

# ImaNote: a Zoomable Web-Based Multi-User Image Viewing and Annotation Tool

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## Abstract

We have created a tool called *ImaNote* (Image Annotation Notebook) for viewing, zooming and annotating arbitrary-sized images using a web browser. Multiple users can work with the tool simultaneously, being able to almost instantly see and edit each other's modifications. In this paper, we describe the design, implementation and user interface of *ImaNote* focusing on issues arising from the web-based nature of the software as well as from its intended use as a tool for visualization and interaction with digital surrogates, facsimiles and replicas of cultural heritage objects.

Categories and Subject Descriptors (according to ACM CCS): H.3.5 [Information Storage and Retrieval]: Online Information Services—Web-based services; H.5.3 [Information Interfaces and Presentation]: Group and Organization Interfaces—Computer-supported cooperative work; D.2.2 [Software Engineering]: Design Tools and Techniques—User interfaces

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## 1. Introduction

ImaNote (Image Annotation Notebook) is a web-based multi-user tool that allows the user to display high-resolution images and to link and add personal annotations as well as multimedia resources to them. The added images can be navigated by using a simple zoomable user interface that includes an overview. Though initially targeted to the cultural heritage sector, the tool allows any user to save and share her annotations and memoranda to any image, or compilation of images.

To support the community-centered usage, it is possible to use RSS (Really Simple Syndication) to keep track of the annotations added to the image and to make links on user's own blog, web site or email that permanently points to the annotations on the image. It is also possible to create user groups and easily share annotations between group members.

### 1.1. Goals of the project

Among the objectives of the project have been to create an accessible digital media environment that includes a master plan for storing, classifying, and searching cultural heritage materials and for aggregating them into meaningful wholes from parts.

We have sought to make use of interactive technology to facilitate non-linear discursive encounters and support a decentralization of the author's role. Thus the emphasis on social software in which many authors with diverse points of view can contribute to one application.

### 1.2. Related work

Cartography and user interface design are the two most important contexts for *ImaNote*. The work of You et al. on the usability of web map zoom and pan functions serves as a starting point when considering the low-level properties of user interaction in this context [YCLL07]. Zooming and panning are fundamental in numerous map-related tasks, coupled with orientation, which was not included in their study.

Hornbæk et al. studied the effects of an overview map on user performance and found out that while the overview did not offer better navigation speed the user satisfaction was increased nonetheless [HBP02]. The importance of map design and personal preferences became apparent as well. Finally we would like to mention the work of Furnas and Bederson, which provides an interesting take on the representation and analysis of zoom levels and panning in the form of *space-scale diagrams* [FB95].

Google Maps (<http://maps.google.com/>) is a popular web-based world map providing both satellite images and traditional maps. The freely available data as well as the Google Maps API (Application Programming Interface) have given rise to a wide variety of location-based web applications with annotation capabilities. These applications often combine data from multiple sources and go with the name “Google mashups” [Ajm07]. Two interesting examples of such mashups are PlaceOpedia (<http://www.placeopedia.com/>) which connects Wikipedia articles to their locations and The Historical Marker Database (<http://www.hmdb.org/>) which uses Google Maps to display the locations of historical events.

## 2. Interface design

The usability goals were to make the navigation easy to understand and to make it easy to find details of special interest. With these objectives in mind, the interface design aimed to enhance the experience of perusing through the image by giving the viewer an extreme close up view of the details, providing the feeling of touching the image and creating the feeling of being in front of an augmented version of the image.

### 2.1. Elements of the main interface

The main interface consists of an overview image, a main image, navigational controls for zooming and additional controls related to annotating the image. The aim was to make the main interface scale well to different browser window sizes to improve the accessibility of the software.

#### 2.1.1. The image display area

Image display area displays the actual image along with the annotations related to the currently visible area. Each shown annotation consists of a black and a white rectangle, to ensure that they can be easily viewed on all kinds of images. When the cursor is positioned on top of an annotation, the annotation’s EPI (Electronic post-it note) appears next to it. It is also possible to click and drag your annotations to a different position.

Next to the image display area is an overview area that displays the whole image as a small version, *world-in-miniature*. On top of the overview image there is a rectangle that designates the area currently visible in the larger image display area. While according to Hornbæk there was no apparent speedup with world-in-miniature the overall user satisfaction was greater [HBP02].

The image can be navigated by zooming and panning. Zooming is achieved via two simple HTML links, labeled + and - for zooming in and out — the metaphor commonly found in user interfaces. It is possible to zoom in as close as 1:1, and zoom out arbitrarily far, using premade magnification steps or scale levels. You et al. call this mode of

zooming *original center zoom design* [YCLL07]. *Zoom-in by marquee* method is another powerful approach, but was discarded due to its interference with the EPIs.

Panning the image can be done in two ways. The user can either click on a spot in the overview image which results in the main image being centered on the clicked location *re-centering* or he/she can simply click on the main image and move the cursor while holding down the mouse button (*moving by dragging*). The third approach mentioned by You et al. [YCLL07], *panning buttons*, was omitted due to its non-intuitive nature.

### 2.1.2. Annotation function

The Annotate function is used to create the EPIs that are one of the main features of ImaNote. After the user has chosen to create a new annotation, a new movable note will appear on the image and the user can fill in details for the note’s EPI (see Figure 1). An EPI contains the following information: The Title that is a description of the annotation used for identification and recall and the Annotation text that is whatever you want to say about the image, or section of it, in the annotation. The Annotation text can be a summary about key aspects pertaining the image and the resource that are being brought together through the annotation. It can also contain an explanation about why the particular resource is being linked to the image.

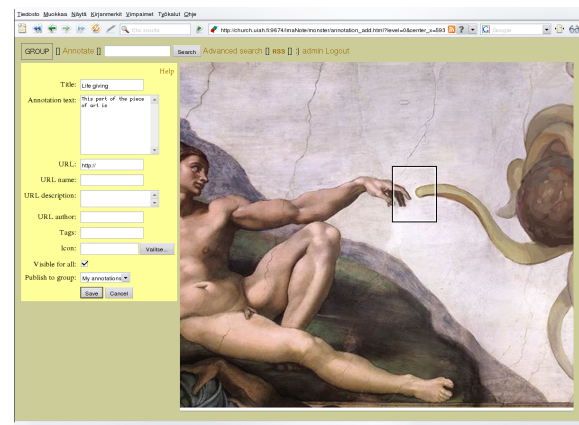


Figure 1: A screenshot showing the EPI creation process

A URL field lets the user to link to an external file or site. In the URL description field, a textual description can be added. The name of the author of the resource located via the URL given above, if available, can also be entered in the URL author field.

The Tag field provides for a way to label the annotations with keywords so they are easier to sort and search afterwards. It is also possible to join multiple words to form one tag using double quotes (e.g. “Karelian Isthmus”). In the Internet, collaboratively generated keywords and tags are also

referred to as *folksonomies* [Mat04]. To further ease recognition and sorting annotations, users can utilize the icon field to insert an icon or image into the annotation.

### 2.1.3. Group functions

The group function displays the groups that the user who is currently logged in belongs to. It enables the user to select whether to display public annotations or the annotations created by the members of a particular group.

If a user has previously created or been given an user account, he/she can login using his/her username and password. After logging in users see their own annotations emphasized on the image and they can create new as well as edit their existing annotations.

### 2.1.4. Searching

It is possible to search for annotations by simply listing words that the results must contain. However, if more specific searching is needed, it is possible to use advanced search and specify that certain parts of the annotation (title, main text, author, etc.) must match the given search conditions. Search result is a list of EPIs and by clicking on a specific EPI the image will be centered on its location so that users can easily locate results on the image.

## 2.2. Management interface

All management and configuration of ImaNote, such as adding new images, adding new users and changing groups is done through a series of simple HTML forms which are divided by category (image management, user management, etc.). Some of these forms require that the user has logged in as Zope administrator, but for example the form for adding users can be set to work without authentication, if the creation of new user accounts doesn't need to be confirmed.

## 3. Technical implementation

ImaNote is written in Python, implemented as a Zope product. Zope is an open source application server that runs on almost all operating systems (GNU/Linux, MacOS X, \*BSD, Microsoft Windows, etc.) and therefore ImaNote can be installed on any of these platforms. The client side of ImaNote heavily uses javascript to enhance the user experience, but even without it the basic interface is usable, albeit clumsy. If the client doesn't support javascript, a simpler version of the interface is provided, where the image is created using a standard HTML image map. With javascript enabled the full interface works with most modern browsers, including Firefox 2.0, Internet Explorer 7 and Opera 9.20.

### 3.1. RSS

RSS (Really Simple Syndication) is a web feed format used generally to publish frequently updated content. In ImaNote

each image provides an RSS feed that contains at most ten annotations that have recently been edited or created. Each feed entry contains the corresponding annotation's most important details (author, title, description, etc.) and a URL pointing to the annotation's location on the image. This way users can easily track latest changes, as they can not only see what has changed, but where it has happened as well.

### 3.2. Handling large images

Because there might be multiple users looking at the image simultaneously, loading the whole image and zooming it would impose hard CPU load on the server if done on the fly. When a new image is first added to ImaNote, several zoom levels of the original image are created and each is split into smaller 128 by 128 pixel images which are then stored individually. This takes up more space, but reduces server CPU load when users are browsing the image as only those 128 by 128 blocks of the specific zoom level are loaded. Determining the parts that need to be loaded is done on the client using javascript. If javascript is not used the image is composited on the server side.

ImaNote can handle any image that fits into the main memory of the server. However, adding a new large image to the system may require a significant amount of time because of the heavy processing. After processing an image its size doesn't have almost any effect on the overall performance, as the amount of 128 by 128 images needed to compose an image depends mainly on the size of the user's browser window.

## 4. Case studies

ImaNote evolved as a response to the needs of two research initiatives of the Systems of Representation group at the Media Lab of University of Art and Design Helsinki, namely the Map of Mexico 1550 and Exploring Carta Marina Cultural Heritage Forum. Among the key objectives of these projects was the dissemination of cultural heritage knowledge via the use of digitally born artifacts. The results from these two projects served as real world test cases for ImaNote and helped to develop its concepts and interface further.

### 4.1. Map of Mexico 1550

In the beginning, during the years 2002–2003, the tool's functionality revolved around the necessity to display a version of the digital facsimile of the Map of Mexico 1550 at exhibition venues, such as the Aztecs exhibition held in the Royal Art Academy gallery in London, UK. The facsimile used in this exhibition was a high fidelity two-dimensional digital replica created from a subset of the data gathered for the project. It was displayed as a stand-alone interactive installation with a touch screen. The original prototype was programmed in C++ and OpenGL.

At this time, the interaction design was built around the metaphor of navigation of information space via multiple levels of magnification. This was implemented through an overview zoomable user interface. Our work at this point was informed by developments of the online map collections of the American Memory project at the Library of Congress in Washington D.C. A key difference, however, was in our choice to develop Open Source software that is freely available and does not require the use of special plugins.

Usability tests were conducted in March 2003 when the digital facsimile of the Map of Mexico 1550 was installed in the Museum of Cultures in Helsinki. During four days we carried on interviews and observed user interaction with especially invited guests as well as normal museum visitors. Differentiated set of tasks and questions were prepared for each of these groups. Some of the people invited were experts in anthropology, history and education. The tests and their results are discussed in detail in a separate report by Salgado and Diaz-Kommonen [SDK03].

#### 4.2. Carta Marina

Carta Marina by Olaus Magnus is the first scientific map of the Nordic countries. Between the years 2003 and 2004, the tool was re-designed and re-engineered for use in displaying the Digital Carta Marina via the WWW (Figure 2). The result was DisplayMap tool, an early version of ImaNote. This work was done as part of Communities of Interest to Promote the Heritage of European Regions (CIPHER), a research and development project in the area of cultural heritage funded by the European Union IST 5th framework. During these developments, a class of grade 6 students and their teacher used and tested the tool as part of their educational activities in areas such as art education, geography, history, and language writing skills.

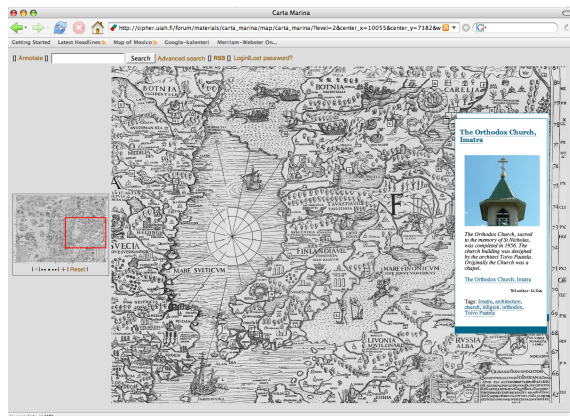


Figure 2: A screenshot showing part of Digital Carta Marina loaded in ImaNote.

Work on creating the Narratives and Legends of the his-

toric center of Mexico City brought the need to further improve the DisplayMap tool. As a result the tool was further developed into ImaNote, a generalized image annotation tool.

#### 5. Conclusion

ImaNote can support any kind of image which makes it suitable for multiple purposes involving visual annotation. According to the feedback gathered in the exhibitions it is of interest to the general public. The interface has been kept simple and easy to access using existing web technologies. However, it needs further development to work with devices having extremely small screen sizes, such as mobile phones and PDAs.

The tool has been successfully used in several exhibition venues as part of the Map of Mexico 1550 installation, including the Beta Lounge Helsinki exhibition in Ars Electronica 2006. It will among the projects featured in the Museum of the Future pavilion at the Universal Forum of Cultures held in Monterey in the autumn of 2007. Our current efforts include creating communities of users who are interested in using and continuing the development of the tool.

#### References

- [Ajm07] AJMANI V.: *Google Maps Mashups (Wrox)*. Wrox Press Ltd., Birmingham, UK, UK, 2007.
- [FB95] FURNAS G. W., BEDERSON B. B.: Understanding multiscale interfaces. In *Proceedings of CHI 95* (1995), pp. 234–241.
- [HBP02] HORNBAEK K., BEDERSON B., PLAISANT C.: Navigation patterns and usability of zoomable user interfaces with and without an overview. *ACM Transactions on Computer-Human Interaction* 9, 4 (Dec. 2002), 362–389.
- [Mat04] MATHES A.: Folksonomies - cooperative classification and communication through shared metadata. Available from <http://www.adammathes.com/academic/computer-mediated-communication/folksonomies.html>, Dec. 2004.
- [SDK03] SALGADO M., DÍAZ-KOMMONEN L.: Interface design and usability in the digital facsimile of map of Mexico 1550. In *Discovering New Media* (2003), Botero A., Rantavuo H., (Eds.), University of Art and Design Helsinki Working Papers, pp. 16–21.
- [YCLL07] YOU M., CHEN C.-W., LIU H., LIN H.: A usability evaluation of web map zoom and pan functions. *International Journal of Design 1* (2007), 15–25.