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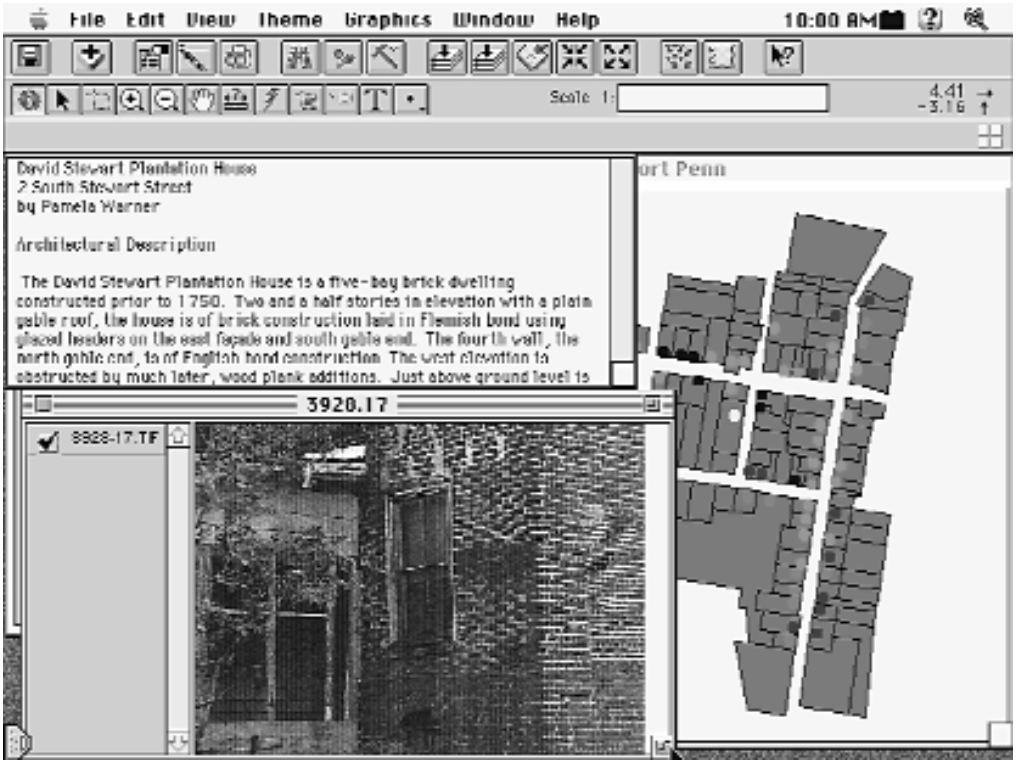
Applying GIS Technologies to CRM

Over five million cultural resources are recorded on State and Tribal Historic Preservation Office (SHPO and THPO) inventories nationwide. These inventories serve as the major repository of cultural resource information for most preservation-related activities. SHPOs and THPOs, federal agencies, preservation professionals, and scholars increasingly use Geographic Information Systems (GIS) to access information and use these statewide inventories in new ways. The integration of maps, images, and descriptive information makes GIS technology a powerful and innovative tool for cultural resource management.

A GIS is hardware, software, and digital data combined to create an integrated and interactive mapping program. A GIS simply reflects the three-dimensional world in a series of map layers. Through this overlay technique, each data type or theme, such as topography, waterways, road networks, or cultural resources, is represented as a layer of data. Users can view each map layer individually or together producing a dynamic map controlled by the user. A database links to each theme adding dimension to the maps themselves and connecting individual map elements with their context or attributes. The power of GIS centers on the relationships created between map themes and attributes. This integration allows users to manipulate maps, run queries, or model future events. Users can quickly locate resources on maps based on a database query, or conversely, locate database information via a spatial query of map themes. This constantly changing and evolving mapping environment is unique to GIS.

One example of how GIS can be used to manage historic resources is a project completed in 1996 at the University of Delaware focusing on a National Register Historic District in Port Penn, New Castle County, Delaware. Planned and founded in 1764 by David Stewart, Port Penn's relatively small size and available documentation made it ideal for a GIS application illuminating its distinctive history.

A profile of the town was created in a GIS using ESRI's ArcView7®. Historic maps of Port Penn and building locations were overlaid to profile the town's growth. Digital versions of parcel maps from 1792, 1868, 1893, and 1995 show how the town's layout evolved. Within each parcel, an icon represents a structure in the district. National Register attribute information, as well as floor plans and photographs, link to each building; an architectural description, statement of significance, and chain of title are also indicated for each lot.



The Port Penn, Delaware ArcView7® project, completed at the University of Delaware, Center for Historic Architecture and Engineering. Screen capture by the author.

Other charts and tables provide an extensive picture of Port Penn through time. For example, information extrapolated from the GIS indicates that rates of building construction peaked between 1825-1850. It is known that, during this period, William Cleaver attempted to shift the commercial focus of Port Penn to his newly-constructed wharf. Maps of the period reflect this shift; new construction clustered near the water, dramatically changing the original town plan. Other trends, such as building functions, show simi-

lar shifts. Studies, based on National Register data, profile changing architectural trends reflected in building details and usage. Integrating this information into a GIS allows users to explore developmental changes at Port Penn. Because GIS allows the retrieval of a multitude of documents related to various themes, its value as a forum for multi-disciplinary research and planning cannot be overestimated.

Entire states can be profiled in GIS. MAPIT (Mapping and Preservation Inventory Tool), created by the National Park Service, is a GIS program created for SHPOs. With MAPIT, users can locate, inventory, and study a state's cultural resources. Similar to the Port Penn project, MAPIT links to databases, images, documents, and historic records, as well as extensive geographical data to provide as much information about each resource as possible. The MAPIT application is a customized version of ArcView7®. The pilot project, Virginia MAPIT, contains a state view; users can view and query cultural resources on a large scale to identify trends or distribution patterns. At the county view, cultural resources and their contexts are shown in detail emphasizing localized patterns and providing a preservation planning platform. Property view describes an individual site, linking to maps, documents, and images.

Each view reflects the SHPO organization containing specific functions for all seven program areas. Specific data is made available to update, edit, browse, or for analysis. In addition, a wealth of context information provides a more complete set of tools for either viewing or manipulating cultural resource data, such as digital quadrangle maps, census data, political boundaries, physical features, or shared data from other agencies. This format integrates the SHPO's archival resources; paper files and paper maps are joined making them easier to use.

The goal of the MAPIT project is to develop an effective and powerful GIS tool for SHPOs and THPOs. GIS technology presents many new possibilities for historic preservationists: the integration of data with easy access and querying capabilities will make our cultural resources more accessible, ultimately benefiting the public. Maintaining accurate and current information, shared with other governmental agencies across states and regions within a cultural resource GIS, will also lead to better planning and decision-making, and, ultimately, better cultural resource management.

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Portable Non-Contact 3D Scanner

The ShapeWorks™ scanner is useful for imaging archeological sites and artifacts. Carvings, pits, and objects can be easily and quickly scanned in the field with a portable version of the scanner. Vitana Corporation manufactures and markets this non-contact 3D scanner for modeling, reverse engineering, and archival applications. ShapeWorks™ is a complete hardware and software solution that includes digitizer, motion platform, PC, and software to scan, align, merge, and edit complex objects. The InSight sensor is made in four different versions with varying depths of field and accuracies from a 3 inch Depth of Field (DOF) to a large sensor with a 52 inch DOF; all are mountable on a panning motion platform that rotates up to 315 degrees. ShapeWorks™ acquires 3D XYZ points in inches or mm at a rate of 15,000 per second. 3D files can be exported in many different formats from plain XYZ point clouds to WRL and DXF files. 3D editing and compression software is included. More information can be found at: <www.vitana.com/shapeworks/index.html>.

Tom Schoenhofer
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Scan of a bas-relief cast lead decoration with 49,000 valid 3D points. Digital image courtesy of Vitana Corp.