Pad++, a general-purpose zoomable substrate for creating and interacting with structured information, is under development by researchers at the University of New Mexico and New York University. All Pad++ objects support zooming, and there are mechanisms for navigating through a multiscale space using panning, zooming, and hyperlinks. Pad++ includes a number of efficiency mechanisms that help maintain interactive frame-rates with large and complicated graphical scenes.

Applications based on Pad++ attempt to tap into our natural spatial ways of thinking by supporting views of information at multiple scales. These applications move beyond the simple binary choice of presenting or eliding particular information and present a continuous context in which information is encountered. Arrangement, proximity, size, and scale-based representation may be used to present semantic information in manners unique to zooming interfaces. Very large amounts of information may be embedded at successively deeper levels, making it easier to provide effective access to a structure of information much larger than the available display.

PadDraw is a sample application that supports many of the features found in drawing and hypermedia programs, but it adds a zooming component. Zooms are smooth and continuously animated, much like using the zoom controls on a video camera, so users always retain a sense of context. When a link is followed in PadDraw, the system automatically pans and zooms the view, taking the user to the appropriate piece of data. Readers are left with the sense that the starting information point is "up to the left" or otherwise in an intuitive relationship with their current view. This helps readers to orient themselves in a complex hypermedia document.

Gray Matters is a collaborative, multiscale hypertext artwork/fiction. Using a subset of the PadDraw functionality, it creates an environment for multiscale reading and exploration. Fifteen images from *Gray's Anatomy* are tinted and arranged in a patchwork body. Each image has two representations: a scanned and manipulated bitmap, and a simplified vector graphic. The bitmap is seen when the view is zoomed out, and this cross-fades into the the vector graphic as the view moves closer. At the same time, color-coded labels representing texts fade into visibility. As the view zooms in further, the labels dissolve away, and the full texts are displayed against the color fields of the vector graphics.
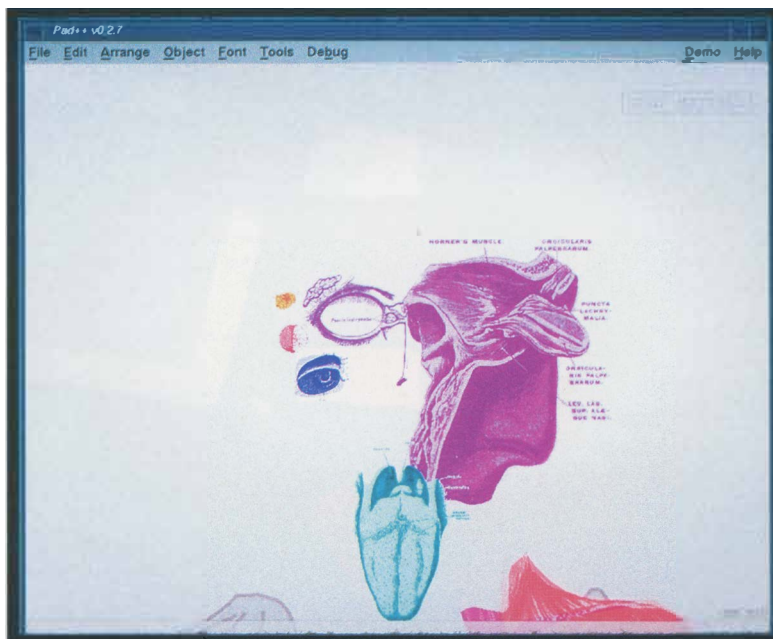
Noah Wardrip-Fruin, Jon Meyer, Ken Perlin
NYU Center for Advanced Technology
719 Broadway, 12th Floor
New York, New York 10003 USA
noah@cat.nyu.edu
http://www.cat.nyu.edu/graymatters

Ben Bederson, Jim Hollan
University of Mexico
http://www.cs.unm.edu/pad++