

# **Geolive: Participatory mapping on the Web**

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## **Abstract**

Geolive is an online participatory mapping application that combines the Google Maps API and Joomla an open source content management system. Using the example of a food system mapping project developed at the University of British Columbia Okanagan, this paper discusses the usability, design and implementation of Geolive, as well as explores the broader possibilities and limitations of participatory mapping using web 2.0/3.0 and open source software.

## **Background and Relevance**

The recent and ongoing development of web-based social networking and Geoweb applications has had a significant impact in the way people access and share location-based information (Haklay et al., 2008; Hudson-Smith et al., 2009; Elwood, 2010). The new ability to allow any Internet user to author content and then communicate this content with a global audience has changed the flow of knowledge between individuals, organizations and government (Goodchild, 2007; Nuojuua, 2010).

In this new era of multiple-authored interactive web content, the design and implementation of Geoweb applications requires new considerations, and must overcome novel and emerging hurdles not found in legacy web-based geoinformatic applications (Rouse et al., 2007; Coleman et al, 2009). Considerations in the development of geoweb tools include:

- Security and user management
- Expandability and concurrency
- Reusability, ease of distribution and durability
- Data management and privacy
- Data dependability, and content filtering
- Data analysis and decision making

Geolive is a web-based participatory mapping tool developed at University of British Columbia Okanagan. The application allows users to create and share their own spatial information using a single dynamic map-based interface. The original goal for Geolive was to create an application where many users can view and author spatial data content simultaneously, while allowing the software to be open-sourced, reused and distributed. Although there are numerous requirements in supporting public participation using Geoweb applications, the main focus of our research, and concomitantly this presentation, is design-centric. In other words how, from a usability perspective, can an

online mapping tool be designed and developed to best support the active participation of users in the contribution of location-based content and in doing so promote community involvement in geographically bounded issues.

## **Methods and Data**

To take Geolive from concept to deployment, we used a modular architecture that allowed Geolive to take advantage of existing open source software. These software blocks were used to solve many of the complex problems encountered in developing a Geoweb application from the ground up. This meant that instead of re-inventing the software development protocols required in typical website management and administration, Geolive's development could focus on integrating our participatory mapping application with existing blocks, or modules, of website functionality. This freed up efforts to focus specifically on developing the mapping component of the tool.

The design of Geolive as a Content Management System module has provided us with many advantages over standalone applications (Goodrich and Tamassia, 2006; Stallings, 2005). Geolive's user management is simply an abstract connector to the system that Joomla provides (for examples see <http://docs.joomla.org/JFactory> and <http://docs.joomla.org/Framework>). Additionally user management plugins can be applied directly to Joomla and work with Geolive immediately, these include for example user profile pages, avatars, and access control. The Joomla framework also provides platform independence, allowing Geolive to be easily distributable. However, allowing multiple Geolive instances to exist makes it difficult to maintain software. To help keep versions consistent, Geolive instances have the ability to upgrade themselves to match the highest released software version that is released on the Geolive project server. The ease of distribution of Geolive may provide solutions to future issues involving large volumes of data (currently large datasets have not been encountered).

The Geolive client application is built using the Google API as well as a number of 3rd party JavaScript Libraries, such as Mootools, CKEditor, and the Simile Timeline. Using asynchronous communication between the client and server, users can actively manipulate and contribute to the map. One of the key concerns with using the Google API is how client information and map data are stored. Although the API is used to render content, Geolive's data are stored on the local server, and is protected using existing Joomla security. Unlike cloud-based storage, managing user contributed data this way adds the ability for it to be analyzed and filtered by administrators. However security issues such as SQL injection and cross-domain script attacks must also be considered (Connolly & Begg, 2005). Building an Ajax framework can also be prone to security flaws, as it exposes sensitive methods that could be exploited if not properly secured (see <http://www.symantec.com/connect/articles/ajax-security-basics>).

## **Development considerations**

Each of the six considerations for Geoweb application design identified above have had a major bearing on design and usability of Geolive as well as the trust that users can place in the tool in regard to security and privacy of their sensitive information and data.

Security and user management include the ability to protect user accounts using Joomla's authentication framework and user connectors, as well as securing asynchronous communication; Expandability and concurrency allow administrators to design for, and adapt to, large and growing users and datasets with simultaneous manipulation; Reusability, ease of distribution and durability enable the provision of an installable package that can be customized and used on different hardware and software platform; Data management and privacy, ensure that user contributed content is stored locally and used ethically); Data dependability, and content filtering mean that information is accurate and can be managed efficiently and; Data analysis and decision making help provide statistical information and tools to find trends and patterns in user contributed information. Each of these considerations will be discussed during this presentation.

### **Conclusions**

The Geolive application is a participatory mapping tool built using a number of open source software libraries. Its integration with the Joomla CMS has allowed it to meet complex security requirements for web applications, while allowing it to be distributable. Geolive has been implemented into a number of different web sites, and demonstrates strong potential to share spatial knowledge.

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