GeoLink™ unites GPS and GIS technologies
GIS WORLD interviewed Douglas Richardson, president of GeoResearch, Inc., the developer of GeoLink, an automated mapping system that combines the power of GPS and GIS applications.

GIS WORLD: Dr. Richardson, how did your firm first develop the idea for integrating GPS and GIS technologies?

DR: We came to the field from GIS and developed many early GIS applications, especially in geography and natural resources work. Many of our projects involve remote locations in the northern Great Plains/northern Rockies region. We saw an early need for accurate locational information for the development of GPS and GIS databases. We also were heavily involved in the development of new technology in real-time data acquisition and transmission. Those capabilities allowed us to see the value of GPS integration early on as well as to technically achieve that integration with the GeoLink system.

GIS WORLD: What is the significance of GPS to GIS?

DR: The integration of GPS and GIS represents one of the most significant new developments for natural resource management and facilities mapping in recent years. Rapid, mobile access to accurate computerized geographic information through GPS provides affordable solutions to a great number of GIS application needs. Its value is not only in the development of GIS databases, but in the maintenance and updating of existing off-the-shelf GIS databases. Finally, it allows one to use GIS databases in many new ways, including field verification, vehicle tracking, etc.

GIS WORLD: Have you found it difficult for many users to adopt GeoLink?

DR: Like any good computer software today, we designed GeoLink to be user friendly so the user can collect good-quality GIS data—both spatial data as well as attribute data—will a low level of technical skill. That makes it possible for users in third-world countries, for instance, to develop accurate GIS databases quickly using people whose technical skills don't exceed that of driving a vehicle and pushing a couple of buttons. We conducted projects where high school students collected large quantities of accurate data quickly by walking or driving across the area to be mapped and entering selected attributes with a single key stroke as those attributes were entered. For example, we recently accurately mapped and obtained latitude and longitude coordinates for all bridges on an 800-mile stretch of Interstate 90 in only two days by driving that route at 65 mph with a single technician who had no prior training in either GIS or GPS before the mapping was conducted. The result was an excellent quality database, obtained at a fraction of the cost and time that other methods would have required.

GIS WORLD: So you are saying that the learning curve for GeoLink should be, in most cases, fairly short.

DR: That's right. The field mapping requires almost no background. Accurate field data can be acquired for both attributes and spatial data with only an hour or two of training. The integration of the data with GIS systems does, however, require someone who understands the GIS system.

GIS WORLD: Is GeoLink expensive?

DR: The primary cost associated with the system in the past was the GPS receivers. Receiver prices have dropped markedly in recent years and a complete GeoLink system, including the GPS receiver, now can be obtained for less than $7,000.

GIS WORLD: Can you give us some examples of new applications of GPS/GIS that you think will develop in the next year or so?

DR: We have seen significant growth in the use of GPS/GIS for mapping in electric utilities and telephone systems, for numerous environmental and natural resource applications, as well as for oil and gas development applications. We see these as the three significant growth areas during the next year. The system is being used by many electric utilities such as Florida Power & Light, rural electric associations such as Denton County, Texas, and telephone companies such as Southwestern Bell for mapping utilities systems. The environmental applications are numerous, with companies such as Exxon, USA using the system for mapping oil spills.
GeoLink Specifics

GeoLink was first launched three years ago. The system connects a GIS directly to a GPS receiver to obtain position information in the field in real time. The information provides the latitude, longitude and altitude positioning for automatic arc-node entry. GeoLink also accepts attribute information in the field and positions the attributes in a coverage with accurately georeferenced coordinates. All information can be internally time stamped for unambiguous update histories. The user can produce accurate maps, including labels, whether driving at 65 mph or walking along a remote trail. GPS and GIS data are clearly displayed, including the current map coverage, receiver position, numerical coordinates, time, receiver status, etc.

Examples of applications using the system include:

- **Multispectral scanning/GPS/GIS.** The Environmental Protection Agency's Environmental Monitoring Systems Laboratory - Las Vegas, Nev., uses a combination of aircraft-borne multispectral scanning and GeoLink to allow precise navigation, georegistration, and GIS integration. Lockheed Corp. recently used the laboratory's system to map road conditions, fumaroles and hot springs in Yellowstone National Park, both from the air and with GeoLink-equipped vehicles on the ground.

- **Real-time vehicle monitoring.** Emergency services, automotive manufacturers, consumer security services and U.S. Department of Agriculture researchers are monitoring vehicle locations and conditions on "live" GIS maps. Also, atmospheric conditions are automatically monitored and recorded into GIS using mobile vans equipped with sophisticated external monitoring devices and GeoLink.

- **Wildlife and forestry applications.** Forest roads, cattle guards, caribou migrations, timber stand characteristics, highway and transportation features have been extensively mapped.

- **Transmission line mapping.** Florida Power & Light uses the system to acquire latitude and longitude information to be used in analysis of transmission line outages related to lightning strikes.

- **Yellowstone National Park.** This annual conference is a gathering of leaders in the development of GPS and GIS technology integration. A special feature of the conference is the New Technology Forum, in which leading developers in GPS and GIS technology describe their latest technology innovations, new projects and plans for the coming year. This year several companies rolled out new GPS products at the conference, and the New Technology Forum offered a comprehensive overview of state-of-the-art technology by such leading GIS/GPS companies as Magnavox, Sony Corp., ERDAS, Ashtech, Trimble, Motorola, Magellan, Environmental Systems Research Institute, Intergraph and GeoResearch. In addition, the conference includes GPS/GIS mapping field trips and hands-on training in the GPS/GIS field. Next year's conference will be held in July again near Yellowstone National Park.

- **GIS WORLD:** Obviously, there are many current and potential applications for GeoLink, but what GPS and GIS units are currently supported by the system?

- **DR:** We have adopted an open systems approach to working with GPS receiver manufacturers and GIS system developers. Currently, the system supports most major GPS receivers and all major GIS systems. We have developed an interface to both the C/A code mapping level receivers of numerous manufacturers, as well as the very high accuracy "survey-level" GPS receivers. GeoLink is thoroughly embedded in systems such as ARC/INFO, AutoCAD, ERDAS and others, and can interface via DXF or ASCII formats for most other federal and private GIS systems.

- **GIS WORLD:** Are you planning any significant system enhancements or additions?

- **DR:** One of the most exciting new developments is the GeoLink XDS module that allows an electronically sensed external data source to be automatically georeferenced and continuously integrated directly into the system. Thus, automatically sensed attribute data can be input directly into the GIS via the system. Applications already include bathymetric mapping, continuous air pollution monitoring in a traveling vehicle, and mapping of cellular telephone signal strength.

- **GIS WORLD:** We understand that GeoResearch sponsors a major annual conference for the GPS/GIS field. Can you tell us more about this?

- **DR:** Yes, we sponsor an international GPS/GIS Conference each summer. The first annual GPS/GIS Conference was held just last year in Alaska. The U.S. Army Corps of Engineers is using the system for mapping wetlands. The Environmental Protection Agency just purchased GeoLink for use on the Superfund program. The U.S. Forest Service has used the system on an environmental impact statement for data collection and analysis, forest road mapping and timber stand attribute mapping. Transportation also is another steady growth area for GPS/GIS. Highway mapping applications are going on in numerous states, including California, Washington, Florida, Virginia, Montana, Texas and many others.

- **GIS WORLD:** Why have GIS managers gone to GeoLink?

- **DR:** The cost of data development for GIS is by far the most expensive component of most government or private GISs. GeoLink reduces the cost of acquiring accurate data for the GIS and is, we believe, the most convenient method on the market today for accurately updating existing off-the-shelf databases such as TIGER files, DLG files and other commercially available databases. Finally, GeoLink provides the accuracy for the database and the ability to acquire the specific attributes of interest to the GIS manager that no other systems can cost effectively provide.
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