ArchaeoSTOR Map: Publishing Archaeological Geodata on the Web

Yuma Matsui
California Institute for Telecommunications and Information Technology
La Jolla, California
yumatsui@ucsd.edu

Aaron Gidding
California Institute for Telecommunications and Information Technology
La Jolla, California
agidding@ucsd.edu

Thomas E. Levy
California Institute for Telecommunications and Information Technology
La Jolla, California
tlevy@ucsd.edu

Falko Kuester
California Institute for Telecommunications and Information Technology
La Jolla, California
fkuester@ucsd.edu

Thomas A. DeFanti
California Institute for Telecommunications and Information Technology
La Jolla, California
tdefanti@ucsd.edu

ABSTRACT

Modern field science, including archaeology, utilizes a massive amount of digital data captured by state-of-the-art measurement instruments. Large archaeological data sets may include images, geospatial data, analytical data, and metadata. Geospatial information plays a central role in the life cycle of those data; information is collected, organized, and published for analyses and visualization as final output using geospatial data as an index. The web is an ideal place to publish scientific data and promote diverse collaboration, and thus we need a system to publish digital archaeological data efficiently so that it is also integrated in our data management workflow. In order to realize this goal, we designed and implemented a web-based application named ArcheoSTOR Map, which visualizes and publishes raw archaeological data onto a map.

Categories and Subject Descriptors

H.2.8 [**Database applications**]: Spatial databases and GIS; J.2 [**Physical Sciences and Engineering**]: Archaeology

General Terms

Design

Keywords

Archaeology, Data Management, Geospatial, Visualization, Web, Workflow

1. INTRODUCTION

Data intensive e-Science is becoming mainstream and we deploy this methodology in archaeology[1]. Large data sets are frequently acquired from archaeological sites using the latest instruments. For instance, ground and air-borne images are taken with digital cameras, topography information is acquired with high-resolution laser scanning (LiDAR), geospatial vector data is obtained from total stations, diagnostic material information is gathered with x-ray fluorescence (XRF) and Fourier transform infrared spectroscopy (FTiR), and various metadata are compiled from archaeological sites and artifacts. In order to fully take advantage of such heterogeneous data, archaeologists need both a streamlined workflow to collect, organize, and publish data and a visual tool in order to easily browse data. Considering the nature of archaeological data in which everything has spatial context, this analytic tool should be based on geographical information. We also designed the tool to run as a web application because archaeological data should be made public on the web[3]. Through this project, we aim to promote collaborative research with published data.

2. METHODS

We established an archaeological data management workflow and developed a web-based tool named ArchaeoSTOR Map for visualization, analyses, and publication of archaeological data on the web.

2.1 Data Management Workflow

The overview of our data management workflow, which takes several data types into consideration, is presented in figure 1. First, in data collection phase, we import geospatial data in shapefile format which were collected from total stations and ground and air-borne digital photos. These data can be edited and annotated later with client computers for field activities. We also input various analytic data and metadata of excavated artifacts through a web application that works as a database front-end. Next, in the data organization phase, the data are transferred to the central data management servers which are equipped with PostgreSQL and PostGIS, a relational database that can handle geospatial data. The photography data are placed in file storage. The artifact data and annotated photo data are correlated

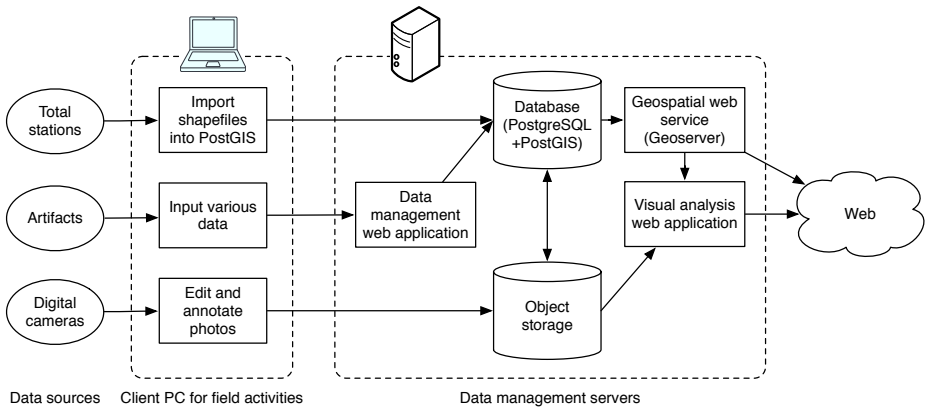

Figure 1: Workflow of archaeological data management

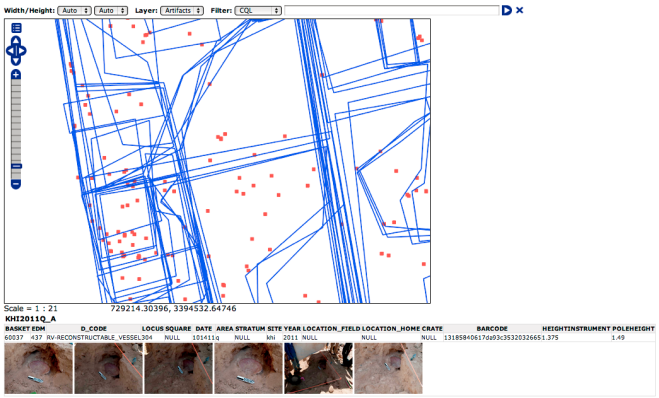

Figure 2: User interface of ArchaeoSTOR Map

with the geospatial data using area information. Lastly, in the data publishing phase, we use Geoserver as a standard geospatial web service interface. We also use our own web application for visual analysis of archaeological data to visualize geospatial data, image data, and artifact data simultaneously.

The servers run in a virtualized environment, and thus it is easy to transport server images between a remote site and a campus datacenter and to make the data public. The benefit of this system is that archaeologists can instantly grasp the visual overview of sites and artifacts after returning from excavations and archaeological data stored in this system can be directly published and shared on the web using spatial and query interfaces.

2.2 Visual Analysis

Our web-based map visualization application named ArchaeoSTOR Map enables instant visualization and publication of archaeological geospatial data such as site shapes and artifact locations. Figure 2 shows the user interface of the tool on a web browser. In the figure, lines form shapes of sites, and points represent locations where artifacts are found. When artifact points are clicked on the map, detailed artifact information and photos are retrieved and shown as depicted. We use OpenLayers to bring geospatial data from Geoserver and render a map.

In terms of taxonomy of interactive dynamics for visual analysis[2], our application provides basic visualization that combines geospatial data, visual images, and artifact information on a single map. It also has data filtering capability by relevant filtering terms. The tool can navigate users to more detailed individual views of artifact and photo data management.

This application of spatial queries offers a great platform for sharing archaeological data with the general public and other researchers. By generating a curated set of data specifically for public consumption, researchers can share a fully interactive map on the web without using a stand-alone GIS program or special plug-ins. The experience of directly selecting relevant data on a map is particularly useful in the context of collaboration.

3. CONCLUSIONS

We developed a system called ArchaeoSTOR Map to realize efficient visual analysis and publication of archaeological data on the web. This system is integrated into a streamlined data management workflow. Improvements to the platform are currently underway in order to facilitate a public release.

4. ACKNOWLEDGMENTS

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