

# A Distributed Framework for Distance Learning in Anatomy: The Digital Anatomist Interactive Atlas

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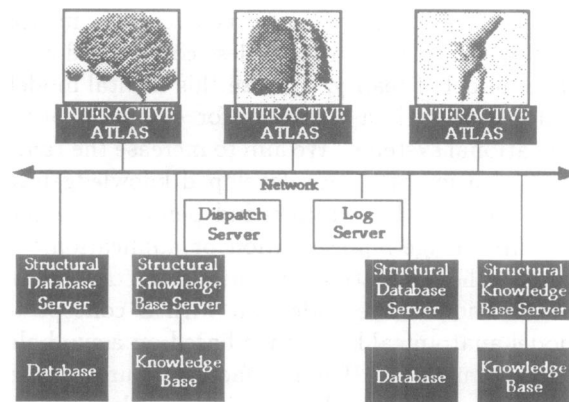
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We describe a client-server framework for an interactive atlas of anatomy. The client program, which runs on a Macintosh computer, is used to retrieve 2-D and 3-D images depicting regions of the body. Once an image has been retrieved the client can be run in either browse mode or quiz mode. In browse mode, when the student clicks on a region on the image, the corresponding structure is briefly outlined, and the structure name is displayed. The structure name is then used as an index for retrieving additional information about the structure, primarily definitions and 3-D animations saved as Quicktime files or as sequences on a video disk. In quiz mode the computer asks the student to point to the locations of structures on the image, keeping score of the number of correct answers.

The atlas program is independent of the anatomy content, which is saved in external disk files. Each image accessed by the atlas is accompanied by a *frame* file, which contains structure names and associated polygonal regions defining the extent of the structure on the image. Frame files can also associate Lisp commands with image regions. The primary Lisp command is (*OPEN-FRAME filename*), which causes a new image to be loaded, thereby allowing the development of image frames for navigating the atlas content.

The atlas client can be configured to run in either stand-alone mode or networked mode. In stand-alone mode the image and frame files are stored either on the local hard disk, or on CD-ROMS of anatomy animations that we have developed. In networked mode (see figure) the content is stored in a *Database* that is accessed by a custom *Structural Database Server*. Associated definitions are stored in a *Knowledge Base* that is accessed by a custom *Structural Knowledge Base Server*. When the client first start up it accesses a *Dispatch Server*



base server to connect to, thereby allowing us to control entry to the servers and to perform load balancing. In addition a *Log Server* tracks image access and transfer times for all clients.

The anatomy atlas has been used over our local area network for the past 4 years in 3 neuroanatomy and 1 gross anatomy course. Analysis of the log files shows it has been used at 286 remote sites, with 53 outside the US and 51 at a single university in South Carolina. Although we have now provided alternate access to the same information via the Web (Bradley et al., these proceedings) the custom framework is faster since all interaction takes place at the client once the image and image frame are downloaded. In addition the custom client can show overlays, and can be packaged for completely local use from CD-ROMS.

Thus, until the Web evolves these capabilities (which may not be long), we will continue to provide both methods of access to the same data.

The on-line atlas is available by anonymous ftp from <ftp.biostr.washington.edu/pub/browser>. The current atlas content is described elsewhere (Conley et al., these proceedings).