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Mercator, hands-on: the use of “experiential” technology for atlases

Keywords: Digital exhibits; maps; atlases; 3-d virtual technology

Summary

Digitisation and electronic distribution has mitigated many problems associated with exhibiting atlases. How the images are compiled and presented varies, and range from providing simple graphic image files of the maps to attempting to emulate the experience of perusing the bound volume. The British Library’s *Turning the Pages* project has recently captured Mercator’s mid-16th century atlas of Europe for the latter type of presentation. Exploiting the possibilities offered by multi-media, imaging programming and animation are used to mimic the experience of turning pages of the book to view maps inside, and supplementary information, magnification and other tools are meant to further enhance study of the item. The implementation of this project is described and the product examined with other digital facsimiles of atlases; the effectiveness and relevance of these technologies for viewing maps in particular is considered.

Introduction

Books have long presented a challenge to librarians and curators who wish to showcase their bound treasures, and the credibility of displaying books has presented something of a conundrum. While exhibition frees the object from its dusty shelf, to be displayed and visible to many people simultaneously, the item may in actuality be made less accessible, being frozen open on one spread in a glass display case where no one can touch it or discover its contents. The development of advanced technologies for multimedia image display has brought about alternative methods. Bound works may be made available electronically in a realistic, book form, providing a facsimile with the look-and-feel of the original volume and bringing the full contents to light, while retaining the benefits of conventional museum displays via text and commentary.

These technologies have been used to a very small degree to make the graphic contents of atlases available. Gerard Mercator’s atlas of Europe (Mercator 1570-72) was recently added to The British Library’s *Turning the Pages* (TTP) program (Figure 1), an exemplar of the three-dimensional, animated technology used to display books. This program is examined and the results are considered. The use of this and other digital tools to exhibit maps as pages within the book context raises questions about the nature of maps and atlases, the new electronic means of making them available, and the ultimate purpose and success of these technologies to convey the content and experience for cartographic research and education.

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Figure 1: The Mercator atlas in the British Library's *Turning the Pages*

The atlas exhibited: map or book?

Books as “objects of display” are laden with limitations, and incite questions about the purpose of exhibiting them and how the viewer is meant to interpret what is, literally, unreadable and out of reach (McKenzie 2006). These concerns apply to atlases, with a unique slant resulting from their contents being essentially compendiums of loosely-linked graphic images. The John Ritblat Gallery in The British Library at St. Pancras, London, is a dimly-lit exhibition gallery of “treasures” showing primarily books and manuscripts in glass cases. In the area devoted to cartographic materials, two of the maps displayed are bound in books. For both of these (Add MS 27376, Harley MS 1808,f.9v), the accompanying caption describes the map being shown, with no attention given to the book that contains it. The Map Library foyer, in the same building, displays The Klencke Atlas (Maps K.A.R, 1613-60), but the large volume is closed and locked in a glass case. It seems that maps are often proffered as complete works in themselves, so that even when they appear within books or atlases, they are isolated with quite a separate identity. The challenges of displaying books in a faithful and complete manner are thus compounded for atlases, which carry dual demands to represent the disparate contents (maps) as independent “artworks”, while maintaining awareness of it as a book, or a single publication.

Experiential technologies

“Experiential technologies”, a limited type of virtual reality system, are here defined as digital multimedia presentations designed to mimic a particular ‘real-life’ experience. Computer models and animation suggest movement through space and interaction, and various embodiments of the technology have been employed to impressive effect in many arenas, including simulating the action of books. Card et al ([2004](#)) trace their involvement in the development of computer software

for animated digital books, identifying the Silicon Graphics Demo Book in 1993 as one of the first, “true 3-D book[s]”: an interactive, virtual 3-D book with animated page-turning. Continued research, at the Palo Alto Research Center with 3Book ([Card et al. 2004](#)), and in universities ([Chu et al. 2003, 2004](#); [Cubaud 2005](#)) has led to further advancements in developing scalable, systematic computational structures to combine visualisation and animation, to represent the physical features of a book.

The *TTP* application spearheaded by the British Library and Armadillo Systems in 1998 is perhaps the best-known, proprietary use of the technology. Because of its commercial focus towards the museum and library world, it has since been used to display rare books in the biomedical sciences at the [U.S. National Library of Medicine](#) (2001), for three texts at the [Wellcome Library](#), and the National Library of Ireland used it for manuscript notebooks at the [James Joyce and Ulysses exhibition](#) (June 2004). The Swedish company, [Touch and Turn](#), markets software for individuals to produce and present their own books (*T&T Publisher 2.0* and *T&T Viewer 2.0*, respectively), though a 2003 project, *Mediation of rare books over the Internet*, involves eight European libraries and museums. The Library of Congress implemented their [Page by Page](#) program in 2005, based on the National Library of Medicine’s customization of *TTP*. The interactive video kiosks display books for “The cultures and history of the Americas” exhibition, a preview for a new permanent gallery space.

These technologies seek to present a virtual reality of interacting with the item as an object/ artefact and a source of information, thereby differing from other, more common methods of presenting books electronically. Such approaches tend to either represent the two-dimensional contents of the book, whether as pdf, graphic or text files (e.g. virtual, or e-books), or else depict page-turning action using Flash, java, or other video viewing tools (e.g. museum exhibits at MOMA 2002 and V&A 2006), at the expense of naturalism, content and detail. While these are also effective for their purposes, the distinctions between them must be recognized. Experiential technologies place value both in the tactile qualities of the object and the experience of apprehending the book as a three-dimensional artefact¹, while still making the content of a sufficient quality to be a surrogate for the original.

Turning the Pages at the British Library

The British Library pioneered an initial use of this experiential technology to provide access to particularly rare and valuable items in its collections. While it has generated some thought-provoking commentary about the implications of digital access (Capet 2005), the *TTP* program has been widely acclaimed, primarily for allowing the interaction and access that engages visitors. It was introduced with the 1998 opening of the British Library’s new St. Pancras building exhibition galleries, which included kiosks with touchscreen programmes presenting digital facsimiles of the Lindisfarne Gospels. Touch-sensitive screens are still used at the Library, with a 37” plasma screen in the entrance foyer and terminals scattered throughout the exhibition gallery. The

¹ Though representing paper pages digitally has been challenged on a philosophical basis and even called skeuomorphs in this context, a line of thought expressed well in Sally Northrop’s post to the blog of the Institute for the Future of the Book entitled “Who really needs to turn the pages?” ([Northmore 2006](#)).

project was based on a *VirtualBook* software system developed in partnership with [Armadillo Systems](#). In April, 2004, *TTP* became available on the web via the Library's [Online Gallery](#).

Two software systems are currently used to recreate artefacts in *TTP*. The more sophisticated, *VirtualBook (TTP-VB)*, uses 3-D modelling to create the precise surface geometry of each page with enhanced reflexivity shadows and textures. Constructed in *MacroMedia Director*, animation is based upon photographs of intermediate points in each page-turning movement ([Chu et al. 2003](#)); this captures the peculiar weight and character of the page and the movement of the binding as the pressure shifts. The processed graphics are then superimposed onto the 3-D computer model, animated, and merged with text and audio features, zooming tools, and interactive "hotspots". Because of the size of the files generated by this fusion, only selected pages will be presented in this format rather than entire books or libraries. This elaborate manifestation of the technology is presented to best advantage via touchscreen using the interactive kiosk system.

TTP-3D, in contrast, uses imaging programming to give the illusion of 3-D, and this less-advanced technology can be created for the web or as an application on CD/DVD-ROM. A generic model of the book, sans details such as paper thickness and weight, is used to carry the images, allowing batch-processing during imaging programming. This package was developed some time after that of *TTP-VB*, predominantly to allow web publishing. It also makes possible the inclusion of entire books, whereas *TTP-VB* creates files so large as to be only feasible for portions. The page-turning facility, text commentary, audio voiceover, and magnification are features common to both. Because of the less demanding technology, it is not as expensive and takes less than half the time for production work than that of *TTP-VB*, requiring two to three weeks after image files are received by Armadillo Systems.

Mercator atlas

The work, called "the most important surviving body of Mercator's work in a single volume" (Barber 2005) is a handmade atlas probably assembled by the Flemish cartographer Gerard Mercator himself between the years of 1570 and 1572, using printed and manuscript maps. The 46 pages of maps in the relatively small atlas (40 cm) were cut primarily from existing wall maps; approximately 40% of the maps in the volume are Mercator's own. For the latter, three dissected, printed maps were used; two of these appear in their entirety: an unprecedented, detailed map of the British Isles (1564) and the only surviving copy of his 1554 map of Europe. A portion of his 1569 wall map of the world, the first in the Mercator projection, was used. Two hand-drawn, regional maps are also included (Watelet 1997: 12). The remainder of the cut-outs are primarily from Ortelius' *Theatrum Orbis Terrarum* (1570). The volume was compiled for the tutor to the Crown Prince of Cleves for their trip through Europe in 1570, and represents an important stage towards the publication in 1585-95 of the first "atlas" to be named so, the word coined by Mercator himself (Ackerman 1997; Crane 2002).

Selection & Curatorship

Purchased by the BL in 1997, the reputed cost of approximately £1 million was paid for with a Heritage Lottery Fund grant of £500,000 and the Library's annual grant-in-aid from the government; it was at the time the most expensive cartographic item that the Library had ever bought. The public funds, however, were granted on the condition that it would be digitised. Numerous, ultimately failed attempts were made to secure grants and other private funding to make

the item available via electronic media, but the Library eventually agreed to pay for it and in 2004 work began to add it to *TTP*. It was not until September 2005 that it became publicly available online. Not only was it the first cartographic work to be added to *TTP*, but the first complete book in the program to be captured.

Outside of the technical work of adding an item to *TTP*, the process includes the input of preservation and conservation professionals and intellectual contributions of curators for text development. A script to accompany each of the images was prepared by Peter Barber, Head of Maps, in partnership with an editor assigned to the project, and a voiceover recording of the text was done. The script consisted of one to four paragraphs of historical background and explanation for each map.

Technology

Digital photography of the atlas was accomplished in-house at the British Library's Imaging Services Department. The 46, two-page spreads of maps were photographed to the specification of 300dpi, and saved as uncompressed TIFFs. A conservator or preservation staff member was present to provide assistance and guidance with regard to handling during filming (the Preservation assessment of the atlas approved digitisation without prior conservation). The studio workflow was colour managed throughout, with the colour profile embedded into each digital image and a colour target included to allow post production changes and correct printing/ matching. Files were then saved onto CDs for archival purposes and sent to Armadillo Systems where the production of the application took place.

The *TTP-3D* option was decided upon for the lower production time and the cost advantages it offers, while still allowing the wide access required to fulfil the Library's obligations for public funding. A "gallery version" for use on the touchscreens inside the London, St. Pancras building and a web version (Figure 1) were created; a CD-ROM version was not made. The online availability raises issues common among online applications, particularly for one so graphic-intensive (bandwidth requirements, problems of downloads/plugin, future maintenance of site, isolation of files from browsers and links), but these were not judged to be prohibitive for the goals of immediate access and widespread availability.

Product

The result of this endeavour is inclusion of the atlas on the Library's *TTP* kiosks, and on the web via an online downloadable application. Use of the online application requires download of Macromedia Shockwave plug-in within a standard web browser, and is greatly improved by a broadband connection (though there is a narrow-band version for dial-up users) and sufficient memory. Once loaded, a draggable text panel and a voice-over of the curator's text supplement the facsimile. Though there is no keyword searching of place names on maps or a gazetteer, a digital hyperlinked table of contents provides direct links to particular maps. Pages can be "turned" in either direction in three ways: making a sweeping motion over the pages with the hand cursor, clicking the forward/back buttons, or adjusting the sliding scale. The magnification tool allows close examination of the pictorial relief and legibility of scale, placenames, and other text.

Reception from the press specifically about the addition of the atlas was positive, but minimal ([Public Technology.net 2005](#)). Within the first six months of being online (September 2005 - Feb-

ruary 2006), there were more than 45,000 downloads of the atlas, making it by no means the most popular of the 15 *TTP* books available on the British Library's website, but nevertheless in the top five.

Other electronic depictions of the atlas as book

Only a very few digital reproductions of atlases employ holistic, experiential methods to represent the book. The author is not aware of other presentations of atlases employing experiential technologies to the same degree as *TTP*, but there have been some animated depictions and a number of impressive two-dimensional, non-animated replications of atlases.

Animated

A CD-ROM produced in 1998 by Bibliothèque Nationale of France and Opus Species is an implementation of 3-d technology to make a medieval, multi-sheet *mappa mundi* widely accessible. Large medieval world maps are rare, delicate, and difficult to study, even on site (Edson 2002), which makes them especially good candidates for digitization. *Mapamondi: une carte du monde au XIV siecle* (BNF 1998) presents a digital facsimile of The Catalan Atlas, a large world map made in Majorca in 1375, reputedly by Abraham Cresques.

The Montparnasse Multimedia CD-ROM product employs an animated, page-turning function to display in detail a digital facsimile of the six sheets of vellum, now twelve leaves, mounted on board and folded like a screen (Woodward 1987). The "volume" is tilted at an angle away from the reader, and the oblong pages turn in a *MacroMedia QuickTime* movie, with controls to pause action and leaf pages forwards and backwards. Multilingual explanatory text and audio, with magnification, panning, rulers, and a location map make this a useful and serviceable facsimile of the original. In addition to satisfying the scholarly audience's need for a faithful reproduction, this presentation appears to be directed towards the interested learner, as it explores the maps in terms of themes and the milieu in which it was created on a basic level, and musical accompaniment and visual dynamism make it an entertaining and enjoyable resource. Unfortunately, this CD is limited to use on earlier operating systems (Windows 95/98), and it has not been re-released, making it less accessible than it should be. The current [online version](#) (BNF 2006), while presenting the same text in an attractive way, does not offer nearly the same quality of images.

Non-animated

The page-turning facility for digital facsimiles of atlases is most usually bypassed; the majority of atlases employ two-dimensional presentations, both on the web and CD. For some, the maps are isolated by cropping out obvious visual suggestions of the volume such as binding and page edges and one is aware of the atlas simply by the title and telltale visual clues (e.g. [Atlas of the Baltic Sea by Aleksei Nagaev, 1757](#), Helsinki University Library). A great many, however, present the atlas as a book. One resource using "book images" is the *Atlas sive Cosmographicã meditationes de fabrica mundi et fabricati figura* (Octavo 2000), a fine high-resolution reproduction of the Lessing J. Rosenwald Collection (Library of Congress) copy of Mercator's Atlas of 1595. The interface is familiar and usable in pdf format; the images are of a high resolution and can be zoomed-in on, and it is easy to navigate. Online, the [Frederik den Femtes Atlas](#) from the Royal Library, Denmark, shows each open page of the 55 book set. Download of the *DjVu* browser

plugin is required. The National Library of Scotland offers the optional use of a plug-in to show [The Blaeu Atlas of Scotland, 1654](#), and is an exemplary site for studying the piece, showing the entirety of the atlas, including maps with color bars, linked directly to the text, both original and translated.

Concluding Remarks

The debut of digital kiosks or online galleries with experiential features to display their treasures reveals current goals of museums and libraries to reach a larger audience by using technology to present an inviting and attractive interactive interface. Programs designed to duplicate the experience of using the volume have proven to be successful on a popular, crowd-pleasing level, though when resources are tight, it could be at best unnecessary and at worst, gimmicky and overdone, “a bizarre homage to an obsolete medium” (Chu, 2004). Atlases, as books of maps, share the benefits and problems that the technologies present. The content of atlases may be even better served, in fact, due to their dual nature of being independent art works as well as a united volume.

The examination /review of digital atlas presentations suggest several guiding principles and considerations that distinguish them from books, and reveal how atlases are unique among cartographic items:

- ? Regardless of the particular technological format used and features included, atlases should be a priority for digitisation within map collections for preservation reasons alone. Atlases are more prone to damage than single map sheets due to the ir bound format, as aging binding is further damaged with every page movement.
- ? Electronic presentations should recognize the nature of maps in atlases by representing the context of the item and not excluding the elements suggesting such. When digital book images are cropped down to reveal the map alone, it dilutes the understanding and complete experience of the item. Photography should be captured as double-page spreads, with covers, page versos, and edging included. The experiential technologies focussing on the book as an object or artefact, as opposed to information content, highlight this distinction.
- ? Inversely, proper navigation and viewing of map content is essential. The smallest details on the map should be legible via magnification tools that provide sufficient legibility on typical screen sizes. Some accommodation should be made for finding locations within the atlas; if a gazetteer of all included placenames cannot be created, links at a map level should be provided. Links between maps and any text in atlases should be considered.

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