

Flash GIS

Delivering Geographic Information on the Internet.

Overview

Delivering geographic information on the Internet is a great challenge for the humanities researcher. Current GIS-to-web solutions have the benefit of being easy to use and fast to deploy if their features and functionality meet your project requirements. However, if you need high quality display, animation, a custom interface or advanced interactivity these systems will be inadequate.

Combining the high quality vector display of Flash with an SQL database, we have developed a system we call Flash GIS. This system can offer the extensibility and functionality needed to handle complex geographic relationships. The Flash plug-in was designed to display animated advertising in a web browser, but it is broad and general in function and thus can be applied to a range of humanities data visualization problems.

In order for Flash GIS to move beyond its current proof-of-concept state and become production ready, automated conversion of standard GIS file formats to Flash's .swf format will be needed. If we can overcome this hurdle, Flash's flexibility and ease of integration with emerging technologies gives it the potential to be a robust GIS-to-web solution for humanities research.

GIS-to-Web Solutions

Slow download, lack of customization and limited animation are the major problems with current GIS-to-web solutions. Commercial solutions like ESRI ArcIMS or AutoDesk MapGuide share the same organizational model: 1) a database, 2) an application server on a web server and 3) a display engine in the web browser. The application server functions to negotiate the communication between the database and the display engine. The display engine may be as simple as the web browser or as sophisticated as a JAVA applet. The display engines vary but provide these common functions:

- Pan and zoom
- Show and hide layer or coverage
- Cursor location readout of latitude and longitude
- Hot linked objects and areas to web resources
- Object information rollovers
- Printing

If the browser is used as the display engine, all user interaction requires message passing to the application server, thus making response times slow. JAVA applets are large and slow to download and inherit the poor quality of the JAVA display technology.

Java applets may not function properly across multiple platforms and browsers and may not be supported in future versions of web browsers. Current GIS-to web solutions use native GIS file formats for storage. Native file formats are convenient as preprocessing is reduced or eliminated, but their inefficient structure results in large files sizes. Only limited tools and functionality for showing change over time or animation are available in these off-the-shelf systems. Customization of interactive functions and user interface are also very limited without extensive programming.

Flash GIS

With installation on 96 percent of all web browsers, the Flash player plug-in is a more stable delivery target than the web browsers themselves. There are hundreds of thousands of Flash users - far more than all GIS users combined. Although Flash was designed to deliver animation and advertising, not GIS data, the ease with which we have re-purposed Flash demonstrates its flexibility and adaptability to a broad range of display and data visualization tasks.

Flash GIS follows the same organizational model as commercial GIS-to-web solutions with the Flash Player plug-in serves as the display engine on the web browser. We store data in a temporary XML file to reduce server hits, speed delivery and allow the display to run independent of the server. When the database contents change, the temporary XML file is updated to reflect the changes. If the data changes frequently a direct XML socket connection to the database would replace the XML temp file. Our configuration is as follows:

PostgreSQL Database > JAVA Servlet > XML > Flash Player Plug-in

Flash is composed of an authoring environment and a browser plug-in. Using the plug-in as the GIS display engine and the authoring environment for tool and interface development provides significant advantages over commercial GIS-to-web solutions. Flash offers the following features:

Fast downloads via open, compact, streaming media file format. (SWF).

High quality vector and raster display.

High-level customizable interactivity.

Automatic viewer scaling in the web browser.

Complete control over interface customization.

Animation – positional, shape and display property transformations.

Tight integration with off-the-shelf web development tools.

Retrieval and display of HTML, XML, images, movies and other map files.

Standards based scripting language. (ECMA-Script, JavaScript)

Encapsulation - separation of data from display.

Data driven from local or remote files or any ODBC database.

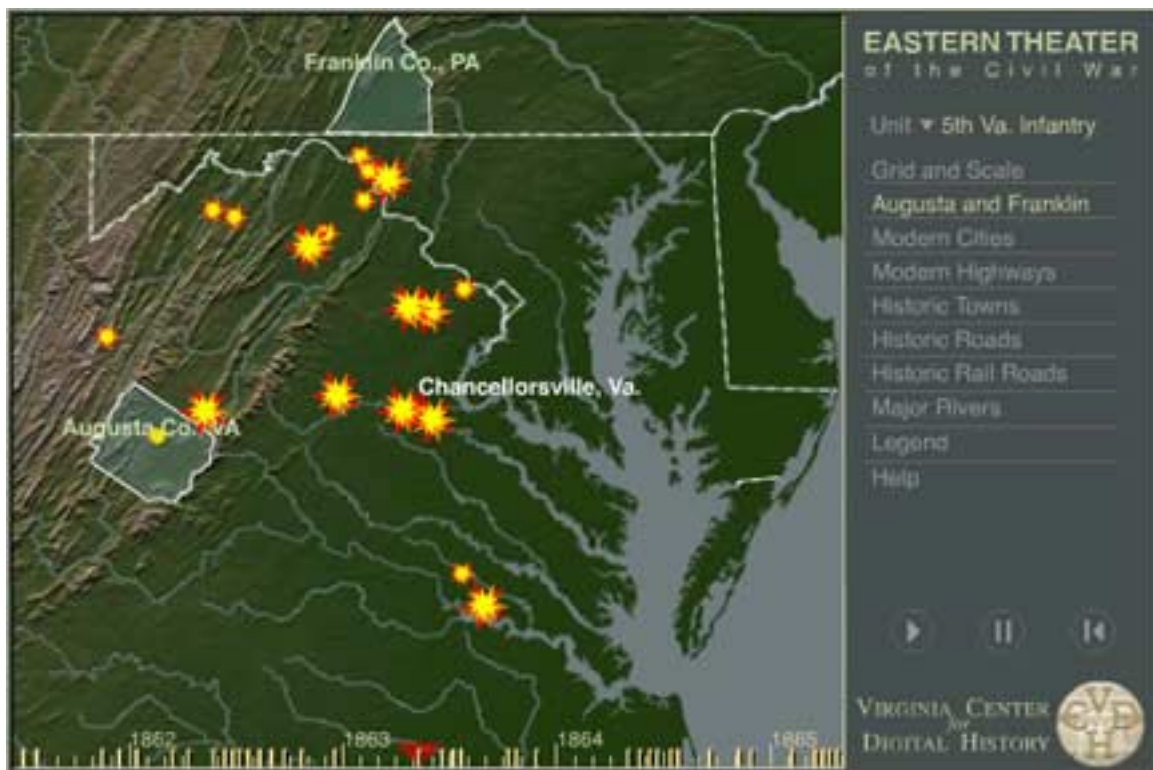
Deliverable to a broad range of devices and media, including removable media, web browsers and wireless devices.

Examples

The Valley of the Shadow Project:

<http://jefferson.village.virginia.edu/vshadow2/MAPDEMO/Theater/TheTheater.html>

This initial effort shows the theater-level movements of American Civil War units from Augusta County, Virginia, and Franklin County, Pennsylvania. Each major battle they fought in is linked to a database fact sheet, which provides detailed information on that unit's experience. All urls are hand coded and all animation hand tweened.



Production details available here:

<http://jefferson.village.virginia.edu/~cj8n/doc/mapit/index.html>

This link includes information on projection correction of historic maps as well as detailed information about conversion from the Shape to .swf file format.

The Salem Witch Trials Project:

<http://jefferson.village.virginia.edu/salem/maps/index.html>

This map shows the occurrence of witchcraft accusations in the Massachusetts Bay Province during 1692. Animation and object properties are driven by externally loaded XML data. This regional map also demonstrates pan and zoom, lat long tracking, external file loading, an advanced menu system and dynamically calculated date values.



The Salem Township Map is in early development, serving as a test-bed for arbitrary coordinate system re-mapping and point plotting accuracy.



The Boston Back Bay Fens Project: _

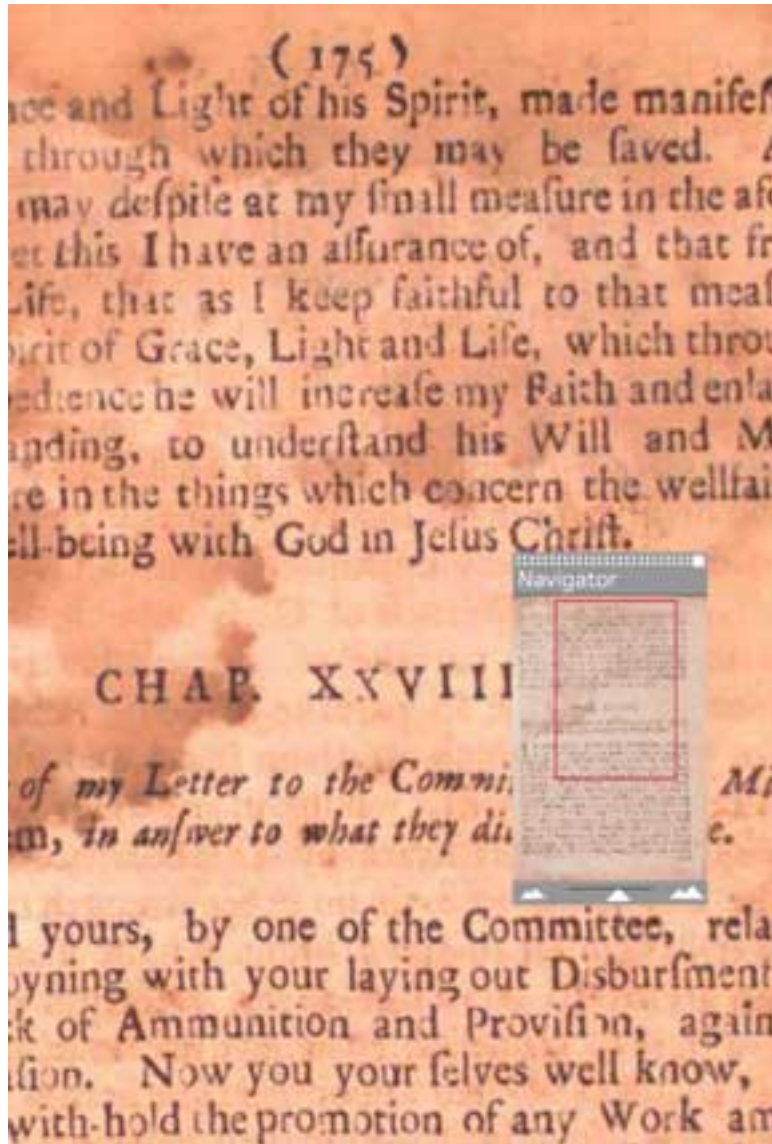
<http://jefferson.village.virginia.edu/backbay/fens.site/html/maps/contextmap/greatbay/greatbay.html>

This case study of Boston's Back Bay Fens and its surrounding urban landscape demonstrates the extreme data density that Flash can manage, while maintaining small file sizes and a high level of interactivity. This map is also in a state of early development.



Page Viewer Project: <http://jefferson.village.virginia.edu/~cj8n/drrh/image.html>

This simple page viewer demonstrates the ease with which Flash tools can be generalized and reused. The pan and zoom navigation tool shown in the page viewer originated in the Salem Regional map. It was re-purposed into a page viewing utility in a matter of minutes.



Remaining Challenges

Flash's .swf file format is an open standard and available for developers to integrate into their products. Our technique for migrating Shape files into .swf format optimizes the data by converting simple segmented lines into bezier spline curves using the MaPublisher Plug-in running in Adobe Illustrator. However, This conversion and optimization process is labor intensive. An automated conversion from standard GIS file formats into .swf format is needed for Flash to work well in a larger production pipeline. Ideally, ESRI would adopt the Flash format as a direct output option.

Software vendors and users have a great opportunity to deliver better products and projects based on Flash's strengths. For example, Flash uses a technology termed SmartClips, which allows a user to create a Flash interface that assists users in repetitive authoring tasks. A single high-level user can empower any number of lesser skilled users with advanced functionality using SmartClips. Another Macromedia product, Director, has recently added 3d capabilities with Shockwave 3-d. This promises rich and highly customizable 3d elements and environments that integrate cleanly with Flash.

Despite Flash's roots as an advertising and animation tool, the humanities GIS community should consider it as a display engine. Flash, more than other available technologies, can offer the extensibility and functionality required to display these complex geographic relationships.

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