Just-In-Time Browsing for Digital Images
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We present “Just-In-Time Browsing,” (JITB) a method for quickly browsing large collections of digital images over the Internet, intended specifically for, but not limited to, scanned document image collections. Unlike many Progressive Image Transfer (PIT) methods, JITB provides the user with immediate, random access to user-selected or priority-ordered regions of an image at maximum spatial resolution, with progressive bit-depth resolution, while preserving context - as quickly as the information can be assimilated - hence, “just in time.” JITB uses a combination of bitplane encoding, JBIG compression, user interaction, data prioritization, and prefetching to provide in teractive browsing. Content-relevant portions of a document/image can typically be accessed in just 2-6 Kbytes and 1-3 bitplanes rather than downloading an entire image only to find it is not what the user wanted.

Images are preprocessed for use with JITB by creating various resolution versions of the image, tiling the image at each resolution for random spatial access, bitplane encoding the tiles for progressive grayscale (or color), compressing each bitplane, and storing the compressed data in a file, along with metadata and a table of offsets to the streams of compressed data. We use JBIG compression because it compares favorably against most of the other compression methods commonly used, at least for the first two or three bitplanes, which is where JITB makes its primary contribution. JITB is extended grayscale and color images through quantization and reordering of the (color) palette. “Browsing templates” specify the default priority for regions of the image. The JITB server will reorder the data on the fly if the user requests a region of interest with the mouse. In our sample JITB application, a digital microfilm browser, we reduce the amount of user interaction needed by using the recent user interaction history to prefetch regions that are requested by the user on many subsequent images.

The concept of “browsing” defines a “space” where full, lossless compression is usually neither necessary nor desirable, but where rapid access at full spatial resolution would be sufficient to capture visually the essence of the document or image being presented. JITB provides this functionality with priority-ordered or user-selected regions of interest being transferred and presented as quickly as they can be browsed. Since browsing is the objective - not saving/downloading - progressive bit-depth is sufficient, and full spatial resolution essential, to understand text or other graphical detail contained in the image(s). If saving is desired, images can be queued for download at a later time as a background task.

Images add a richness to the web that cannot be achieved running in text-only mode. However, while browsing cyberspace, many images will be encountered, each one often requiring several seconds (to several minutes) to download. The time and tedium associated with these downloads adds up lost minutes ... and hours, and is unacceptable. Thus, even with “thumbnails” subsequent enlargement is usually necessary anyway. JITB addresses this problem by providing the user with immediate access to specified regions of interest at full spatial resolution with sufficient bit-depth or grayscale/color fidelity.