



THE WHITE ROSE GRID

e-Science Centre

Virtual Vellum

Introduction

Virtual Vellum is one of three demonstrator projects funded by the UK e-Science programme and Engineering and Physical Sciences Research Council to produce models to show how e-Science technologies can be applied to advance understanding of complex research issues in the arts and humanities. e-Science in this context means the development and application of advanced technologies, especially grid technologies, for research collaboration via the Internet, including particularly the sharing of digital and computing resources.

Research Questions

Arts and Humanities scholars working on international collaborative research projects involving large-scale image collections held on local and/or distributed databases often need to consult one another to explore questions of mutual interest (e.g. aspects of iconography or other art-historical features, definition of image content, and real-time comparison of similar or related images whose originals are sometimes located at other remote sites).

Access and Data Grids offer the ideal framework and computing power for rapid and efficient handling of such large-scale collections of high-resolution images, permitting real-time and close-up scrutiny of single or juxtaposed images, with independent zooming control and functionalities such as annotation and hotspotting. Readily available generic tools for this kind of work do not yet exist. Their design and delivery to the research community poses a considerable but appealing challenge. A flexible, robust viewing environment is urgently needed, compatible with different platforms (Windows, Mac, Linux), to allow scholars to present papers with confidence in a manner which allows them to manipulate their image files quickly, efficiently and flexibly, without having to sacrifice vital nuances of argumentation.

The Demonstrator

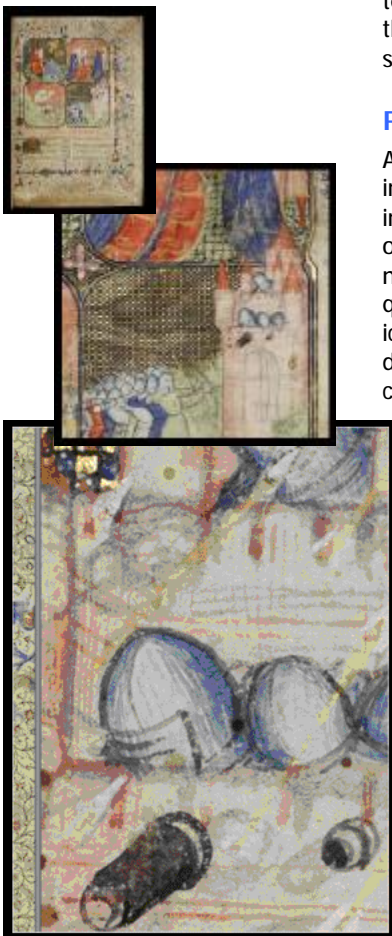
Virtual Vellum enhances the techniques that are currently employed to display high-resolution images in real-time, where image sizes are typically greater than 8K x 6K pixels. Areas of specific interest include the use of JPEG 2000, platform independence and the use of both Access and Data Grids.

JPEG 2000

JPEG image compression is currently the predominant technique used for viewing high-resolution images in real-time. This is partly due to its affording a noticeably smaller file size as compared to the raw image. However, high-resolution images can still take a considerable time to download over the internet, and in addition require a large amount of processing to convert them into a state such that they can be displayed to best advantage. Image viewing tools currently available resort to splitting the complete image into smaller fragments ("tiling"). This produces smaller JPEG file sizes, but at the cost of requiring many JPEG files for a single, high-resolution image. When a user views an image, the software retrieves only the relevant JPEG sub-images for the portion of the main image that is being displayed.

The technique of fragmenting a single image into multiple JPEG images is, however, redundant with respect to pre-processing the data and storing it. JPEG 2000 presents an attractive alternative since it achieves the segmentation using a single file without any redundancy. Furthermore, at similar compression ratios the JPEG 2000 compression technique achieves better visual results than its JPEG counterpart. Thus, compared to the original compression quality and ratios, we can either have smaller file sizes or high-quality encodings.

Virtual Vellum embraces the enhancements that JPEG 2000 offer over its predecessor and facilitates the viewing of images that





are encoded in such a format (although it is backwards compatible for viewing image datasets encoded using the older JPEG tiling style). In similar wise to the JPEG version, the JPEG 2000 viewer can be used to manipulate the display of high-resolution images in real-time.

Platform Independence

Platform independence provides another facet to the demonstrator project. Since Virtual Vellum is written entirely in Java version 1.2, there is no need to download extra plug-ins (e.g. Flash) before the software can be run. Furthermore, as the software is completely self-contained it can be easily transferred between different computers without the need to copy additional library files that might otherwise be required.

In addition to delivering Virtual Vellum as a platform-independent application, the software will be made open source and open access. This will allow scholars to develop the software further in directions that meet their specific needs.

Using the Grids

The Froissart Project provides an initial set of images comprising four complete digitised manuscript surrogates (giving ~1TB of uncompressed image data). The image datasets are stored on and retrieved from a local hard drive, over the internet and via a Data Grid using Storage Resource Broker (SRB). The White Rose Grid and the Worldwide Universities Network's WUN Grid will provide the primary grid networks during development. The retrieval of non-locally stored images further supports the need for the comparatively better JPEG 2000 compression technique, where bandwidth is at more of a premium.

Virtual Vellum is equally adept at facilitating stand-alone presentations of images to conference or lecture audiences as it is at streaming data from a non-local source in real-time. The demonstrator application is therefore ideally suited to Access Grid environments where scholars wish to discuss the iconographic or art-historical details of such images.

Features at a Glance

Virtual Vellum will provide researchers with generic viewing tools and environment for image datasets comprising:

- large volume image datasets
- high-resolution image files (> 8K x 6K pixels)

encoded using:

- JPEG
- JPEG 2000

delivered as:

- open source & open access
- platform independent (i.e. Windows/Mac/Linux)

allowing access to image datasets:

- from a local hard drive
- over the internet
- via a Data Grid using Storage Resource Broker

ideal for:

- Access Grid seminars
- live conference presentations and lectures

Further Information

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