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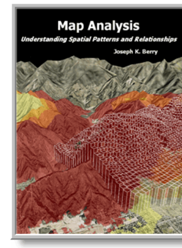
What's a Map?: *Media Mapping Technology Is Redefining the Term*



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What's a Map? *Media Mapping Technology Is Redefining the Term*

by Betsy Pfister, Ken Burgess and Joe Berry

Introduction

From the beginning of photography, people have had an interest in where pictures were taken. In the late 1800s, photographs from all over the world were sought by eager homebodies who wanted to know what other places were like. These photographs provided a visual reality to people who previously only had abstract ideas of other places obtained from representations in maps, art and literature. Most of the photographs in these early collections had descriptions of where they were taken written on the back--many were annotated with the actual latitude and longitude to five significant figures.

Today's GIS users have different ways of understanding "place." They tend to see places as abstract elements of a demographic, and they generate endless numbers describing locations and their relation to other locations. GIS people tend to think of photographs as maps, using geo-registered aerial or satellite images the same way they use street data. In doing this, they can lose sight of the fact that abstract representations on maps are placeholders for reality.

Current and developing technologies for media mapping are changing that mode of thinking for many GIS users. Media mapping merges photography and geography to help users understand space by experiencing abstraction and reality through the integration of maps and images (see Figure 1).

Media Mapping's Roots

The idea behind media mapping isn't new. GIS users have tried a variety of ways to associate a picture with the location it represents. Solutions for this vary from low-tech to highly complex. The low-tech version typically involves taking a picture in the field and then writing down a Global Positioning System (GPS) location and the photograph's frame number. With luck, photographers make relatively few mistakes in taking notes. Then someone scans the photo and manually enters the GPS data and image file into the GIS database. Hopefully, that person also makes relatively few mistakes. Other than the "human-error factor," the main deterrent to this method is inefficiency--it's a pain.

Figure 1. A media map allows users to click on a location and view pictures or other linked files.

More recently, engineers have come up with some high-tech ways to automate the process. For example, there are a few different video mapping technologies available today. Video mapping, the forerunner of media mapping, refers to geo-referencing video footage. It requires a means of associating GPS data with video. A mapping software package that can read the encoded GPS data builds a database that includes the GPS locations referenced to video time codes. The software displays a map that shows where the video was taken, and users access desired video footage by clicking locations on a map.

Video mapping often is contracted as a service, because most systems are based on several pieces of sophisticated equipment requiring skilled operators. But such services generally produce excellent results. An interesting example of a video mapping service is Continental Shelf Associates Inc. (*http://www.conshelf.com/*), which provides under-water video mapping services. Coastal and Ocean Resources Inc. (*http://www.*coastalandoceans.com/) provide aerial video mapping and other consulting services. Skyview Technologies LLC (*http://www.skyview-usa.com/*), creates video maps from a small blimp. For more demanding users, systems based on stereo videography produce images that allow GIS users to select any point in an image and view its geographic coordinates. Ohio State University's Center for Mapping (*http://www.cfm.ohio-state.*edu/) developed a GPSVan System with stereo video capability. They also have developed an Airborne Integrated Mapping System. Unfortunately, the associated expense and complexity of such systems tends to alienate most GIS users.

In 1997, Red Hen Systems developed a video mapping system as an agricultural field-scouting tool (see Figure 2). Perhaps it shouldn't have been a huge surprise to discover that the agricultural community at the time was a little "green" on GIS technology.

Agriculture consultants and farmers were leery of trying something new, and they also were a bit skittish about computers and video hardware.

Figure 2. A user demonstrates Red Hen Systems' VMS 200 product, a forerunner to media mapping that creates real-time geo-referenced video.

However, experienced GIS users from other fields eagerly adopted the technology, and the humble agriculture mapping solution became a GIS tool in a wide array of industry applications. The fledgling technology ended up in the hands of ecologists, foresters, weed-control managers, archaeologists, the oil industry, law enforcement officers (see Figure 3), military intelligence personnel and others. The users all had one thing in common: They wanted to *see* the locations they marked on their GIS maps.

Current Evolution

During the last few years, video mapping technology has focused on streamlining solutions to the photography/geography problem. New software and hardware components add laser range-finding and digital compass data to the system. Eventually video mapping, with its emphasis on mapping line objects, evolved into *media mapping*, which features additional support for mapping point objects. Red Hen Systems, for example, has a MediaMapper product that integrates digital pictures with GPS locations.

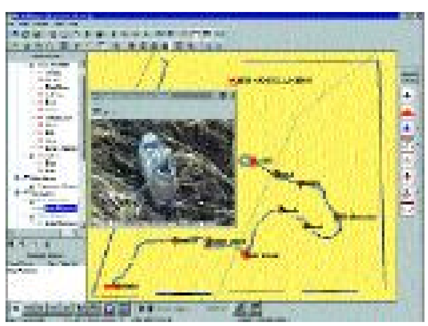

Figure 3. The Wyoming Crime Laboratory created a training scenario to demonstrate its use of media mapping. A "victim" died of exposure, and the system helped inventory the body and various items of clothing.

Video mapping systems still exist, and they're important to those who require a link between maps and real-time video. For example, aerial applications are well served by video mapping, and there's a growing interest in the remote sensing community for this kind of mapping (see Figure 4).

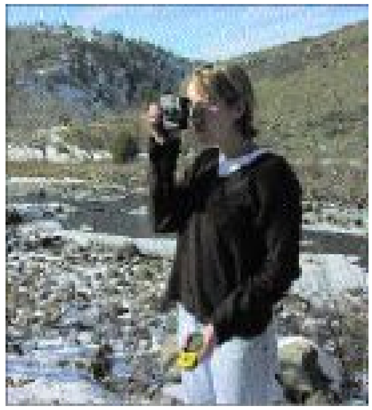

Figure 4. A special application of media mapping has been developed for aerial remote sensing. The system has been tested successfully in forestry and agriculture.

However, many GIS users seek something simpler. They don't need video— they want less hardware, fewer cables, and easier field and desktop operation. "Exportability" of media maps across GIS platforms is critical. These issues led to the development of media mapping, which doesn't rely on GPS data or video as the sole media source.

Media mapping has arrived at a place in time and development in which fieldwork is as simple as taking photographs. In its current evolution, media mapping refers to an automated method of adding multimedia files to a GIS database and then accessing those files by selecting locations on a map. Today's "media mapper" might be called a "photo-geographer" or "geo-photographer" who uses a digital still camera in the field and brings a hand-held GPS receiver along for the ride (see Figure 5).

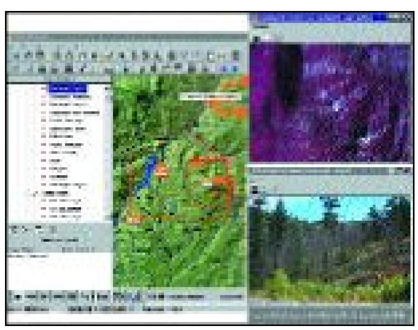

Figure 5. Today's media mapping products help users merge digital camera images with GPS locations.

Only slightly more complex than taking pictures, a media mapping system requires GPS receivers to save a track log as users take pictures. This file then is downloaded to a computer along with the digital images as software generates maps "hot linked" to pictures. The result allows users to click a map location and view what's there.

A media map can be associated with any kind of digital media, hence the evolution of the name from the early video map. Map features can incorporate multiple links to any kind of file, enabling users to inspect a location through pictures, notes, audio, streaming video or whatever kind of information they choose to store.

What's currently available is a map- centric application of the media-mapping paradigm— the map provides access to the linked information. But the way GIS users think is evolving, and media mapping brings up interesting questions about how users will process, access and understand GIS information in the future. It's somewhat difficult to contemplate or explain the implications of media mapping, because the GIS community seems largely indoctrinated with the understanding that "imagery equals map." In the media-mapping paradigm, imagery equals reality, or site detail, while map equals abstraction, or distribution of objects in space. As a whole, these ideas blend hard data with intuitive understanding to expand the limits of what we can know about a location.

Access to Information

The explosive growth of the digital camera market is bringing about further changes in our thinking about the future of "spatial media." It's estimated that 5.5 million digital cameras will be sold this year in the United States alone. As it stands today, media mapping is successfully making photographers of geographers. This is logical, because the technology's development sprang from a map-centric point of view typical of people who are accustomed to using GPS/GIS technology. However, a closer inspection of software being developed to support digital camera users leads to the idea of media mapping from a photo-centric point of view. If users can access images through maps, why shouldn't they be able to access maps through images?

There are several image-browsing programs on the market, which serve to organize and provide access to digital images. If you buy a digital camera today, you'll probably receive some sort of image browser as part of the package. These browsers provide access to images through "thumbnail" views, file times and user annotation. Technology is available to organize pictures in space, therefore it seems a logical next step to expand media mapping into the photo-centric realm of the image browser. Success with this would make geographers of photographers by enabling users to click on a picture to see a map of where it was taken. Information access soon will be achieved through either maps or pictures, and users will be able to make that choice based on their preferences.

Future Environments

Our understanding of physical experience is intimately associated with our understanding of space and time. The increasing use of GPS and GIS in technologies that touch our daily lives is clear evidence of this importance. Innovations that assist and inform us are incorporating mapping as a standard method of communication. Computing technologies are becoming more portable, easier to use, better connected and less expensive, all of which contribute to the growing expansion of GIS into consumer markets.

A simple example is the eventual replacement of paper maps bought at a gas station.

Soon those maps will be "beamed" directly to our cars, personal digital assistants and cell phones. We'll get more than just maps— all kinds of information about the local area, from points of interest to the availability of goods and services; will be part of the mapped information. In a sense, a map will be a live extension into the immediate environment, feeding us information that's organized spatially and searchable by whatever we want to know. This rich mix of geo-referenced multimedia soon will become part of daily life.

GIS and multimedia technologies are poised for considerable growth. The combination of the two has more value than either independently, and will result in a different way of understanding GIS data and our world. It's a natural path of development that GIS users can expect to see much more of in the near future.

Pfister is vice president of communications at Red Hen Systems; e-mail: betsy@redhensystems.com. Burgess is vice president of research and development at Red Hen Systems; e-mail: kburgess@redhensytems.com. Berry is president of Berry & Associates and a monthly GeoWorld *columnist; e-mail: jberry@innovativegis.com.*