cartographic techniques

SOFTWARE REVIEW

Software reviews will normally be solicited by the editors, but unsolicited reviews are invited for consideration. If you are using a piece of software useful in working with map information, and are interested in contributing a review, please communicate this interest to the editors.

TWO MAPPING SOFTWARE PACKAGES FOR MACINTOSH COMPUTERS

Reviewed by Gene Turner, California State University at Northridge

MacChoro II with Map Animation. Image Mapping Systems, 516 S. 51 Street, Omaha, NE 68106.
List $295.

Atlas*MapMaker 4.53.
Strategic Mapping, 4030 Moorpark Ave., San Jose, CA 95117.
List $495.

Anyone interested in looking at the distribution of data collected by statistical units such as counties, tracts, zip codes, or police reporting districts is likely to resort to the creation of a choropleth map. Its creation is straightforward and, once the boundaries for the statistical units are set, new maps are generated by changing the shading patterns according to the classes derived for new data variables. The process can be readily adapted to a computer and over the years a number of programs have been developed to generate choropleth maps.

Macintosh computer users basically have two statistical mapping programs from which to choose. One, *MacChoro II*, is a relatively simple choropleth mapping program with the capability of limited animation, while the other, *MapMaker 4.53*, is more complex with many more options. Both take considerable memory (1Mb minimum) and

have slightly different approaches and features for creating a choropleth map. For this review I tried both programs on a Macintosh IIci with color monitor, 8 Mb random access memory, 80 Mb hard disk, and *Virtual 2.04* from Connetix Corp. which increased available memory to about 12 Mb. This may seem like a lot of power to run a mapping program, but for applications such as generating a map of the United States by county, it's not enough. Indeed files of such maps can grow to 4 or 5 Mb in size after conversion to a PostScript format in one of the drawing programs. Dealing with very large map files almost becomes an art since they tax your hardware, your software, and your patience.

MacChoro II

MacChoro II comes with a single disk containing the program and some sample maps of the "lower 48" states. A 114 page manual introduces the program step by step, reviews each of the eight major menu headings, and provides several appendices for separate topics such as using *MacChoro* with other programs. A second disk containing county boundaries for each state may be purchased separately.

Loading the program simply involves copying the files to the hard disk. The creation of a map may begin by selecting an existing map file such as "US48.Data" which was provided with the program. After starting, two windows appear along with eight menu items — File, Edit, Window, Data, Animate, Map, Legend, and Text — across the top of the screen. One window contains a spreadsheet which can hold up to 50 variables for up to 600 areas. Users who want a tract map of a Metropolitan Statistical Area (MSA) or a county map of the United States (almost 3150 counties) will find the 600 area limit too

few. The other window contains an outline map. To cause a choropleth map to appear one must select a desired data column from the spreadsheet and then click on the Draw Map button in the upper left part of the spreadsheet. In addition, two other windows can be opened, a reduced view window of the entire graphic display and a window for text editing. Any of these may be brought forward by selecting one from the Window menu.

The classification of the data for the map is controlled by the Data menu and the Classification option. Two to sixteen classes may be selected and six different methods are available. The "Unclassed" method defaults to the maximum sixteen classes. Other methods include a standard deviation and a natural-breaks method as well as the usual equal interval, quantile, and user-defined methods. Under the Classification option is a Classification Stats suboption which gives various descriptive statistics about the distribution of data within the classing method. In addition, a classification accuracy index gives a relative indication of how well the data fit different classing methods.

Data (no values greater than or equal to one billion) may be brought into the program in several ways. It may be converted from an earlier version of *MacChoro* using the Read Old Data option under the File menu, it can be typed into the spreadsheet from the keyboard, and it can be pasted into the spreadsheet from any tab-delimited spreadsheet. However, the user must be careful when entering data to ensure that the order of the data values exactly matches the order of the polygon boundaries. The program does not check a data ID against a polygon ID to match data to areas. This places an extra burden on the user to always check the order of data

since unexpected changes may occur. For example, census tract lists from different sources often have frequent mismatches.

Names or other character data are converted to 0's when imported into the *MacChoro II* spreadsheet. Data can be exported from the spreadsheet in *MacChoro II* to another spreadsheet such as *Excel* by the same copy and paste procedure. Limited data handling options are available for the spreadsheet under the Data menu. Two columns may be added, subtracted, multiplied, or divided. Data also may be multiplied by a constant, converted to log form, and listed in sorted order.

Some other data handling options in the program such as Search For and Tabs-to-Spaces under the Edit menu will only work with certain windows such as the Edit window. Which commands are for which window is not always made clear by the program or the instruction manual.

A second major set of information for a statistical mapping program is the description of the geographical units to which the data values must be matched. *MacChoro II* does not provide any routines for directly creating boundaries, but it does provide connections to other programs so that boundaries can be created and assigned identifying codes. Polygons can be imported from an earlier version of *MacChoro II*, from *MapMaker*, from a scanned image input into a drawing program such as *MacDraw* or *SuperPaint*, and from a custom file of counties for all US states. A series of conversion routines are buried in a submenu, Convert, under the submenu, Map File, under the main menu, File. Boundary files may also be exported to drawing programs via these options, modified, and then re-imported into *MacChoro II*. If ID's for the polygons are being entered into an

imported map through the Edit-ID option, care is needed since it is not possible to undo an error. One must start over.

MacChoro II provides several graphic utilities to enhance the map. Probably one of the most useful is the ability to generate a bar scale in miles or kilometers and drag it to a desired position. One may create a box of the desired length and then choose Scale from the Legend menu. A bar scale of a convenient length will be fitted in the drawn box. Other options include the capability of computing the map scale, changing the choropleth shading patterns (from a fixed set of 24 patterns) placing a frame line, and placing several pieces of text (title, date, source, classing method, and the accuracy index value). These items may be drawn in different colors although the actual map can only be displayed in one color in order to save memory. A legend may be easily created by creating a box and then selecting the Legend option under the Legend menu. Minor adjustments to the type size and legend boxes can be performed under the same menu. There is no zoom command on the map. Changes in size can be made in several somewhat awkward ways by erasing the map, clicking and dragging a map box, and then selecting Display in Frame from the File menu. The look of the map may be improved by drawing it over several pages and then specifying a reduction of 25 percent in the Page Setup option under the File menu. This action results in finer, sharper lines on a LaserWriter printer.

A special feature of *MacChoro II* is its animation capability. Essentially this entails the generation of a sequence of maps and then flipping through them rather than making the map move around the screen. Two basic approaches can be taken. One is to generate a series of map classes for a single

variable noting how the patterns change with the type of classification or the number of classes. The second is to select a given number of classes of one type for a set of different variables. Setting up an animation sequence is fairly easy and the process does give an interesting look at multiple variables. One can make changes to the speed of animation or pause by clicking anywhere on the screen to call up a pop-up menu. A Copy-mode option appears to affect the way different patterns appear when plotted over one another, but there is no explanation of this function in the manual. One can generate up to 255 maps for an animated sequence, but a 300 by 400 pixel display requires about 15Kb per map.

MapMaker 4.53

This program provides a number of features (with the obvious exception of animation) beyond those of *MacChoro II*. In addition to choropleth maps, one also may create graduated symbol, dot, and value-by-area cartogram map forms and these may be displayed simultaneously. The program provides a number of ways of importing and exporting data and graphics to other programs (such as *MacChoro II*) and can provide the basic maps for generation of high-quality color printing. It can generate a map of all counties in the United States although one must have sufficient computing power and memory to attempt this. Enough features are available in *MapMaker 4.53* that it almost can serve as a stand-alone mapping program with considerable design capability.

MapMaker 4.53 comes on four disks. One contains the program and the three others contain outlines and some data for 150 world countries, all 50 states, and all counties for all states. A large number of other geographical files such as census tracts, zip codes,

and major roads in the US may be purchased from Strategic Mapping. After copying the program to a hard disk and starting it, a blank window appears with eight items across the top menu: File, Edit, Assign, Layers, Categories, Display, Fonts, and Style. Generating the first map requires reading the manual since the process is not intuitive. By selecting New under the File menu a sequence of windows begins which requests the number of boundary files to be assembled (usually each state is a separate file), the size of the map on the page, and whether any other geographic features are to be added. This step is important since the map can not be moved (unlike *MacChoro II*) on the page after the user establishes a window for it. A map of the selected area will then appear within the user-defined window.

The next step is to select the Import Data option under the File menu. Data is expected in the form of a tab-delimited text file with a maximum of 30 variables. Usually the first record in the file is a tab-delimited list of category headings. *MapMaker* will then read the data file matching an ID number in the first field of the data file to a corresponding number in the geographical boundaries. These two numbers must match exactly or the data will not be linked to the geographical units. Usually geographical units such as counties or census tracts are identified by some standard code such as FIPS codes since such values are commonly part of large census files extracted from tapes. An advantage of this linking method is that the data file can be of any size or order and it does not have to be processed to create a map of fewer areas. Once all data values have been read a map of the first variable is displayed. The actual data values for each geographical unit may be checked by selecting the Data Values option

under the Assign menu. A list of areas then appears and one may be chosen for the display of its values. Checking data values by moving through the list of geographical units is rather slow compared to the spreadsheet display of *MacChoro II*. Data can be exported in the form of a text file to other programs by selecting the Export Data option under the File menu.

If a choropleth map is being produced, one of the first cosmetic changes to the map is to remove a set of point symbols from the legend which are assigned to each class along with a shading pattern. These are removed by selecting the Select Point Types option under the Display menu. Selecting the No Points Displayed on Map or Legend option removes this feature from the legend.

The data classification options available in *MapMaker 4.53* are fewer than in *MacChoro II*. Only equal interval, quantile, and user-specified classification methods are offered. These are changed by selecting the Data Divisions option under the Assign menu. Also available under this menu is View Data Statistics which gives a descriptive list of the data distribution.

Unlike *MacChoro II*, the default shading patterns in *MapMaker* are not very suitable for a map since they are coarse and possess little value difference. These can be changed with the Area Fill Patterns option under the Assign menu. Any of 35 patterns can be selected although only a few possess suitable, non-textured value differences. Each may be specified in one of 8 colors against a background in one of 8 colors.

Completion of this step usually results in a suitable choropleth map. Maps of other variables may be generated by selecting the desired one from under the Category menu. If manual classification has been selected, then new classes will have to be specified.

Geographical data can be processed in a number of ways in *MapMaker*. It can be converted from latitude and longitude to a map in one of six projections, it can be scanned and converted to a PICT file and then assigned ID numbers, or it can be digitized on the screen. Since the necessary format is provided in an appendix of the manual, it is possible to write programs to reformat data from other programs to a form compatible with *MapMaker*.

Boundary data is used for the dot, choropleth, and cartogram displays. To change between the choropleth, dot, and cartogram map forms one need only select the Select Area Types option under the Display menu. A window appears with buttons to change the map form as well as spaces to set the dot value and unit area for the cartogram. Graduated symbols, however, require a special point file. Each point is located by a single x,y coordinate with an appropriate identifier. Features controlling this map form are found under the Select Point Types option under the Display menu.

MapMaker provides a number of graphic utilities for enhancing the display. Along the left margin are a series of line and object drawing and shading tools common to many drawing programs. Under the Assign menu are options to change the color of parts of the map and the legend as well as the background. These options enable one to easily generate colorful displays which are suitable for photography directly from the screen. Under the Assign menu are options to add a shadow around the edge of the map and to draw a grid of latitude and longitude over the display. Text of a desired font can be placed anywhere on the display. Titles, labels, and notes can be generated and dragged to a desired position. If the background is cluttered the type can be framed with a

masking rectangle.

A Layers menu provides other interesting possibilities. One option, Layer Options, makes it possible to copy different displays to separate layers for manipulation and display. Several maps can be presented at once and selectively edited. The other option, Base Map Options, enables one to turn off the base map or the map distribution. By turning these off selectively, one can save a base map as a PICT file and separate dot patterns or polygon shading as additional files. These can be imported and recombined in a drawing program. For example, individual dot patterns might be created this way and then combined into a single map in a drawing program. The Layer Option did seem to present some problems with large files and would occasionally cause the program to crash although smaller files did not present a problem.

Perhaps one of the strongest criticisms of *MapMaker* is the lack of a good legend for the graduated symbol and cartogram map forms. Currently no reference symbols comparable to the map are displayed in the legend and this should be corrected.

Both *MacChoro II* and *MapMaker* 4.53 perform acceptably well. *MacChoro* generates a more appropriate default map than *MapMaker* and has some useful options such as bar scale generation, animation, and classification methods not available in *MapMaker 4.53*. *MacChoro II*, however, generates only choropleth maps and does not seem to function in quite the same way as many Macintosh programs do. Often several steps are necessary to perform a function that should be possible with a single command. For example, the importing and exporting of data require several steps. The limitation of 600 polygons in *MacChoro* and lack of a color display tend to

make it less desirable for maps of entire MSA's or all counties of the United States. Certainly one disadvantage of *MacChoro II* is that the US County outlines must be purchased as a separate file while the same file is included in the price of *MapMaker*.

MAPPING THE YANOMAMO

Anthropologist Napoleon Chagnon and the Stone-age Yanomamo — The native people of the Amazon River Basin — have a new way of defining home. Chagnon and Venezuelan anthropologist Charles Brewer-Carias are using global positioning system technology to map the locations of native villages in the Siapa River Valley.

In the first stage of a 10-year research project, Chagnon recently located eight villages, made contact with three previously undiscovered villages, and recorded more than 250 position fixes. A Trimble TransPak receiver (Trimble Navigation, Sunnyvale, California) was used to help navigate the unexplored regions of the basin.

An estimated 14,000 tribespeople live on the Venezuelan side of the Amazon Basin; 9,000 live on the Brazilian side. Although mistreatment of the Yanomamo continues on the Brazilian side, the success of this survey may offer protection for the Venezuelan peoples. The president of Venezuela, Carlos Perez, has pledged to protect the Yanomamo from the encroachment of modern civilization by creating a Siapa Valley Biosphere reserve.
Geo Info Systems, June 1991

LANDSAT NEWS

Landsats 4 and 5 continue to function nominally. Landsat 6 is on schedule for launch in mid-1992.

Rep. George Brown (D-CA) introduced the Landsat Continuity Act on May 23. The goal of the legislation is to secure government funds to begin development of Landsat 7 through the authorization of $20 million for long-lead satellite hardware items. Brown said he felt the Landsat 7 funding question had been delayed too long, putting the continuity of the program in jeopardy. Landsat 6 will be due for replacement in 1997, giving contractors barely enough time to develop Landsat 7 even if funds are appropriated in the Fiscal Year 1992 budget.

The first round of hearings relating to the Landsat Continuity Act were held on June 26 at a joint meeting of the Science, Space and Technology Committee and the Permanent Select Committee on Intelligence. The Committee heard testimony from eight members of the remote sensing community, representing three areas of data applications: military, scientific/ global change and civilian/ commercial.
Landsat World Update 4:5, June 1991

SPOT NEWS

Sales of SPOT imagemaps are rising rapidly: 150 in 1989, 500 in 1990, and a target figure of 1,000 in 1991. A SPOT imagemap resembles a map, except that the conventional planimetric content is replaced by a satellite image. If suitable ground control points are available for level 2B preprocessing, the absolute location accuracy is 30m.

In late 1990, SPOT IMAGE decided to launch a new family of products under the general tradename GEOSPOT. Physically, a GEOSPOT product is a map-type document on a SPOT satellite image underlay. It is geo-referenced to a given cartographic projection, geo-coded to a specific geographic grid, and cut to match a specified system of map sheet lines or a geographic grid. They

are available in a range of scales from 1:25,000 to 1:100,000. Other scales between 1:10,000 and 1:250,000 are available on request. *SPOT Flash 1, February 1991*

DIRECTORY OF COMPUTER AND HIGH TECHNOLOGY GRANTS

The *Directory of Computer and High Technology Grants* lists 640 funding sources for computers, software and high-tech related grants. The Directory provides profiles on foundations, corporations and federal programs.

Three essays on grantsmanship will guide you through the intricate process of securing a grant. *Getting Grants with Computers/ Getting Computers with Grants* makes suggestions on where to look for funding for computers. Another essay provides an enlightening debate between Apple and IBM computer experts. The third essay lists methods available to secure discounted and free software.

The cost of the First Edition is $44.50 per copy (add $4.00 for handling). The *Directory of Computer and High Technology Grants* can be ordered from the publisher, Research Grants Guides, Dept. 4B, P.O. Box 1214, Loxahatchee, FL 33470.

cart lab bulletin board

This forum is offered to encourage communication among practitioners at a time of rapid technological transition. Questions, comments, and announcements are invited.

A New HyperCard Stack for Digital Cartography
Jeremy Crampton
Penn State

The Temple University Cartography Lab has developed a handy new HyperCard stack for Apple Macintosh computers for editing

text on digital maps and other graphics that involve textual elements. The stack, called *Textmaker*, allows users to create a separate document containing their text and then to import it into Adobe *Illustrator* 3.0. From there it can be converted into other formats, such as Aldus *FreeHand* 3.0.
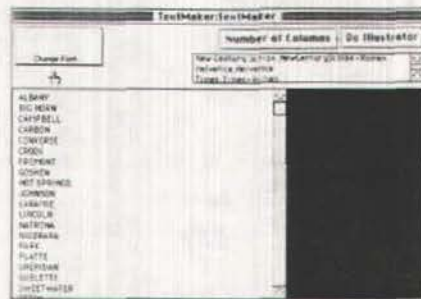
Figure 1

Textmaker (see Figure 1) was developed primarily for positioning place names, rather than blocks of text. The user types the list of names into a word processing document and imports it into *Textmaker*. A HyperCard button can then be used to save it in a form that *Illustrator* can open.

As digital cartography continues to replace manual production at cartography labs, cartographers are finding that in some applications it is often still useful to think of the digital mapmaking process in terms of traditional cartography. Name placement is one of those areas. In manual traditional cartography it is common to produce an alphabetically ordered proofing sheet of place names and other map labels that afford easy editing and revision. These labels are then individually removed and placed on the map. *Textmaker* was developed to emulate this process.

I played with *Textmaker* in our lab using a Mac II. Although the HyperCard stack itself is fairly easy to use, experience with, or at least knowledge of, the HyperCard environment would be a bonus.

Once in *Textmaker* there is little need or scope for text formatting, this being best done in *Illustrator* (do your editing in the word processing program). There is a button labeled "change font" but it did not seem to do anything. *Textmaker* will be most useful to cartographers if they think of it as a conversion program rather than an editor or formatting environment. However, a useful addition for the future would be some kind of alphabetizing scheme, so that the list of names could be ordered for export to *Illustrator*.

I began by typing lists of place names in several word processing packages, such as *WriteNow*, *WordPerfect* and *Word*. In order to test whether *Textmaker* could retain formatting done at this stage, I varied the fonts and typesize of the names. However, since *Textmaker* can only accept ASCII format (such as the "text only" option in *WriteNow*, or the "text only with line breaks" option in *Word*, these formats were nullified, with the text coming into (and going out of) *Textmaker* only as Helvetica 10 point. Since the flow of operations goes from a word processing program through *Textmaker* into *Illustrator*, it is best to do your editing before you import the text into *Textmaker*. And if, as expected, you are using *Textmaker* for place names, a spell-checker will not be of much utility — old fashioned copy editing will be needed.

To import the text into *Textmaker* I used *Sigma Edit*, a utility that can be accessed under the Apple menu. (If you have System 6.xx, you can install a DA using the Font/DA Mover; if you use System 7, just place the *Sigma Edit* application in the Apple Menu items folder in the system folder.) To bring the text in, open *Textmaker* and then open *Sigma Edit*, which will allow you to open your word processed file. Choose your text with the cursor or with