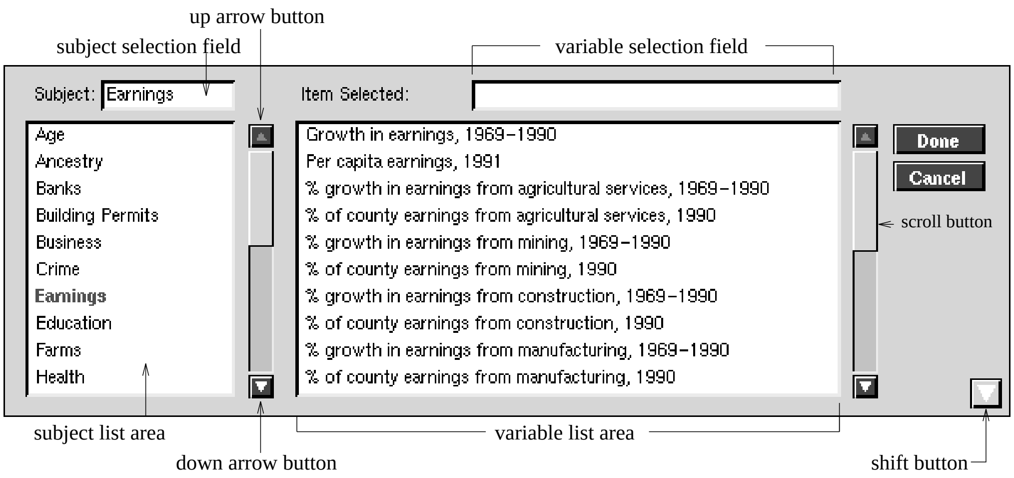


Figure 2.3: Statistic list

selection field above the list. Try selecting a subject and then a variable now. You can change your selection easily by clicking on another item. Select another variable. Note that the highlight moves from the old selection to the new one, and the selection field is updated to show the new selection. You can also change subjects if you don't see a variable you like. Once you are satisfied with your selection, press Done. You can press Cancel at any time to cancel the selection process and go back to where you were.

When you press Done, the list window disappears, and **Sense of Place** retrieves the data for the selected variable from its database. A splash window appears to show the progress of the data retrieval. Once all the data have been retrieved, the splash window disappears, and the Graph View and the Map View are filled in. Figure 2.4 shows the Graph View and the Map View for the variable Persons reporting United States ancestry per 100,000.

Note that the Graph View now shows a plotted curve, a list of counties, and an indicator bar. The indicator bar shows the graph position of the counties in the list. The list can be scrolled just like the variable list. Alternatively, you can drag the indicator bar to any position on the graph, and the list will automatically scroll to show the counties at that position. Try moving the indicator bar, and note how the list changes. Note that the list also contains the precise value for each county.

Also note that the maps in the Map View are colored according to the data. The color scheme is shown at the bottom right of the state map (the one on the left). The brighter the color, the higher the value for the county. The county map (on the right) shows the portion of the state map that lies inside the box on the state map. This box can be moved with the mouse to any position. Try moving it now — by holding the mouse button down and moving the mouse — and watch how the county map changes. Note also that when the mouse cursor is over a state, that state's name is shown in the information bar above the maps.

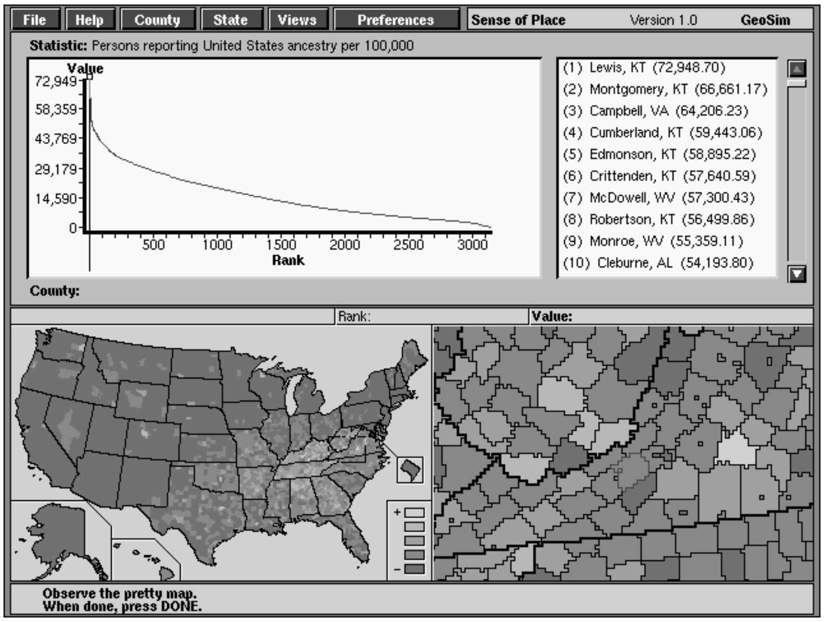


Figure 2.4: Graph View and Map View for Persons reporting United States ancestry per 100,000

The information bar also contains value and rank fields, which are used to show data values and ranks for states and counties. "Value" is currently highlighted because the coloring of the maps has been calculated according to the statistical values for all the counties. (The coloring can also be calculated according to rank, as we will see in Section 2.4.1.) Try placing the mouse cursor over a county in the county map. Notice that, in addition to the county's name, its value for the variable and its rank among all counties is shown in the information bar.

We will examine other aspects of the Graph View and the Map View later. Let's go on and look at the other items in the county menu.

2.2.2 Find county on graph

If you look back at the county menu, you will notice that this item now appears in black. This means that you can select this item to find the position of a particular county on the graph. Go ahead and select this item now.

You should see window with a list of state names on the left, and a blank list on the right. The blank list will be used to show counties after you select a state. The state list works just like the variable list: you can scroll it up and down, make a selection, and change your selection once you've made it. Try selecting a state now. (The state you live in might be a good one to pick.)

When you select a state, the name of the state is highlighted, and echoed in the selection field above the list. The counties in the selected state are then shown in the list on the right. The selection process for a county is the same as a state. Try selecting a county now. (Again, we suggest picking the county you live in.)

Note that you can change states or counties at any time during the selection process. (Of course, if you change states, you will have to reselect a county as well!) **Sense of Place** doesn't actually look for the selected county until you press Done. You can also press Cancel at any time to cancel the search. Go ahead and press Done when have are satisfied with your selection. (Make sure that you have selected both a state *and* a county.)

When you press Done, the list window disappears, and **Sense of Place** looks for the position of the selected county on the graph. Once the position is found, the indicator bar is moved there, and the list is scrolled to show the highlighted name of the county. You can try finding several more counties now if you like.

2.2.3 Find county on map

This item works much the way Find county on graph does. You select a county in exactly the same way. The movable box on the state map is then moved to the position of the selected county, and the county's border is highlighted (shown in red instead of black) on the county map. Try finding the county in which you live.

2.2.4 Rank counties

The variable list appears when you select this item as it does when you select Examine variable by county. The difference here is that you can (and should) select more than one variable. You can pick as many as eight variables for a ranking metric. (The number of variables currently selected is shown at the top of the list window.) Again, press Done once you are satisfied with your selections.

After you press Done, you should see the the Ranking Window, which is shown in Figure 2.5. The Ranking Window is used to set target values for the selected variables. It is split into eight sections, each of which may[1] contain a pair of "odometers" for a selected variable. The leftmost of the two odometers is used to set the target value for the associated variable. The odometer on the right is used to set the importance of the variable relative to the other variables in the metric.

The target value for each variable is shown in the boxes of the odometer on the left. The mean value is initially selected as the target value, but you can change any digit of the value by clicking on it. To increase a digit, click on the top of its box. Click on the bottom of the box to decrease the digit. You can also click on the min, mean, and max boxes to quickly go to these values. Although you are limited to target values that are within the range of observed values for a variable, this limitation is usually not constricting. The range of observed values usually includes *outliers* (unusually small or large values) at both ends.

Once you have set the target value and importance for each variable, press Run Metric. **Sense of Place** will then compute a score for each county based on how closely its values match the target values. Scores are between 0 and 1000 (the lower the score the better). This takes a little time, so a splash window appears to show the progress of the computation. When the computation is done, the current views are redrawn to show the metric scores. The views we have seen so far are the Graph View and the Map View. There is also a third view called the Spreadsheet View, which will be described in Section 2.2.6.

Note that a metric score by itself does not mean much. It is mainly useful for comparative purposes.

[1]The first n sections are used (starting from the top left and working first down and then to the right) for n variables, where n is a positive integer between one and eight.

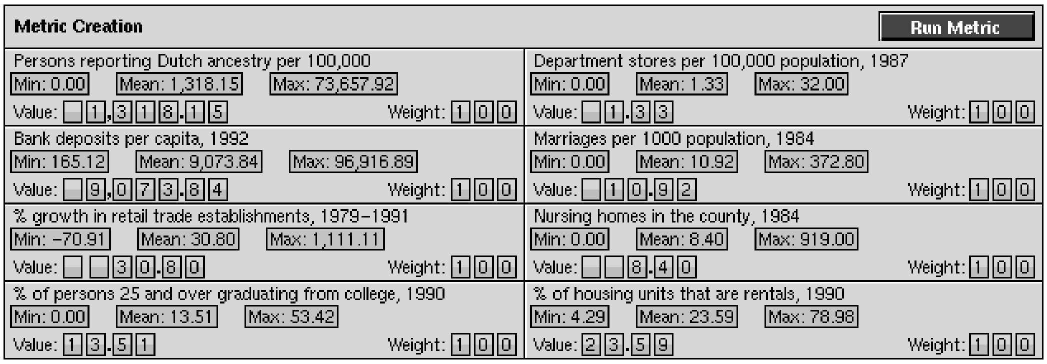


Figure 2.5: Ranking Window

2.2.5 Show all statistics for a county

This item allows you to look at all data for a selected county. The selection process is the same as that used for Find county on graph and Find county on map. When you press Done after selecting a county, the variable list is shown with the values for that county. Section 2.2.1 describes how to select variables from this list.

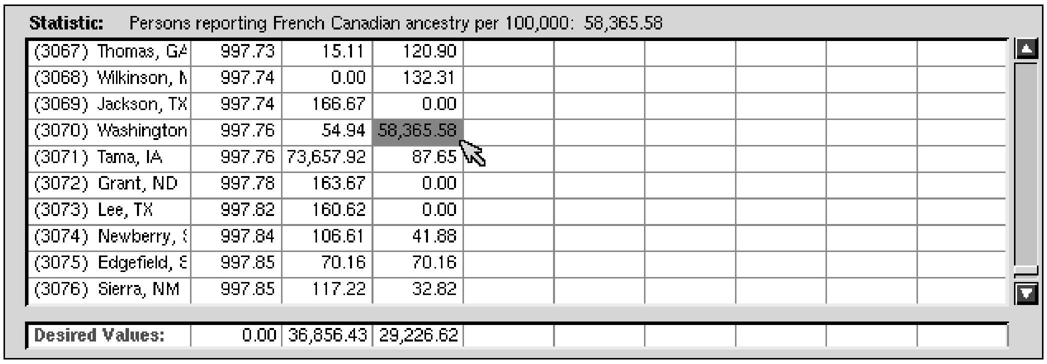
2.2.6 The Spreadsheet View

So far, we have looked at two views: the Map View and the Graph View. We have also looked at the Ranking Window, which can also be considered a view, since it shows the ranges and mean values for the metric variables. We will now look at the fourth and final **Sense of Place** view: the Spreadsheet View. We will also look at how you can switch back and forth between views.

We are introducing the Spreadsheet View last because it is the last one to become available when you run the program. It is used to show the details of ranking metric scores, so you cannot access it until you run a metric.

The Spreadsheet View contains a scrollable spread sheet which lists all counties one to a line. Each line contains the name of a county, its metric score, and the county's values for all the variables in the metric. The Spreadsheet View is shown in Figure 2.6. County names and ranks (in parentheses) are shown in the leftmost column. Metrics scores are displayed in the second column from the left. Values for the metric variables are shown in the remaining columns. Note that the columns do not have headers. Since variable names are generally fairly lengthy, there is only room enough to show one name at a time. When you aim the mouse pointer at a variable's column, the name of the variable name is shown above the spread sheet. The words "Metric Score" appear at the top of the window when the pointer is in the metric score column. When the pointer is in the county name column, the contents of the cell that it's in are echoed above the spreadsheet.

The counties are initially listed in ascending order by metric score, but you can also sort them by any one of the variables in the metric. Variable values are sorted by how closely they meet the target value. To sort by a variable, click on its target value at the bottom of the Spreadsheet View



Statistic: Persons reporting French Canadian ancestry per 100,000: 58,365.58

(3067) Thomas, GA	997.73	15.11	120.90
(3068) Wilkinson, M	997.74	0.00	132.31
(3069) Jackson, TX	997.74	166.67	0.00
(3070) Washington	997.76	54.94	58,365.58
(3071) Tama, IA	997.76	73,657.92	87.65
(3072) Grant, ND	997.78	163.67	0.00
(3073) Lee, TX	997.82	160.62	0.00
(3074) Newberry, S	997.84	106.61	41.88
(3075) Edgefield, S	997.85	70.16	70.16
(3076) Sierra, NM	997.85	117.22	32.82
Desired Values:	0.00	36,856.43	29,226.62

Figure 2.6: Spreadsheet View

(the target values are aligned with the spread sheet columns). There is also a target value (always 0.00) listed for metric scores which you can click on to go back to the original sorting.

2.3 Changing Views

Since there are more views than slots in which to place them, there is a menu for selecting the views that appear on the screen. This menu — called the "Views" menu — is shown in Figure 2.7. To access the menu, press Views at the top of the screen.

The Views menu is accessible at any time during the program, but it's items are inactive until you run a ranking metric. If you haven't run a metric yet, you might do so now, and observe how the menu changes after you do. Each item lists a pair of views, separated by a slash (/). When you select an item, the view to the left of the slash is placed in the top view slot, and the view to the right is placed in the bottom.

You may notice that one of the items is still inactive in Figure 2.7. This item lists the two views that are currently active. The item that corresponds to the currently active views will always inactive, since it makes little sense to re-select those views.

2.3.1 Coordination of Current Views

We have tried to coordinate the interaction tools in the respective views. For example, if the Graph View and the Map View are currently active (and show data), you can click in a county on the county map, or on the name of a county in the list in the Graph View, and the county will be

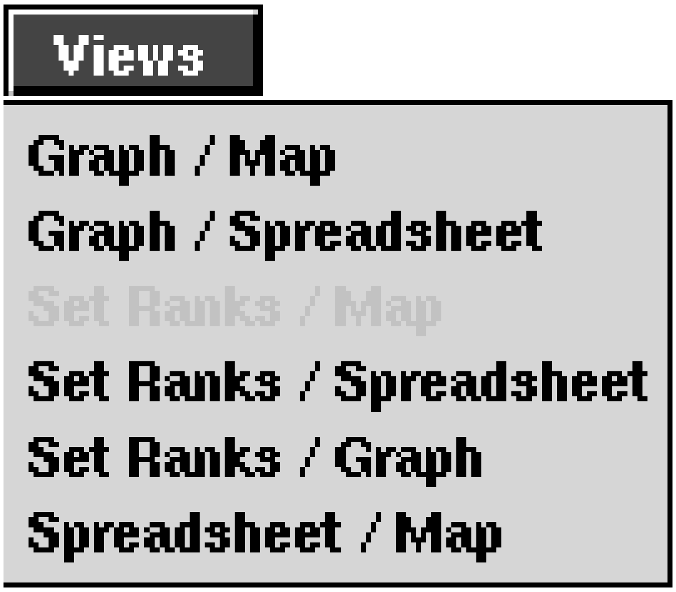


Figure 2.7: Views menu

highlighted in both views. In fact, you can do the same with any pairing of the Map View, the Graph View, and the Spreadsheet View.

The one view that is not necessarily coordinated with the others is the Ranking Window. The other three views always depict the same data. However, while you are creating a new metric with the Ranking Window, it may be out of synch with the other views. For instance, the Spreadsheet View may show variables and target values from a previous metric; it will not be updated to match the Ranking Window until you run the new metric.

2.4 User Preferences

Pressing Preferences accesses a menu of attributes that you can set to suit your preference. Most of the items on the menu belong to a pair of opposites. For example, the item State map borders: Remove is the counterpart of the item State map borders: Add. Only one item of such a pair is visible at any given time. For example, if the state map currently has borders on it, only State map borders: Remove will appear on the menu. The preferences menu is shown in Figure 2.8. The following list describes the items on the menu.

- County map magnification: Decrease. This item decreases the magnification factor[2] of the county map by one. This item is deactivated when the magnification factor reaches one.
- County map magnification: Increase. This item increases the magnification factor of the county map by one. This item is deactivated when the magnification factor reaches eight.
- Graph curves: Discrete. This item causes the graph to be drawn as a series of discrete points. The value for every tenth county is plotted as a point, because there is too little room to plot values for all 3,141 counties. This item is the counterpart to Graph curves: Continuous.

[2] This factor expresses the relationship between the scale of the county map as it appears, and the actual scale of the county map as stored in its image file. doesn't express any relationship between the scales of the state and county maps.

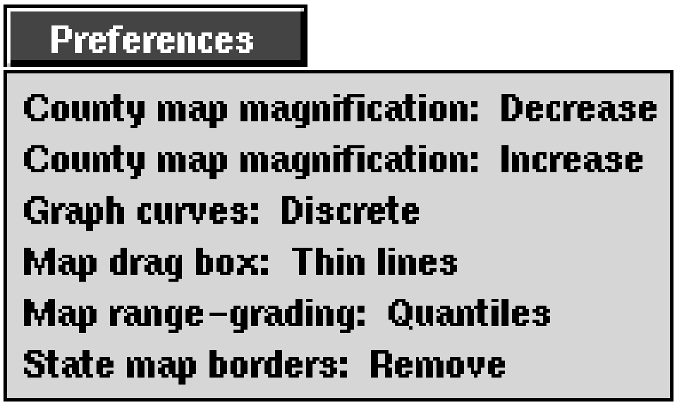


Figure 2.8: Views menu

- Graph curves: Continuous. This item causes the graph to be drawn as a continuous line that connects the values for every tenth county. This item is the counterpart to Graph curves: Discrete.
- Map drag box: Thin lines. This item causes the movable box on the state map to be drawn one pixel thick. This item is the counterpart to Map drag box: Thick lines.
- Map drag box: Thick lines. This item causes the movable box on the state map to be drawn three pixels thick. This item is the counterpart to Map drag box: Thin lines.
- Map range-grading: Quantiles. This item selects rank quantile range-grading for the Map View. This is discussed further in Section 2.4.1. This item is the counterpart of Map range-grading: Equal intervals.
- Map range-grading: Equal intervals. This item selects equal interval range-grading for the Map View. This is discussed further in Section 2.4.1. This item is the counterpart of Map range-grading: Quantiles.
- State map borders: Remove. This item removes borders from the state map. This item is the counterpart of State map borders: Add.
- State map borders: Add. This item adds borders to the state map. This item is the counterpart of State map borders: Remove.

2.4.1 Map Range-Grading

Most of the items on the preferences menu should be fairly straight-forward. However, the range-grading items warrant some explanation. The maps in the Map View are colored according to one of two classification schemes. Each scheme has its pros and cons, depending on what information you're seeking. The first scheme is called "equal intervals". The total range of a set values is divided into several equal-sized intervals. Each county is colored according to the interval into which its value falls. The important thing to note about this scheme is that it separate counties into groups which are not generally equal in size, because the values are not generally uniformly distributed. Because outliers increase the size of the intervals, they can greatly affect the results of this scheme. This is good if you are looking for outliers, but not so good if you want to see subtle differences at other parts of the range.

The other classification scheme is called "rank quantiles". In this scheme, values are ranked in either descending or ascending order, and the total range of ranks is divided into several equal-sized intervals. This scheme guarantees equal-sized groups (± 1), because the ranks *are* uniformly distributed. This means that outliers have no affect on rank quantiles, so you can see subtle differences at all points in the range of values. However, it also means that outliers are inapparent under this scheme.

2.5 Final Comments

There are two more important menus: the Help menu and the File menu. The Help menu offers information about the program, and assistance in operating it. The File menu allows you to print the contents of the screen to a file, or quit the program.

2.5.1 Help Menu

You can access the Help menu by pressing Help. There are two items on this menu. Sense of Place Info accesses information on Sense of Place, including the current version of the program. Tutorial Help accesses a text version of this manual.

2.5.2 File Menu

You can access the File menu by pressing File. There are two items on this menu. Quit causes execution of the program to terminate. Save Screen allows you to save the image on the screen in several different formats. After you select Save Screen, a dialog box will appear with buttons for changing the file format, saving the screen, or cancelling the operation. When you press Save, you should see a white line run down each side of the screen. When the save operation is finished, a window will appear with the name of the output file on it. Press Done in this window to continue with the program.