INTERFACING DIDS FOR STATE GOVERNMENT APPLICATIONS

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ABSTRACT

In 1980 the National Aeronautics and Space Administration (NASA) developed a low cost remote terminal to operate the Decision Information Display System (DIDS) software and communicate with the DIDS host computer. DIDS is an interactive, menu driven, statistical mapping system that produces single and bivariate color choropleth maps for various geographical areas. The key to its use has been the linkage to a large Federal statistical data base maintained by the White House Office of Planning and Evaluation. As part of NASA's efforts to evaluate the utility of DIDS for state government applications, a remote DIDS terminal has been operating in South Carolina since December 1980. This paper will present an update on the experiences of researchers at the University of South Carolina and the State Office of Geographical Statistics with the use of DIDS and their recent efforts to link the system to other computer graphics display processes.

INTRODUCTION

In 1978 NASA and the Bureau of Census, acting upon a request from the Executive Office of the President, developed an interactive color statistical mapping system which evolved into the present Decision Information Display System (DIDS) (Zimmerman 1980). The system incorporated a menu-driven approach to generate choropleth and bivariate maps through color image processing. This much publicized system has demonstrated the technical feasibility of such a dedicated map making machine. Perhaps more importantly the DIDS experience has raised serious questions regarding the value of such maps and their role in the decision making process. This paper will present a brief update on the current status of the DIDS program itself, the results of an evaluation of the use of a DIDS terminal in a state setting, and an outline of an approach to modifying the system to make it more responsive to state and local agency needs.

DIDS UPDATE

After having been succesfully demonstrated for the President and Congress in 1978, the DIDS system proceeded on a somewhat erratic course through a number of bureaucratic arrangements with its future still remaining uncertain. The original hardware configuration at the Goddard Space Flight Center has been replaced by a VAX 11/780 host computer that is currently operated as part of the Office of Planning and Evaluation of the Executive Office of the President. After initial efforts to organize a large scale interagency cooperative arrangement, consisting of numerous remote terminals and a massive data base, were less than successful, the Federal DIDS activity was greatly curtailed. As of October 1, 1982, there will no longer be an interagency program conducted on a central host system. The White House will be operating DIDS as part of its internal information system, abandoning the role of DIDS within other agencies to the individual decisions within those organizations. The Departments of Health and Human Services and Transportation are operating DIDS terminals; each is presently grappling with approaches for establishing a system for operating DIDS once the White House connection is severed.

Since its inception DIDS has consisted of separate elements of hardware, software and the data base. While this latest organizational change means that there will no longer be a Federal effort to establish and maintain a unified data base, its absence does not prohibit an organization from utilizing the other elements. In fact, a private company, DIDS-CO, is operating specifically to provide support to groups interested in establishing a DIDS facility. Another group, Data Resources Incorporated, is supplying data that is directly compatible with DIDS, as well as selling DIDS output products on a service bureau basis on its DADS system (Borrell 1982). The hardware components are commercially available from the De Anza Division of Gould. The original software is available through COSMIC, NASA's software distribution center. Recently a more flexible version of the software, including an expanded color palette, keyword searches and an interface to SPSS, has been developed by General Software Corporation and is running at the three federal locations. It should also be noted that the Commonwealth Scientific and Industrial Research Organization (CSIRO) in Australia has taken the original DIDS hardware configuration and developed its own software, COLOURMAP, that is considerably more flexible than DIDS (CSIRO 1982).

SOUTH CAROLINA INVOLVEMENT

As originally conceived, DIDS was envisioned to consist of a centrally maintained computer that would serve as the host for a large network of remote terminals. In fact, the LSI version that would be linked via a telephone line vastly expanded the potential user community. In 1980 NASA selected South Carolina as the site to examine the feasibility of the network concept within state government setting. The project was jointly conducted by the Social

and Behavioral Sciences Laboratory of the University of South Carolina and the South Carolina Division of Research and Statistical Services. The Council of State Governments (CSG) was given the responsibility of coordinating efforts with other states and disseminating information.

The DIDS remote terminal hardware and software arrived in South Carolina, where it is still operational, in mid-December of 1980. The hardware configuration consists of a DEC LSI 11/23 processor with three RL01 disk drives, an alphanumeric terminal and a 19 inch high resolution (512 X 512) color monitor. The demand for hardcopy output has prompted the addition of a low speed printer and a Matrix color camera system. For approximately fourteen months the system was linked to the DIDS host via a dedicated 9600 baud communication line. Presently it is being operated in a stand alone mode utilizing approximately 300 variables stored on a data disk.

After a few months of operation at the University of South Carolina the system was moved to the State Senate Office Building where it received considerable visability for more than a year. The basic objectives of the study and an interim progress report have been presented at the Harvard Computer Graphics Conferences (Cowen and Vang 1980, Cowen 1981). A report, "State Government Applications, Pilot Study of the Domestic Information Display System in State and Local Government" has been prepared by the Council of State Governments (1982) and a final report on the South Carolina project has been delivered to NASA and will be available shortly (Cowen 1982).

EVALUATION

The evaluation aspects of the South Carolina project concentrated on the operation of the system, its software capabilities, its data base, and user perception and behavior. The highlights of the findings of the evaluation process are delineated below.

Operating Environment

Except for a few problems, the DIDS remote terminal functioned as advertized at two different locations in South Carolina, and on two separate occasions when it was demonstrated in Atlanta. If left in one location, the equipment and software would constitute a reliable and easy to use system that could be operated by non-technical staff. The menu system is easy to comprehend and simple to use. A novice can produce a map using the defaults in a matter of seconds. More importantly, it is also easy to utilize the options to alter the colors and class intervals, zoom, list data or highlight a particular class. The only major problems relate to the difficulty of locating some data items for the beginning and the tediousness of the process for the experienced user.

Capabilities

The DIDS terminal is actually an image processing system with a menu driven prompting system that enables the user to

match a variable with the appropriate geographical base, determine the classing and color schemes and generate a picture. While the preprocessing of the geographical files into pixel locations enables images to be displayed and altered quickly it also restricts the user from varying the placement of map elements or style of text. Although the system restrictions are inhibiting, the basic design appears to have been a reasonable compromise that has not caused any noteworthy problems during the use of the system. The resolution of the monitor generates a surprisingly clear county level map of the United States and the zoom capability compensates for any difficulties with scale. While color is one of DIDS most exciting features it is also one of its most restrictive. A good color camera system that includes the use of instant film can add $15,000 to the cost of the system, however, it was found to be necessary enhancement for a system that attempts to respond to immediate requests for output products or that produces bivariate maps. Unfortunately there is no inexpensive way to produce multiple color picture copies, and the less costly 35mm slides are not always on appropriate medium for presentation, publication or research.

The class interval schemes and the color palette enabled the user to generate very usable choropleth and bivariate maps of ratio or percentage data. However, the software does not provide any option such as graduated symbols or dot distributions that are appropriate for variables that represent absolute values.

Data Base

As an organizational entity DIDS was designed to be the catalyst for the creation of a current and relevant Federal statistical data base. In fact, many people viewed the DIDS hardware as simply the means to access the data items. The fact that DIDS has not lived up to its potential is probably most directly related to the difficulties in maintaining a viable data base. After all, what good is a magical map making machine if no one is interested in the available maps? The delays in the release and entry of 1980 census data were particularly disturbing. It is inconceivable to people who have witnessed the technical wizardry of DIDS that data collected two years ago could not be viewed. It must be noted that most of the problems relating to the data base are bureaucratic in nature and therefore beyond the control of the DIDS program office. Past experience indicates that unless legally mandated it is unlikely that any multiagency data base will ever exist.

The South Carolina project was adversely affected by other aspects relating to data entry. The original system design was developed with the philosophy that each remote terminal would include the same data menus as the host, thereby enabling the retrieval of the same variables. While this philosophy permitted DIDS to function as a unified network, it also precluded local data entry, and made the remote terminals dependent on the operators of the host facility. The unclear relationship of the South Carolina project with the overall DIDS program further compounded this problem. Even though current data were gathered for the counties

within the State there was never any assurance that they would be entered onto the host. While some data were entered at the start of the project, other files were never available. This obviously made the system less attractive to users in South Carolina and hurt the credibility of the project. It should be noted that there is a finite limit to the number of data menus that will fit on a disk pack, therefore, it is necessary for the operators of the host to establish priorities in terms of the contents of the data base. Although the information for 46 counties may be important to policy makers in South Carolina it has very little significance in Washington

User Perception and Behavior

When the South Carolina project began there was considerable optimism and enthusiasm. Although the vast majority of the hundreds of individuals who observed DIDS have been highly impressed with its technical wizardry, due to numerous factors the project ended as something less than an overwhelming success. The inadequate data base was without a doubt, the most restrictive factor. However, there are also several lessons to be learned regarding the general manner in which a system such as DIDS will be used.

Much to the chagrin of cartographers, the lack of success of the overall DIDS effort must be partially attributed to the low priority attributed to statistical maps. Many users actually were more interested in simply retrieving the data than in viewing the display. In fact, they were generally unfamiliar with the production of choropleth maps and more interested in finding specific values for their county than in studying spatial patterns. While they were impressed with the manner in which the class intervals and color schemes affected the appearance of the map, they preferred to have a professional operator make those decisions. Most importantly, it became evident that the system would rarely be used for decision making in a real time mode. Rather, it is viewed as part of a map making service bureau from which attractive slides and color prints could be ordered. In effect, most of the requests for services did not actually take advantage of the system's speed or manipulative features. Many users would have found it easier to have the data residing on a large central computer facility with statistical and mapping software and plotting capabilities that could be accessed through conveniently located non-graphical terminals. Furthermore, they often found a black and white electrostatic plot, which could be easily reproduced, more amenable to their needs.

Although the ability to easily produce bivariate maps is one of DIDS major features, it is not clear whether these displays will ever gain widespread acceptance. Reduced to simple two by two classifications they can produce exciting and meaningful displays. Unfortunately the concept is still so new that bivariate maps will be viewed with awe by most users who will subsequently hesitate to integrate them into their analysis.

RECOMMENDATIONS

With few exceptions, users of the South Carolina DIDS system have been intrigued and amazed with both the DIDS technology and potential. However, in order to be responsive to the information needs of users at the state level, DIDS will require several system modifications, and still may be a prohibitively expensive mapping alternative.

It was never technically feasible or even desirable for the centralized DIDS host to accommodate a remote terminal in each state. Now this possibility is not even an alternative on a limited scale.

Technically, the most realistic approach appears to be the integration of a DIDS terminal into the general data processing system available within a state. In such a configuration the terminal would essentially serve as an intelligent interactive color plotter. Geographical bases of interest within a state, including sub-county level divisions, such as census tracts and census county divisions, would comprise a separate disk to which socio-economic data could be passed as needed. This would enable a user to conduct most aspects of the analysis on a mainframe, thereby freeing the DIDS terminal to be used for those things it does best. Elements from various federal data bases could easily be integrated with locally gathered data. Most of these data could be acquired on magnetic tapes, thus eliminating the need for an expensive communication line, as well as serving as inexpensive archival files. A substantial number of variables could be stored on random access files in a form compatible with one of the major statistical packages such as SAS. These files or the output from a statistical modeling procedure could then be passed to DIDS in preparation for a working session. The DIDS terminal would be the final link in a multi-source, integrated data processing network. In such a setting, the terminal could serve as a more expanded image processing and computer graphics facility. It certainly would be possible to display and manipulate other pixel images such as a Landsat scene or generate standard business graphics.

The incorporation of some of these modifications is currently underway at the Social and Behavioral Sciences Laboratory. The first phase of this process involved extracting data from the DIDS system and integrating it with other data on the University's system. This was accomplished by writing the printer output files onto a floppy disk system which was able to communicate to the University's mainframe. The data has been used to generate a regression model of population growth and has been linked to standard computer mapping software (figure 1). The next phase will include the establishment of local data entry procedures and the creation of a geographical data files relevant to local clients

CONCLUSION

In the late 70's DIDS represented an exciting and innovative

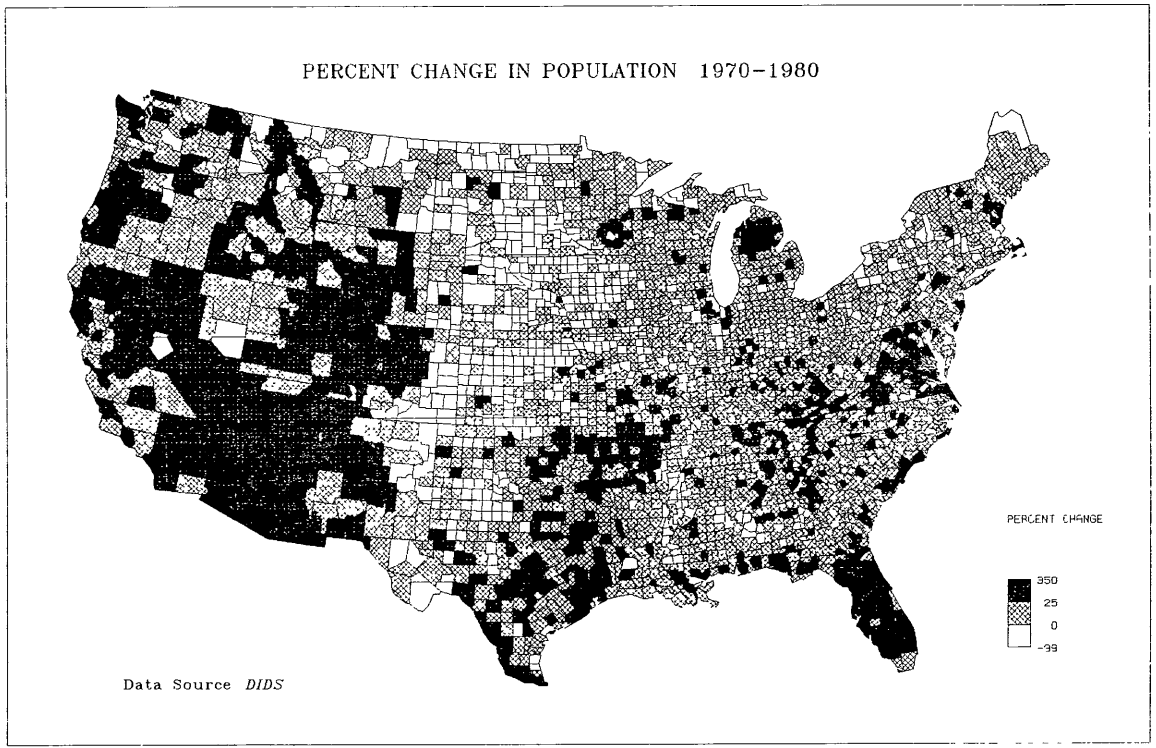

Figure 1. Electrostatic GIMMS map generated from data extracted from DIDS.

approach to computer assisted cartography designed to facilitate and support the decision making process. Now that the promise of a centralized interagency data base has failed to materialize, it remains to be seen whether the hardware and software will be able to stand on their own. Nevertheless, the DIDS experience has provided a great deal of insight regarding the design of cartographic systems. Clearly the technology capabilities exist; now the extent to which such systems will be applied, and the economic value decision makers will accord to the implementation of such systems, remain to be seen.

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