NCGA '91 Expo Features Special Area for New Companies

Companies new to the computer graphics industry will be featured in a special section of the NCGA '91 exposition floor.

Firms which have been producing computer graphics-related products for less than three years may be eligible for special exhibit space rental fees as well as many other benefits.

Contact Martha Filson at 703-698-9600, ext. 313 for more information on the new companies area at the NCGA '91 exposition, April 22-25, 1991 in Chicago.

International Computer Art Academy Slated For Summer 1991

Computer and Art, an international project dedicated to exploring the creative potential of digital art, will hold a two-week long seminar in the summer of 1991. Titled "The Third International Summer Academy," the seminar will be held July 15-26, 1991 on the campus of Franklin College Switzerland in Lugano, Switzerland.

Courses at the Academy will explore the use of computers for fine art, music and graphic design. Attendees will include artists, media designers, and composers as well as teachers and students of the arts.

NCGA member Joan Truckenbrod of the School of the Art Institute of Chicago will be an instructor at the Academy. The seminar will also feature faculty from several other prominent United States and European art schools.

Computer graphics hardware and software developers will be using the Academy as a test site for new products. Attendees will have the opportunity to work with the newest technologies.

The Academy is being co-sponsored by the George Mason University, Fairfax, Va., Franklin College Switzerland, and the Instituto Dalle Molle sulle Methodologie Interdisciplinari, Lugano, Switzerland.

Enrollment is limited to 50 individuals per week. For application materials or additional information, contact Dr. James Finkelstein, George Mason University, 703-323-2400.

MAPPING

A Digital Chart of the World

Setting a standard for Geographic Information Systems

By Michael L. Sena

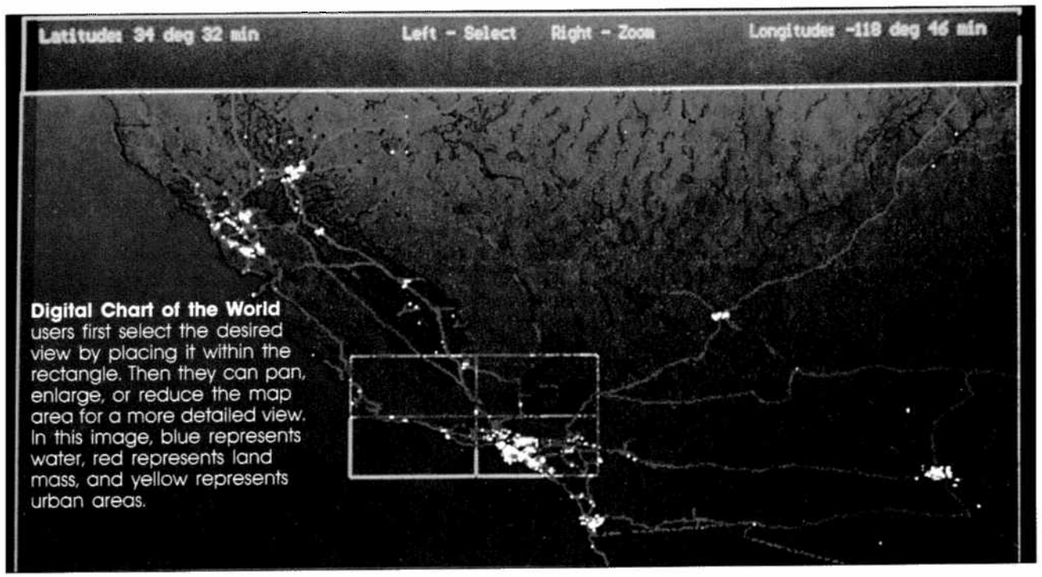
The ability to read and use digital base maps at all scales from any source on hardware running Geographic Information System or mapping software has long been just a dream to many in the GIS and mapping markets. But the outcome of the Digital Chart of the World Project could turn this dream into reality.

According to the project's initiators, supporters, and participants, the Digital Chart of the World (DCW) should set a new standard for preparing, processing, and distributing geographic data. During the two-phase project, a database will be prototyped, standard software will be developed to access the data from CD-ROM, and the actual world database will be produced. The project, expected to be completed by the end of 1991, should yield a digital chart of the world which should become available for public sale by 1992.

Specifically, the US Defense Mapping Agency (DMA, Reston, VA), the DCW's primary contractor, initiated the $10 million project to provide a standard vector data format and the means to distribute the data, and to create a detailed global database that can be used for logistical support, environmental planning, resource management, or any application requiring geographic analytical capability. Also involved in the project are military mapping agencies from the UK, Canada, and Australia (which produced with the DMA the Operational Navigation Charts [ONC], a series of maps that cover the world at a scale of 1:1 million [except for Antarctica, which is at 1:2 million] and which will serve as source material for the Project), as well as more than 60 governmental agencies involved in mapping, geodesy, and charting.

A team of companies led by ESRI (Redlands, CA) are developing the 1:1 million base map. Dur-

Contributing editor Michael L. Sena is president of Matrix Consultants (Boston).

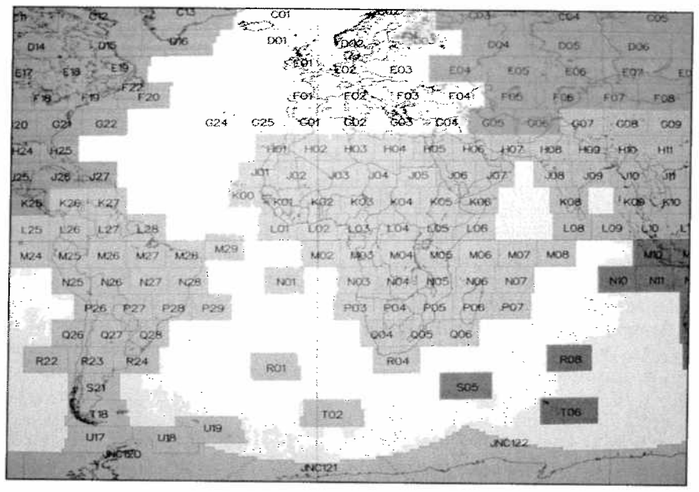


Digital Chart of the World users first select the desired view by placing it within the rectangle. Then they can pan, enlarge, or reduce the map area for a more detailed view. In this image, blue represents water, red represents land mass, and yellow represents urban areas.

ing the project's two-year duration, ESRI is to prepare the standards, convert the ONC map series into digital form, put the resulting database on CD-ROM, and provide users with the means to access and review the data.

Meanwhile, Loral Defense Systems, Akron Defense Systems Division, and Geovision (Norcross, GA) will act as subcontractors. Loral and Akron will provide systems engineering support to ESRI, while Geovision will be responsible for CD-ROM premastering, setting

specifications and converting selected pieces of the geographic database. Through four prototypes that progressively apply work performed to date, the team is putting standards and methods into production, creating and indexing a portion of the database, and creating a CD-ROM master disk, which they will distribute to reviewers; they will then compile the reviewers' comments and use them to improve the next prototype.



Serving as source material for the creation of the Digital Chart of the World are the Operational Navigation Charts, a series of maps of the world created by the DMA and various military mapping agencies. The rectangles represent ONC sheet boundaries; 270 sheets are needed to map all land areas.

During the second phase, the team will document and engineer the software and convert the ONC series to digital form; then the entire DCW product and map access software will be mastered to CD-ROM for distribution. While production is underway, the DMA will investigate appropriate distribution channels and pricing for the DCW database, so that it can reach the widest possible audience.

The standard chosen for the project's geographic data storage is the Vector Product Format (VPF), being developed by the project team as a generic model for geographic databases. VPF is a direct-access format meant to be used, without conversion, in systems designed to work with it. For now, only the DCW CD-ROM software operates with VPF data, but the team hopes that GIS software vendors will adapt their systems to work with VPF and that database producers will use the format to store digital geographic data.

In designing VPF, ESRI relied on its experience in GIS as well as previous work of the Digital Geographic Information Working Group. This group, comprised of agencies from NATO countries, created the Digital Geographic Exchange Standard (Digest) for data exchange on magnetic tape between participating agencies. VPF is based in part on Digest's conceptual data model.

VPF consists of a data model and information on its application. While specifics on the VPF model will not be made public until the final prototype is released, it has been determined that the VPF language includes geometric primitives which users will be able to geographically reference and connect to perform GIS applications.

DCW Project: Phase One

It also includes feature classes with sets of primitives grouped into major classifications. For example, political boundaries may be a cultural/political feature, while drainage may be a surface information feature. As part of the prototyping phase, the project team has tested VPF with several map scales to ensure that it meets the generic model criteria.

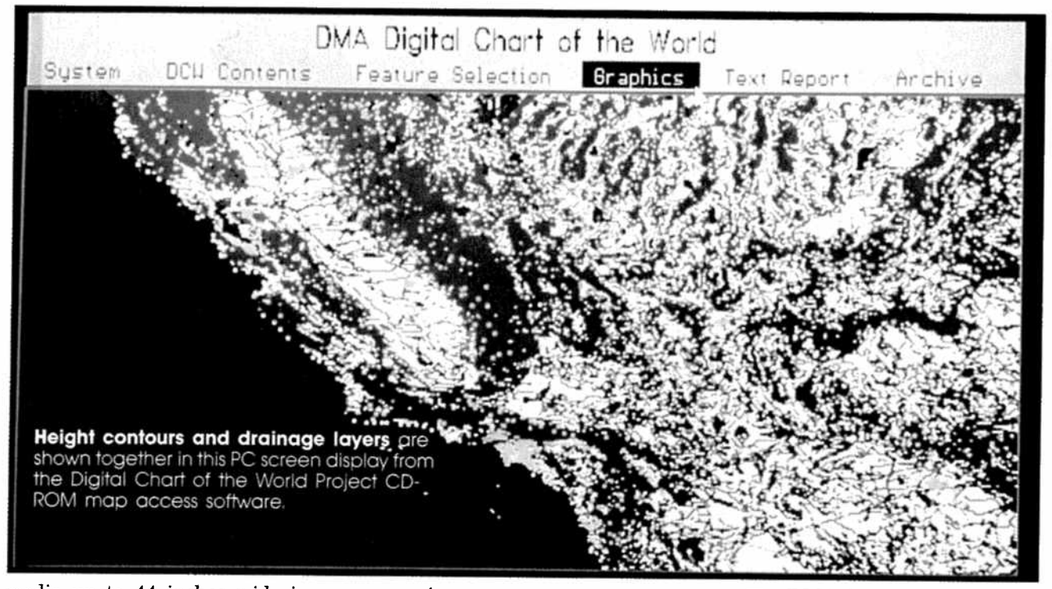
ESRI is using its Arc/Info system to convert the ONC series into the actual DCW product and has acquired several other technologies and incorporated them into the production workflow. Notable among these systems are the ScanGraphics (Broomall, PA) CF 1000/44 scanner and Optigraphics' (San Diego) raster editing workstation.

To convert the ONC series into digital format, ESRI is producing negatives of the ONC sheets, which are sent to subcontractor Geonex Chicago Aerial Survey for production of mylar positives. The team then scans into a 300M Compaq 386/33 PC all features, excluding map type, using the 1000dpi CF 1000/44. This scanner accepts

up CD-ROM production techniques, and developing CD-ROM quality assurance procedures. Geovision will also work with ESRI to improve CD-ROM data-access performance by developing new techniques for indexing data in logical order.

During the first phase of the DCW Project, which should be completed by the end of this month, the project team is developing the standards; during phase two, it will develop the Digital Chart of the World and package it in a form that is readily usable.

The first phase of the project is designed around a "prototyping" process, during which the project team is synthesizing data standards and media access software



Height contours and drainage layers are shown together in this PC screen display from the Digital Chart of the World Project CD-ROM map access software.

media up to 44 inches wide in a continuous roll, which is necessary for the large ONC sheets.

Prior to the vectorization process, the team interactively removes non-essential data or dirt specks that were captured during scanning using the Optigraphics raster editing workstation. They use Scan-Graphics' Rave automatic vectorization software running on a DEC VAX 6320 file server to convert the raster-scanned data in run length-encoded format into Arc/Info vector format.

At this point, the team transfers vectorized data to Arc/Info for final vector editing and topological structure definition, a process which they perform on Sun (Mountain View, CA) Sparc workstations connected to a Sun 4/490 file server. They then use Arc/Info to assign feature classifications and attach data attributes.

Because the Digital Chart of the World is a continuous and seamless database, all features which cross ONC sheets must be matched and integrated. Therefore, the project team will create database segments to facilitate creation of the CD-ROM disks. A final segmentation plan has not yet been decided upon, but it most likely will consist of continents and parts of continents. As the final step in database production, the team will process the Arc/Info data through a DCW conversion program.

ESRI, with help from Geovision, has created a menu-driven program for reviewing the stored DCW data. Although it is not intended to be a full-fledged GIS package, it does contain enough GIS functionality for previewers to continue to ask for more. As an added bonus, the software code will be placed in the public domain when the project is complete.

Data Distribution Medium

The DMA did have specific requirements for the method of distributing the database. They chose CD-ROM because ISO-9660, a single and well-accepted standard for data format, existed. They did consider other media, but they rejected them, either because the media were too expensive to distribute (nine-track tape); they required expensive equipment to read (WORM optical disks); or there was no accepted standard for production (WORM, erasable optical disks, and digital audio tape). Another reason they chose CD-ROM is the relatively low cost of reproducing the data. Once the data is mastered, the cost of copies is less than $2 per disk.

Except for the cost of adding a CD-ROM reader, the DCW product packaged on the CD-ROM can run on a standard '286-based PC with 1M of memory and an EGA monitor. The DMA determined that this configuration was the most common among its clients and other potential users of the product.

ESRI and the DMA are quick to point out that the Digital Chart of the World is not a digital version of the ONC map series. While they are using the ONC series as the source for this database, the DMA will not use it once the DCW is completed to produce its printed maps. This will be done with its Digital Production System (DPS), a parallel effort at the DMA which involves the modernization and expansion of its current, automated map production systems.

At press time, the project team had met all of its objectives through the first three of the prototype stages. Seventy-five copies of the Prototype III CD-ROM were distributed in August, and comments from reviewers are being assembled for the fourth and final prototype. Production is expected to begin on schedule during the first months of 1991.

When the DCW Project is completed, the DMA and other sponsors should have their standards, DMA clients and organizations involved in digital global mapping should have a detailed geographic database of the world, and GIS and database suppliers should have a consistent model on which to base their products. *CGW*