What's in the Art Historian's Toolkit?

A Methods Network Working Paper

Introduction

The purpose of the AHRC ICT Methods Network initiative is to encourage arts and humanities researchers to discover new ways of using information and communications technology to carry out their research. There is an implicit assumption in this statement that by embracing new technologies (and the methods associated with them) scholars will discover novel ways to analyze and understand the information that pertains to their discipline; and may in some cases find new perspectives on the type of research that they do. The purpose of this paper is to consider how this principle might be applied to a particular area of study and what, in practice, some of the implications might be for that discipline.

It is clear that there is a widespread and majority reluctance across most areas of the arts and humanities to engage with any technology that might be considered more advanced or applied than the 'usual' desktop productivity tools[1]; a view reflected by a recent report from the proceedings of the *Summit on Digital Tools for the Humanities* held at the University of Virginia in 2005.[2] Whilst it is important therefore not to brand the art history scholarly community as being especially benighted in its dealings with technology, it should also be noted that they deal with a particularly rich, diverse and highly visual body of material as the focus of their research and analysis. Presently, the technological response to the complex questions that arise from the study of that material is - for the most part - fragmentary, inadequate and poorly coordinated.

To address this problem, art historians may benefit from looking outside of their discipline to learn from colleagues pursuing technology-led solutions in other fields. The Methods Network has a remit to support and fund this kind of interdisciplinary forum and has done so with a series of events and activities that has brought together researchers from diverse fields with the aim of defining shared challenges and collaborative solutions. The tools and methods referred to in this paper are a distillation of some of the techniques that have been presented or referred to in the course of that programme and the intention is to consider how they might be applicable, relevant and useful to art historians carrying out research.

Annotation

Annotation in this sense does not refer to textual markup procedures (i.e XML and its variants), but should be understood as providing a way for scholars to relate a thought or an idea to a particular area of an image or a piece of writing, in a number of different ways. This might be in a very informal way using simple free tools that are capable of superimposing arrows and circles over an image or, more interestingly, might provide researchers with ways of collaboratively building up threads of information about objects which can be attributed and archived and overlaid as the item becomes subject to alternative kinds of scrutiny and different methods of analysis.

To take an analogue example, the Witt Library at the Courtauld Institute of Art is a collection of images, extracted from a huge variety of sources that is mostly composed of printed matter depicting works of art, pasted onto thin cardboard mounts, with handwritten, typed and latterly, printed metadata that describes and identifies the image. One fascinating feature of this library's holdings is that annotations in pencil on the surrounding mount have not only been tolerated but actively encouraged over the years and in certain sections of the library, there is every chance of tracking down initialled comments from very eminent art

[1] Desktop productivity tools in this context includes: word processing, spreadsheet, presentation, email and web browsing software products

[2] The consensus of participants at the workshop suggested that only around 6 percent of humanist scholars went beyond general purpose information technology in their research and teaching. Summit on Digital Tools for the Humanities (2005). University of Virginia, 28-30 September, 2005. http://www.iath.virginia.edu/dtsummit/

historians who have had cause to dispute the information relating to the image; and indeed on some occasions to dispute the veracity of the image itself.

In the digital realm, one initiative from the discipline of musicology that provides a model to accommodate this form of collaborative annotation is the Online Chopin Variorum Edition (OCVE) project. The delivery of this system is via the web (which usefully echoes how most users of art historical information will browse relevant data) and shows what can be achieved within the parameters of a web browser. The pilot version that is currently viewable at http://www.ocve.org.uk[3] features clickable anchor points over images of digitised sheet music (see fig.1) along with the ability to superimpose and juxtapose different versions of specific bars of music against each other.

The interest of this system lies not with the fact that a point on an image can be made to provoke a an additional hyperlinked window, but in that the reference (or anchor) points on these images can potentially be added by multiple users via the browser, and as much or as little attributed scholarly annotation can be applied to very precise parts of the image. For the purposes of the pilot project, the ability to add annotations to the material was reserved to members of the project team and as such, the version that is currently accessible to the public does not allow third-party annotations, but this is a managerial rather than a technical limitation.

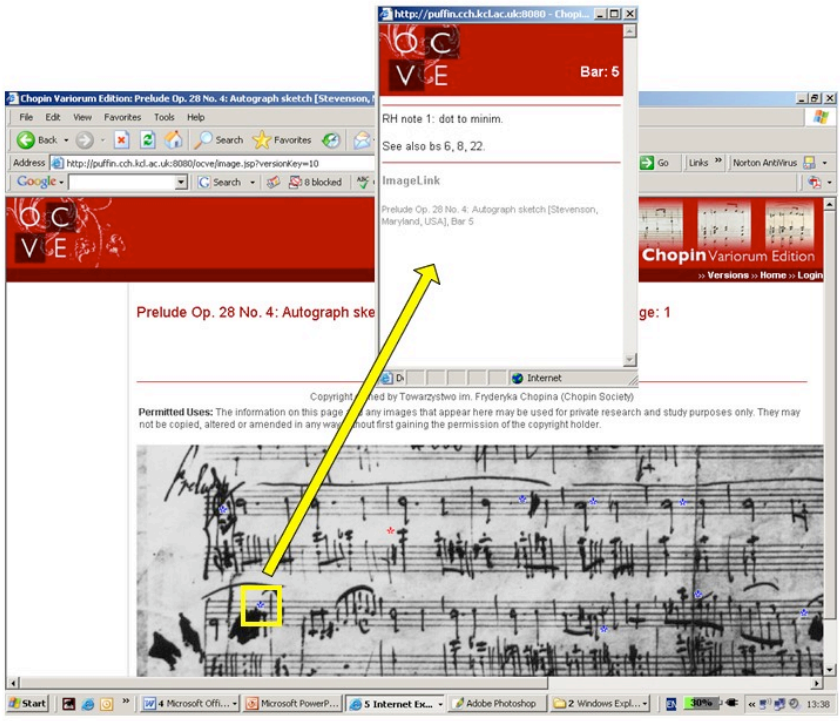

Fig.1 Screenshot from OCVE

In terms of how easy or difficult it is to make web applications truly responsive and interactive in ways that approach the experience of using desktop applications, the growing interest in using a group of technologies that are collectively referred to as Ajax[4] (Asynchronous Javascript and XML) may mean that designers will be able to build in increasingly sophisticated and responsive functionality into web pages. Certain functions within FlickR, Google maps and other Google applications rely on the Ajax approach to enhance their usability and this approach is scalable down to much simpler systems that might simply involve being able to attach virtual post-it notes to web pages that will reappear the next time the page is

[3] Online Chopin Variorum Project, http://www.ocve.org.uk, (accessed 11 September 2006)
[4] Garret, J.J., (2005)

accessed.[5] In simple terms, the Ajax methodology uses client and server side scripting to replace some of the transactions that would otherwise have to go backwards and forwards from the client to the web server every time the user invoked an action on the web page. Communication between the Ajax engine and the web server happens independently of any actions on the part of the user – hence the designation of 'asynchronous'.

The DIAMM website[6] (Digital Image Archive of Medieval Music) is a current example of a resource that allows users to create notes that will remain persistently attached to an image whenever it is accessed. Once registered, the user can search for an image and then has the option via a 'tools palette' to create a public, private or transcription annotation that will be attached to that image and stored on the web server. This is a more common use of an online note facility and in this sense, it is not dissimilar to features already in use by some of the larger art history systems such as the Art and Architecture system[7] based at the Courtauld Institute and ARTStor[8]. One of the defining features of the DIAMM system however is the incredibly good quality of the images and the functionality of the viewer that allows the user to research the images in very fine detail, thereby maximising the usefulness and scope of the annotation function on offer.

Following on from work on the OCVE project, John Bradley at CCH, King's College is currently developing an annotation tool called PLINY that will work as a standalone desktop application. Built on an Eclipse platform it is meant to be a flexible and extensible tool and should allow the user to create annotations in a

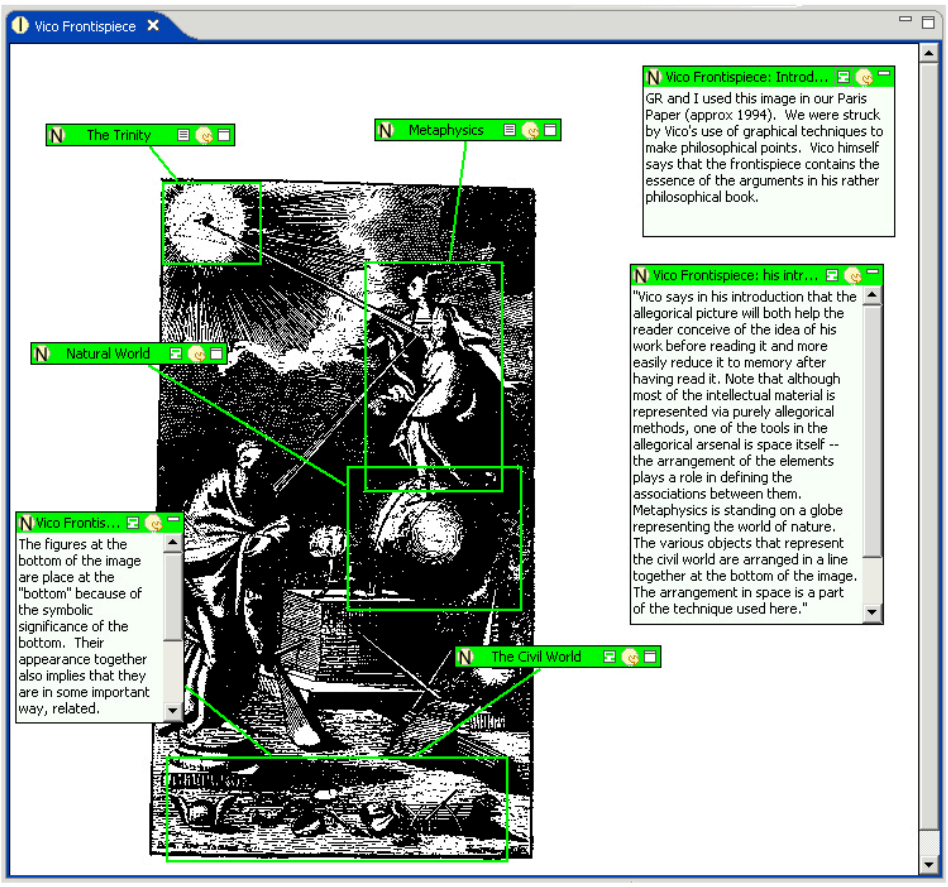

Fig.2 Screenshot from PLINY (with kind permission from John Bradley)

[5] A tutorial for implementing this function is available at: IBM, http://www-128.ibm.com/developerworks/edu/wa-ajaxannot-i.html (accessed 11/9/06)
[6] DIAMM, http://www.diamm.ac.uk (accessed 11/9/06)
[7] Courtauld Institute of Art, http://www.artandarchitecture.org.uk (accessed 11/9/06)
[8] ArtStor, http://www.artstor.org/info/ (accessed 11/9/06)

number of different environments including web pages, pdf documents, images and simple text documents. This approach may more accurately reflect the complexity and density of the type of analysis work that some art historians require when working with images. As Bradley has stated[9], it may also address a need voiced at the University of Virginia *Digital Tools Summit*, and again at a recent Methods Network Workgroup on Tools Development[10], for a computing tool that can support the scholarly act of interpretation across formats at a truly useful level of detail. This is very much a work in progress however.

Collaborative Spaces and Dissemination Tools

Collaborative annotation is, in a sense, a form of asynchronous communication and there is common ground between this subject and the realm of computer mediated communication, an area that various companies have been focusing on very productively for some years now. It is clear that researchers now have more ways than ever before of reaching out to their respective communities and receiving feedback. Wider adoption of voice over IP telephony systems such as Skype, Instant Messenger and iChat clearly create new possibilities for collaborative based work whilst the increasing prevalence of wiki and blog based initiatives for projects will undoubtedly help researchers to formulate new modes of working. The model of collaboration that has always been a hallmark of scientific research, with teams of staff working towards a shared goal, may now have more applicability to arts and humanities researchers in the context of resources and collections of articles being amassed in shared spaces, with overall authorship being difficult to ascertain. Whether this is more or less significant for art historians than for researchers working in other fields is arguable but it *will* have significance if the discipline is to retain technological credibility in comparison with other subject areas.

Art historians are widely reported to rely on ad hoc methods of acquiring images, most commonly by using Google Image search but also by means of their own scanner and camera equipment.[11] Whilst this is undoubtedly convenient for the scholar in the short term, it has lead to a situation where a vast number of images are sitting on hard drives and file servers with almost no visible metadata attached to them. Even where organisations have managed to collate their resources into collections, there can still be problems with ensuring that those archives are cross-searchable and compatible with other complementary sources of information. The recent Community-Led Image Collections report[12] recommends using RSS (Really Simple Syndication) and RDF (Resource Description Framework) methods as practical interim measures in situations where the use of more comprehensive and rigorous systems of cataloguing are deemed too onerous to implement.

> "There is currently an innovative method, promoted by the Flickr social image-sharing site, for describing an image in the content of an RSS entry, providing a thumbnail distinct from the image proper. RSS feeds could be used to promote popular image material and to broadcast it to interested parties and through aggregation, to institutional systems' lists of subject based material."[13]

The principle of RSS feeds and of RDF data, require data to be entered in XML format and as such, will ensure that owners of information will at least be giving their data a minimum standard of integrity and compatibility in relation to other more rigorous systems of classification and data entry.

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[9] Bradley, J., (2006)
[10] Workgroup on Tools Development, 15/6/06, Sponsored by the Methods Network, Centre for Computing in the Humanities, King's College, London
[11] References to this practice can be found in Miller, J. et al (2006) p.13; and the transcript of *Democratising the Image*, CHArt Roundtable Session, CHArt Conference10/11/2005, Led by David Ehrenpreis and Waibel, G., Arcolio, A. (2005)
[12] Miller, J. et al (2006)
[13] Miller, J. et al (2006), p.38

Practically speaking, it is of course difficult to make any kind of metadata entry a high priority for academics whose principle task is to exploit the resources they have discovered rather than simply describe them, probably for the benefit of others rather than themselves. The promotion of less formally strategic tools, such as IP telephony, and the use of blogs and wikis may be a way of changing this mindset however. The point of a collaborative community and the 'gift economy' principle that underpins that cohesion may increase pressure upon individuals to more actively offer up information about the resources they have acquired. As with all sharing networks, the aims are not ultimately altruistic or selfish; one expects to get back as much as one puts in.

Access Grid

Taking the idea of scholarly collaboration and interaction one stage further, an important development that is now gaining ground in the context of the arts and humanities is the use of the Access Grid. It is often included as a component of the procedures and tools variously known as e-Science, Grid Computing or Research Computing, but it can in fact be comfortably isolated from those concepts for the purposes of clarity. An Access Grid session is essentially a virtual meeting room where anyone with the appropriate software, configuration and permissions can join the meeting and interact via video and audio links in real-time (see fig.3). Where it differs from video-conferencing is that firstly, any number of locations can be present (depending on the bandwidth available to the Access Grid node that is hosting the meeting) and secondly, files can be shared across the network, allowing for more elaborate transactions between participants.

Fig. 3 Access Grid Session (with kind permission of the AGSC, Manchester University)

Picking up on the idea of a collaborative annotation environment, a whiteboard can be shared by all participants, on which any image can be displayed and annotated and the results saved, either as a file in its own right or as part of a recording process that is capable of capturing the entirety of the proceedings.

Setting up and maintaining an Access Grid node is a major undertaking and requires an institutional commitment, both financially and in terms of network infrastructure arrangements but the lack of a node within an institution does not preclude participation in a session that is being organised elsewhere. The principle requirement is that the user will need to be granted permission to connect to a bridgehead server (usually the Access Grid Support Centre at the University of Manchester) who will often act as the central connection point for organisations wishing to run a session. Additionally, the user will require a webcam and microphone (such as they might use for IP telephony), a relatively good specification PC[14] and software that comes in a scaled-down version for individual users known as a PIG (Personal Interface to

[14] For recommendations as of July 2002, AccessGrid.org, http://www.accessgrid.org/release_docs/1.1/PIG-Hardware.html (accessed 12/9/06)

the Access Grid). There is an open source option known as The Access Grid Toolkit and a commercial offering called InSORS which is more straightforward to install and has slightly more functionality.

Arts and Humanities use of the Access Grid is really in its infancy but there are some indications that it may become a powerful tool to complement research, particularly in bringing scholars together in a more informal manner than is possible with the whole apparatus that accompanies face-to-face meetings. The University of Hull and the University of East Anglia have successfully collaborated in a virtual research environment (VRE), the outcome of which was a taught course on the 'History of Political Discourse'. In the near future, the Institute for Archaeology and Antiquity at the University of Birmingham, with Methods Network funding, will be setting up an Access Grid Support Network for researchers involved with visualisation and remote sensing.

In the context of art history where the primary materials of study are scattered worldwide and in many cases cannot be moved, it is significant that wherever a network connection can be obtained, perhaps wirelessly in a gallery space in front of a fragile early renaissance altarpiece, then the Access Grid offers the possibility of turning that occasion into an inclusive and highly interactive meeting of scholars.

Image Acquisition

Turning to what is perhaps the most significant application of technology to art historical research, the processes of image capture and storage are potentially where the largest gains could be observed in relation to current practice. As has already been noted, the now established practice of gathering materials from a variety of unmediated sources has led to a great deal of discussion about rights management issues, metadata incompatibility, sustainability and archival robustness. These are issues that need to be tackled by the whole community and a great deal of work is being put into proposing solutions to these problems. At the level of the individual researcher however, it is clear that the expedient and non-technical gathering of images, many of them low resolution, and poorly focused with uncertain claims to being a true representation of the object, have a limiting effect on research and undermine the whole discipline.

One of the ways that technology should be able to make a decisive impact on the study of the visual arts is

Fig.4 DIAMM mobile studio (with kind permission of DIAMM project)

by allowing researchers minute and forensic access to primary materials in ways that are non-destructive and which complement other less materials-based approaches to interpretation. It will be contentious for

some art historians that such focus should be placed on the physical properties of the object but it is a fact that this is the area where technology will operate most effectively.

One of the objectives of the DIAMM project, as mentioned above, is to take very high resolution images of medieval music scores with the best portable equipment available. This results in very sharply focused images that can support high magnification using a mobile studio that can be setup very quickly in any location (see fig.4). Though the techniques used are exemplary (technical detail can be found on the DIAMM website[15]) they are not unusual in the context of digital photographic practice. What this approach really provides is a springboard for what else can be achieved by dealing with the object in this meticulous way.

One of the areas that DIAMM and the Project Manager, Julia Craig-McFeely in particular, has become concerned with is the process of digital restoration. During a Methods Network funded workshop, participants were shown a variety of processes that are used to decipher damaged documents, some of which were completely illegible prior to undergoing this kind of analysis. Using advanced features in Adobe Photoshop, elements of the scores have been made visible and have been transformed whilst the original remains untouched in whichever archive it rests, thereby advancing scholarship, promoting access and providing an archival record of a fragile object.

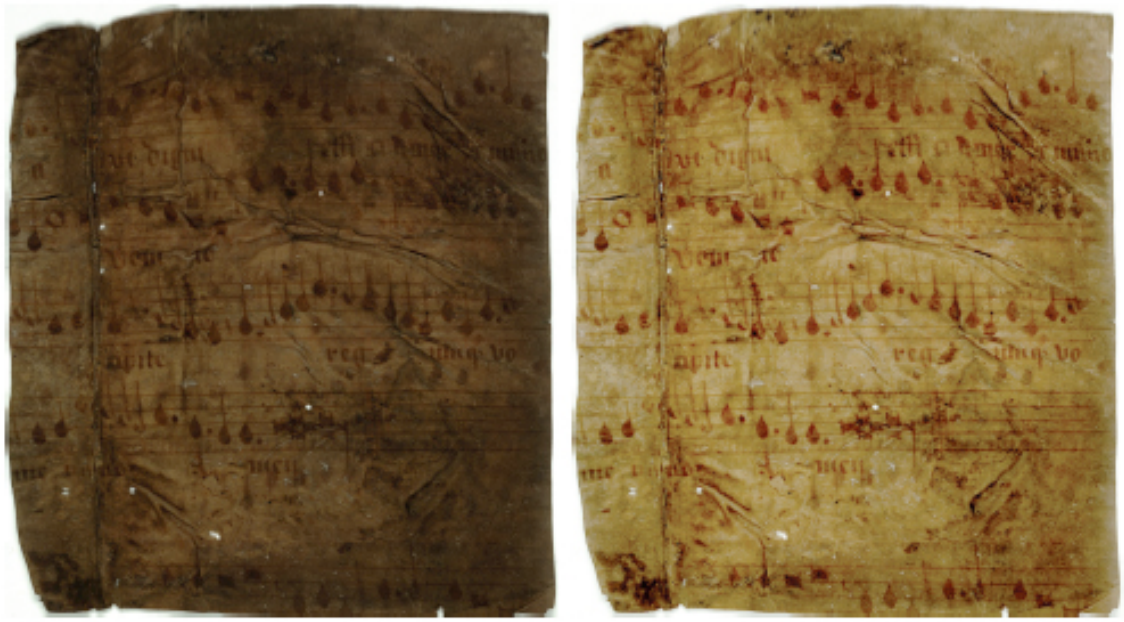

Fig.5 Before and after digital restoration (with kind permission of DIAMM project)

The DIAMM project has also extensively used ultra-violet photography to obtain data about the surface of the manuscripts that may not be visible using the visible spectrum. The area of multi-spectral photography and techniques involving variable light sources is potentially an extremely useful tool for art historians, and one that even some conservators have conceded is under-utilised. An easel painting will typically be made up of a number of layers, all of which may reveal something of the history of the object and may also provide clues to how the object has been damaged, altered, conserved or recycled in the course of its lifetime. The critical factor that cuts across nearly all approaches to the study of art history is that the scholar needs to know to what extent the object (or the part of the object) that they are discussing has integrity as an intentional product of artistic practice and in this respect, technology can be of enormous assistance.

[15] DIAMM, http://www.diamm.ac.uk/content/description/capture.html (accessed 12 September 2006)

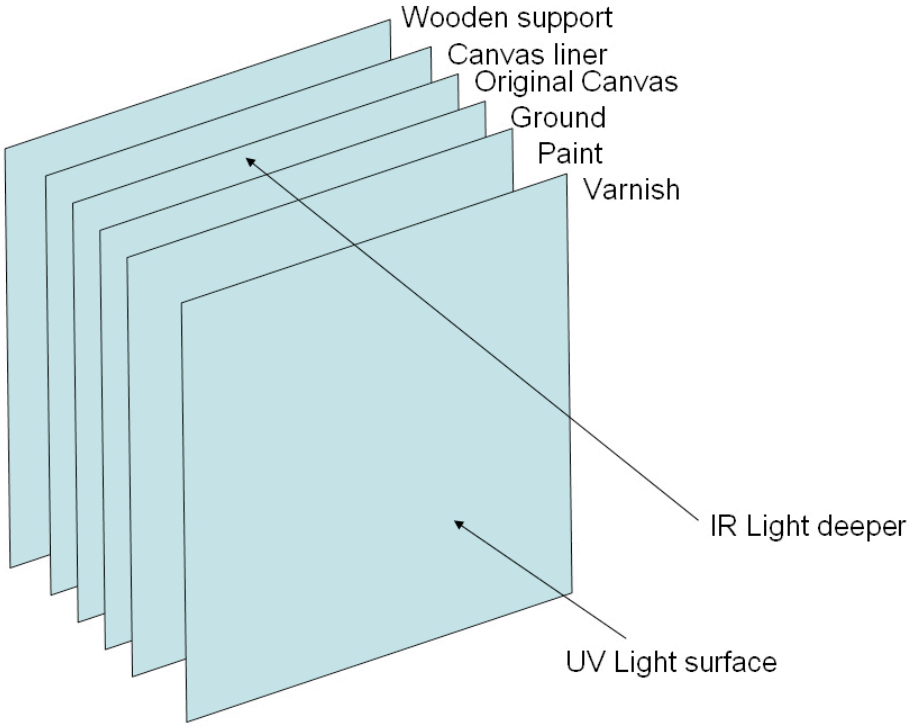

Fig.6 Layers of a typical easel painting

The use of short wavelength ultra-violet light causes the surface of the object to fluoresce giving aged resinous varnishes a green-yellow appearance whilst retouched sections show up as lavender or purple. New surface features are black and start to go lavender as they age whilst interruptions in fluorescence are usually areas where the varnish has been removed.

Long wavelength infra-red light is more penetrative and is good at picking up traces of carbon on light ground so is particularly effective at showing underdrawing beneath painted layers. Other techniques familiar from the realm of medicine include radiography and MRI (Magnetic Resonance Imaging) scanning but the key issue from a digital perspective is that the image output from most of these techniques is ideally suited to digital image capture.

Andrew Prescott from the University of Sheffield and Meg Twycross from Lancaster University are also pursuing research into the use of multi-spectral imaging and have been funded to organise a workshop which will showcase tools that facilitate this kind of analysis[16]. Prescott points out that whilst the Video Spectral Comparator, a commercially available tool, has been available in research libraries for nearly thirty years and has been used extensively for analysing manuscripts, there has been insufficient discussion amongst the arts and humanities community more generally about how far this technology could assist with advancing research.

Content Based Image Retrieval (CBIR)

[16] Methods Network, *Approaches to the Forensic Investigation of Primary Textual Materials,* (workshop proposal), http://www.methodsnetwork.ac.uk/activities/wsp11.html

Another suggestion for an area of tools development voiced at the Methods Network Tools Development Workgroup involved a method of carrying out automated image analysis. Taking inspiration from the TaPOR[17] project which allows users to run a suite of text analysis tools against predefined or imported texts, it was suggested that a similar approach for image analysis might enable researchers to engage with images in new and interesting ways.

In terms of what the components of that suite of tools might be, content based image retrieval techniques would presumably feature. The use of automated searching across a body of material on the basis of shape, tone, colour, texture or spatial location has been around for a long time and is still a burgeoning research area with more papers appearing every year in scientific and technical forums.[18] The application of these techniques has clear relevance in a number of fields including medicine, policing, military work, manufacturing and many other areas where there are prodigious numbers of images that have similar properties but also demonstrate measurable and definable differences. However, the challenge of using these techniques in the context of art historical research always seems to have faltered at what those working in the field have termed the 'semantic gap'.[19] This can be understood as the difference in the potential for searching for primitive, quantitatively definable features and the currently impossible task of automating searches for essence, meaning, emotion, personality, irony and any number of other states of being or modes of interpretation that are widely represented throughout the realm of art. At a recent Methods Network Expert Seminar, Kirk Martinez suggested that it would take multiple generations before computer science was able to get close to crossing the 'semantic gap' with automated retrieval techniques.[20]

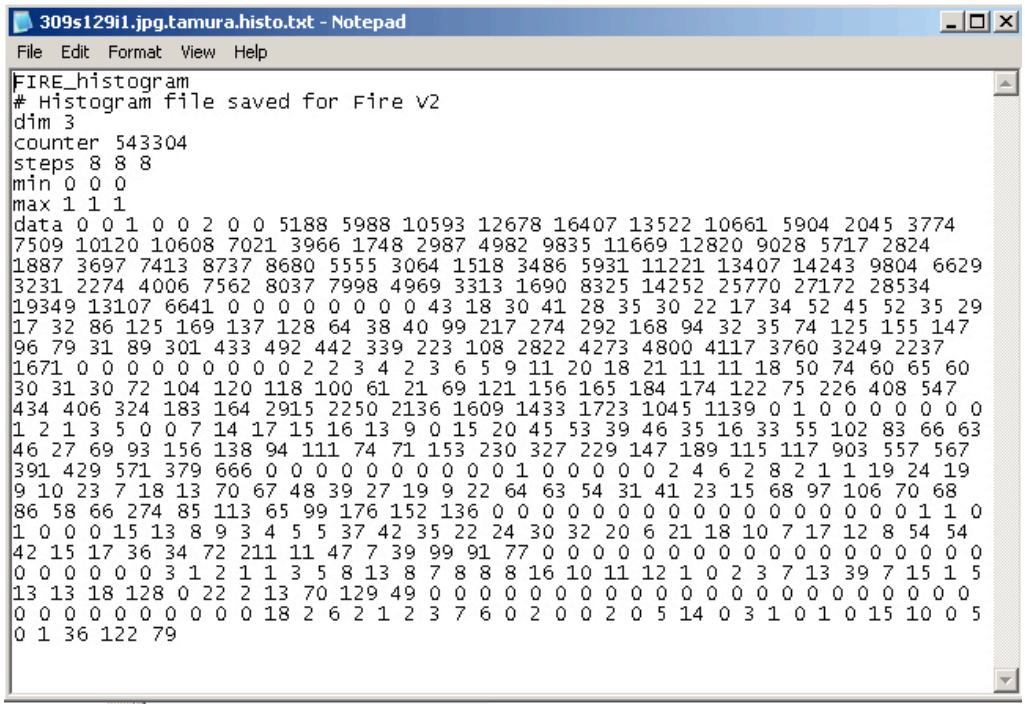

Fig.7 Tamura Features Histogram (with kind permission from Eike Friedrich, Hamilton Kerr Institute)

[17] McMaster University, http://tapor.humanities.mcmaster.ca/home.html (accessed 12 September 2006)
[18] For numbers of articles in IEEE digital library containing 'image retrieval' or 'video retrieval' in their bibliographic data see, Eidenberger, H., (2004)
[19] This term may have been coined by Gudivada V N and Raghavan V V (1995). Cited by Eakins, J., Graham, M., (2000)
[20] Martinez, K., The Semantic Web Approach to Improving Access to Collections, Methods Network Visual Arts Expert Seminar – 27th April 2006

As with the application of all technologies, if a system that initially promises much fails to match the expectations of a majority of users within a reasonable time span, then the attention of those users will turn to other issues and arguably, this has been the case with the attitude of the art historical community to CBIR. It may be useful then to concede that high level semantic searching is not a realistic option for automated image retrieval and refocus attention on what can be gained by searching for primitive or 'level 1' features as Eakins and Graham refer to them in a JISC report from 2000.[21]

At the Hamilton Kerr Institute, a system is being developed to search across an image store of around 5000 digitised cross section paint fragments using algorithmic similarity features. They are currently investigating the feasibility of using an open source programme developed by Thomas Deselaers and colleagues at Aachen University[22] which will allow the user to query by example from a repository of images and will attempt to match that sample using various quantitative techniques.

Fig.7 shows one of the histograms used by the FIRE system (Flexible Image Retrieval Engine) which attempts to quantify image data in a way that approximates to human perceptions of texture[23]. In combination with other histograms relating to shape and colour, the system then attempts to retrieve similar images and in many cases, produces plausible and useful results (see fig.8).

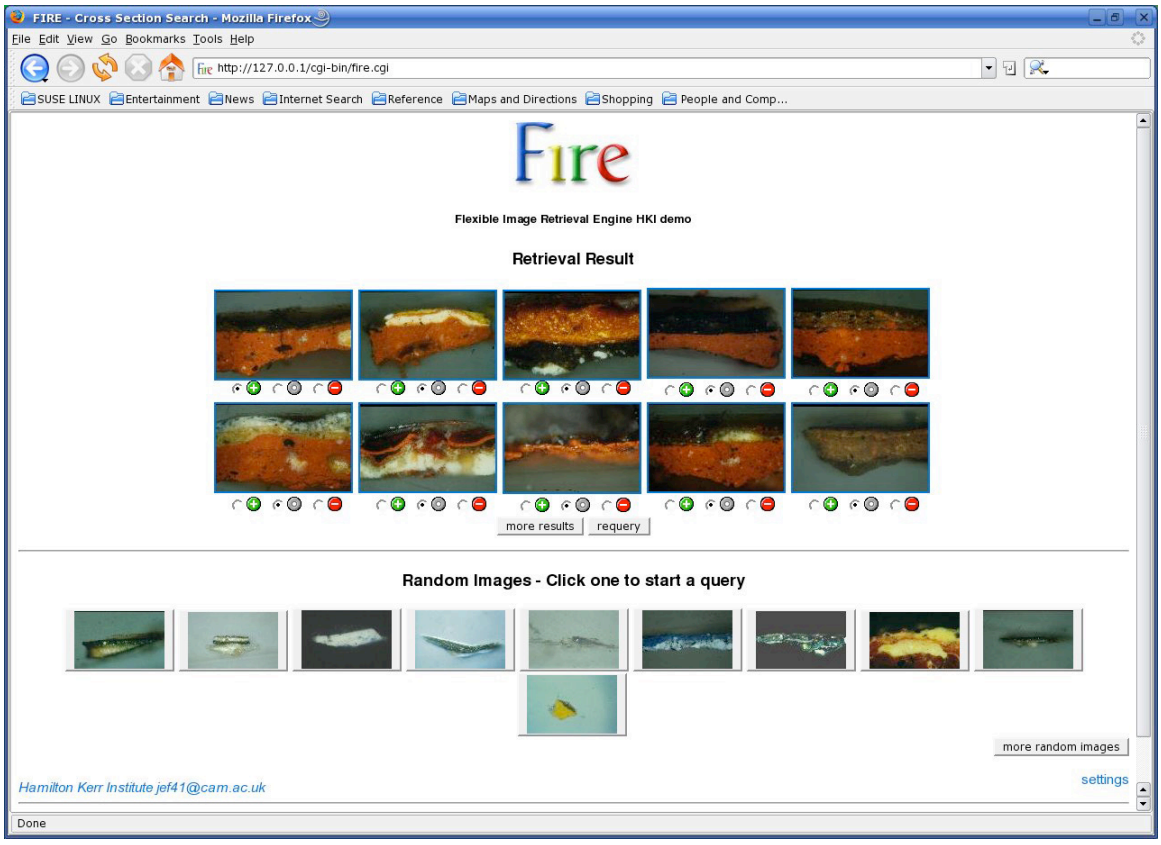

Fig.8 Cross Section Images (with kind permission from Eike Friedrich, Hamilton Kerr Institute)

The majority of items in the retrieved dataset window have a clear relation to each other and the range of types of cross section that are available in the collection can be seen below them in a randomly generated selection of other examples.

[21] Eakins, J., Graham, M., (2000)
[22] FIRE – Flexible Image Retrieval Engine
http://www-i6.informatik.rwth-aachen.de/~deselaers/fire.html (accessed 12 September 2006)
[23] Tamura H., et al

The materials under scrutiny do of course, by their nature, lend themselves to this kind of analysis. The value of the sample depends on the clarity of the layers that can be seen within a necessarily limited outline and therefore slides will be archived that have clear definitions of banding or visibly embedded diverse materials. They are all roughly the same diminutive size because of the nature of the technique and they will often have a relatively flat section as one part of their silhouette that will represent the uppermost surface of the various layers and the one that would be visible to the viewer of the work of art were they standing in front of it.

The value to conservators of retrieving similar cross-section images from large digital libraries will be clear. Comparisons between samples from similar chronological periods will begin to build up a picture of the use of materials in certain regions at certain times and this will help not only with understanding how best to conserve the damaged or at risk item but may also help with attribution and verification issues. It is feasible that a trained eye could look at certain cross-sections and at a glance would be able to categorise the specimen as coming from a painted object from a particular country within a fairly specific time frame. They might also, by analysing the juxtaposition of physical material in the sample, be able to speculate on a number of other issues to do with the trade and availability of materials at certain points in history which, begins to impact upon areas of art historical research outside the circle of conservation studies.

A Tamura Features histogram featuring a jumble of arithmetic information cannot adequately represent later 17th century Flemish Painting (for instance), but it can provide important insights that may help to more clearly define that notion; and having accepted that CBIR techniques are not going to provide users with astonishing new techniques for subject based querying of image data, it is potentially the cumulative affect of applying various processes and methods that will allow art historians to extract the most benefit from adopting a technological approach.

The Corpus Approach

The amassing of detail and the application of a variety of methods has resonances with the type of approach favoured by those working with corpus information and in particular with linguistics research where the analysis of texts using a broad range of quantitative techniques has underpinned a number of areas of enquiry. Techniques for creating concordances, discovering collocations, word frequencies, the clustering of phrases and much else besides have been one of the mainstays of humanities computing for decades but as a broad approach, it appears to have had little cross-over effect on the study of the visual arts. It is true that a number of visual arts related projects have adopted the word 'Corpus' as part of their title,[24] but there appears to be little that formally connect the ways that these corpora are designed to be interrogated and the ways in which linguists and others will analyse a resource such as the 'British National Corpus' (BNC), a collection of texts totalling 100 million words taken from spoken and written sources of language in use during the later part of the twentieth century.[25]

There are some interesting parallels to be drawn between the activity of corpus construction and that of bringing together images for the purpose of studying art history, not least the problem of obtaining rights to the material in the first place. It is customary these days to put together corpora from existing digitised texts as the costs of checking optically scanned material or keying in data (which can still be required for spoken language gathering) are prohibitive. As with image data however, permissions from authors are required where copyright restrictions are in place and some authors will refuse to be represented in corpora or insist on high fees. The use of metadata to define the components of the corpus is of critical value also as patterns of language may become meaningless without the context of how they were originally used. At a slightly more abstract level, the components of language and the components of artistic imagery are both

[24] Noted exceptions that are titled as corpora and refer to the visual arts include: The Corpus Rubenianum Ludwig Burchard, the Corpus of Romanesque Sculpture and the Corpus Vitrearum Medii Aevi.
[25] British National Corpus, http://www.natcorp.ox.ac.uk/corpus/index.xml (accessed 12 September 2006)

unlimitable phenomena and both might be said to constitute a collection of discrete elements that are arranged together to form meaning or achieve an effect. So with this in mind, the question arises, should we be constructing visual corpora in the same manner?

In some senses, this activity is happening with projects such as the Public Catalogue Foundation and the National Inventory of European Painting and it is hoped that these initiatives may eventually provide scholars with enough information from a wide enough range of sources to enable meaningful comparative research. At a recent Methods Network workshop on *Corpus Approaches to the Language of Literature* participants were invited to discover the frequency of use of particular words and phrases in a single chapter of a Dickens novel, the novel as a whole and then in relation to a corpus of 19th Century texts containing a large number of works by other writers. The outcome indicated that Dickens recycled phrases far more than many of his contemporaries, the product perhaps of a requirement to write quickly so that his serialised stories would meet their journalistic deadlines. Following this methodology and given the resources, similar comparisons across periods of art may provide similar evidence to support or refute existing theories or contribute to the formulation of new ones.

It would be disingenuous not to acknowledge that the challenge of returning meaningful data from automated searches across visual information is currently beyond the functionality of any system currently available to art history, as has already been referred to in the context of CBIR. This doesn't render the concept meaningless however, it may just mean that manual and automated techniques would have to be used in tandem to provide useful analytical features on which to run comparisons. These might include: compositional layout, use of posture in figures, clustering of architectural elements, perspective, horizon lines, dimensions, geometry, sight lines, use of colour and shape. Much of this manual annotation could be achieved with software packages such as Adobe Photoshop of course but it is the type of analysis that is possible once the material has been made available in this format which makes the comparison with corpus techniques interesting.

On a less theoretical note, the use of text analysis tools such as textSTAT[26] and Wordsmith[27] would provide art historians with alternative ways of looking at the textual information that has been created *about* art objects, whether that is text that can be digitized from printed sources, metadata text exports from image databases or born-digital commentaries on the web or in word processed formats.

Conclusion

The range of potential disciplines that art history can look to for help and guidance in the use of technology is encouraging and is much wider than the small sample of examples that have been stated here. Alongside the use of annotation and corpus techniques that might be said to emanate from literary and textual studies disciplines, there is of course the enormous subject of XML and its related methods, the use of which is largely navigated around by the majority of art historians who favour plain or proprietary text formats or if pushed, flat and relational databases. Whilst there is always the option of exporting and re-importing fielded data from database formats that have become unsupportable, the cost and trouble of carrying this work out is often de-prioritised in favour of new projects where the participants can specify new systems from scratch, thereby getting around the challenge of having to try and understand data accumulated by other parties.

In the area of communication studies the desktop communication and collaboration tools and the Access grid techniques referred to here can be augmented by reference to networks in general and their increasing ability to transfer larger images at realistically useful speeds. The prevalence of 100 Mbit institutional

[26] TextSTAT is a freeware text analysis package available from: Free University of Berlin, http://www.niederlandistik.fu-berlin.de/textstat/software-en.html (accessed 12 September 2006)
[27] Wordsmith was created and is being developed by Mike Scott at Liverpool University.
Mike Scott, University of Liverpool, http://www.lexically.net/wordsmith/ (accessed 12 September 2006)

connections to the JANET network, and the possibility of 1Gbit internal connectivity within organisations means that many of the old prohibitions on file size transfer no longer apply and researchers can really exploit the detail that modern digital cameras provide, which in the case of semi-professional models can be in the region of 11 megapixels.

Within the discipline of art history, it is interesting that no generally accepted sub-discipline has emerged that might be labelled 'computational art history' or some such appellation.[28] There are documented ways that one can explain this, foremost of which is the difficulty that practitioners face with receiving academic recognition of digital outputs to projects; and there are also parallels within other fields, notably within the area of literary stylistics, which by some accounts has had a hostile reception over the years trying to establish itself as a valid area of research within the broad field of literature.[29] Yet, it remains curious that ideas about the significance of the canon of art history and the contentiousness of the inclusion and exclusion of various objects is cited as an obstacle to the creation of the type of corpora that might encourage computational art historical techniques[30]. Afterall, the British National Corpus has all of the same issues to face in terms of who it appears to include and exclude and yet it has been assembled nonetheless and is a resource that is widely used and very influential.

Chris Bailey and Margaret Graham conclude their paper on 'The Corpus and the Art Historian' by reinforcing the notion that the reluctance to engage with digital techniques is an ideological problem for art history as much as anything.

> Art history's corpora have an appearance of being natural, which the conventional codes of language cannot assume. That it is only an appearance does not matter. The difference may be sufficient to ensure that the contested object of art history continues to evade the interrogative power of digital technology, while linguists and others, whose object both seems more abstract and conventional, make increasing use of it.[31]

At a practical level, the art historian has a common need with scholars in every other discipline to know that any tool or method they are going to take time to engage with is going to repay that time in terms of the type and quality of research that will emerge from its usage. It is the role of the Methods Network and other organisations with overlapping remits to demonstrate from one discipline to another that those outcomes are useful, effective and critical to the future of arts and humanities research.

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