

A Portable Image Annotation Tool for Web-based Anatomy Atlases

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INTERACTIVE ATLASES

Collections of annotated images have application in many areas of medicine. As part of the Digital Anatomist Project, our group has developed a series of web based atlases, each consisting of annotated images depicting anatomic structures¹. The atlases are interactively accessed over the Web via "cgi" programs. The atlases are used in undergraduate medical education courses at the University of Washington, and by other users throughout the world.

The server software is independent of atlas content, and other authors are interested in creating and publishing their own atlases on the Web. The greatest impediment has been the lack of an easy-to-use image annotation tool. The AnnoteImage program described in this paper addresses this shortcoming.

IMPLEMENTATION

AnnoteImage is written as a "pure" Java 1.1² application, using Microsoft's Visual J++ development environment³, and runs on either Sun's or Microsoft's virtual machines. It has been tested on Pentium processor systems running Windows 98, NT 4.0, and Red Hat Linux 5.2⁴.

ATLAS AUTHORING

Authoring an atlas begins with the selection of images, which can be in either GIF or JPEG formats. Annotations, consisting of outlined regions of interest, "pin" locations, and colored "strings" connecting the pins to text labels, are added by the domain expert to identify regions of interest. A specific annotation type may be used to point to animated "movie" links.

Annotations are stored in a text file using an attribute/value notation in a LISP-like syntax. The file contains a pointer to the related image, as well as comment and presentation metadata. The file also contains the annotations themselves, which consist of a type, pin location, id, and a vector representation of the outline of each region of interest.

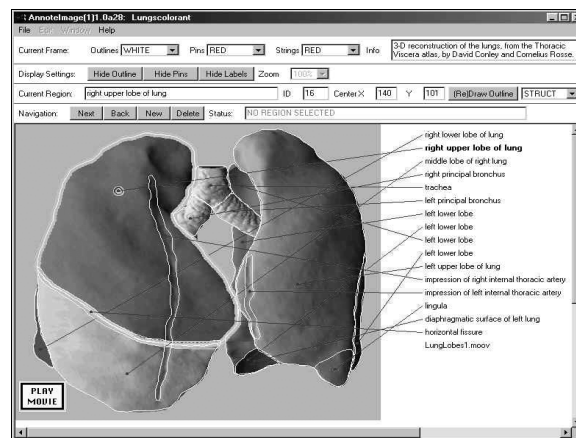
Both image and annotation files are copied into an atlas directory structure, and a file is created to control hierarchical navigation between the images. The cgi scripts use the directory structure and navigation file, in conjunction with user input, to generate web pages reflecting the user's information requests and preferred mode of operation.

CONCLUSION

We have built a portable, easy to use, tool for generalized annotation of outlined regions on GIF or JPEG images, which can run under any system which supports a Java virtual machine. We hope that this authoring tool will facilitate creation of atlas content at independent sites, which may then be linked together to form a distributed educational resource.

FUTURE DIRECTIONS

Development of a version that runs as a privileged applet will simplify both code distribution and atlas publication. Enhancement of the annotation format will allow incorporation of different types of annotations, such as point elements and overlays, while remaining independent of any specific domain.



AnnoteImage display depicting an image, outlined regions (with "pins", "strings", and labels), and toolbars for controlling annotation navigation, editing, and image metadata.

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¹ J. F. Brinkley, S. W. Bradley, J. W. Sundsten, and C. Rosse, "The Digital Anatomist information system and its use in the generation and delivery of Web-based anatomy atlases," *Computers and Biomedical Research*, vol. 30, pp. 472-503, 1997.

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