The Open System Approach to Pictorial Information Systems

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There are many reasons why we should be able to argue that the use of pictorial information systems in the education of students in the humanities will dramatically increase. The need to educate students in the critical analysis of images has always been apparent, but factors which have made this difficult in the past have recently been receding from view. Indeed, it could be argued that a healthy political and social discourse within Western European society requires that universities must turn increasing attention to the criticism of the image. The student population of Western Europe has now been exposed to such systems in both everyday life and the school for some twenty years on a formidable scale. Pictorial information systems are becoming a part of everyday commercial life, they can be invoked in museums, libraries and even shops, they play a role in the 'discourse' of society. Such pictorial information systems can be far more cheaply mounted than was the case several years ago.

The attraction of the pictorial information system is that,there is a fascinating similarity between the format and layout of such systems to that of the late-lamented 'Illustrated London News'. A 'reader' can browse between image, comment, image and comment, subconsciously retaining the assumptions on which the collection of materials has been built upon by its editor. The editor of a system is building up a metaphor upon which to work, for as Lynette Hunter has recently suggested [1], the builder of a hypermedia dataset 'selects a potentially enabling set of links and and directs the user away from other selections'. The danger of unstated yet embedded editorial comment has increased since cumbersome but cheap and practical applications allow work presented on these systems to be made available at an ever more moderate price. Since their impact on culture and society in the closing decades of the twentieth century may well be comparable to that of the printed word in Europe during the hegemony of the Habsburgs it is entirely proper that historians, concerned as they are to 'argue interpretation' should come to grips with the issues at the level of software structure if only to alert their colleagues to the need to pose alternatives to those 'embedded' by the often anonymous creators of pictorial information systems.

The important challenge that pictorial information systems pose is that of enabling the user to exercise systematic criticism of their contents. For there is no such thing as an objective pictorial information system any more than there is an 'unbiased text'. The problem is that we have all learned the canons of criticism of the printed word, whereas those canons which apply to images are often so hallowed, or so inherent in our experience that it becomes very difficult to criticise them. At the same time classical hypertext systems while pleasantly explicit in their biases, do not easily allow the user to exercise criticism since the 'authority of the link' retains a tyranny which cannot easily be gainsaid.

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It is our view that this tyranny 'of the link' can perhaps best be overcome by the creation of an 'open system' which separates authoring from the content of the original material contained in a pictorial information system.

At one level, that of "great art", the issues of interpretation should be tackled in a systematic manner, through software which allows for issues of contextualization to be clearly aired. At another level, that of "small art", these issues of contextualization might conceivably be of greater importance, especially since such 'small art' often consists of the image and text. Historians normally wish to 'read' the entire corpus of visual art from the area of the past under their gaze, not least because their interpretations demand a 'feel' for its overall texture and context. The historian of nineteenth century Brazil for example would wish to range widely through 'official art', through 'popular works' whether expressed in newspapers, formal official portraits, architecture, traveller's sketch, the icon on the wall of a peasant's hut or slave's engraving. Such a scholar would wish to search reproductions of work in a range of media, from feathers, fans, textiles to photographs, cartoons, street or shop signs, to official architecture. Since it is theoretically impossible to predict all the questions that historians might wish to ask of an image it is vital that software platforms which allow for the systematic and automatic recording of the re-arrangement which necessarily accompanies re-interpretation be brought into operation as soon as possible. Only then might historians systematically and formally, be able to refine central propositions which underpin interpretation.

Our concern in this and the following chapter is to move the discussion begun earlier a little further. We would suggest that it is very important to 'contextualize' the images to be discussed, by identifying the technologies required for their creation, by isolating the conjuncture within which they were created, and examining the uses to which they have been put. It is also vital that this contextualization be argued out by users.

Perhaps we should stipulate this concern in a more systematic fashion. In the first place it is vital that anyone examining a pictorial information system in an academic environment should be able to verify the information already contained in related data which has already been loaded into the system. It has already been argued that digitized reproductions are interpretations of objects, and we must be able to document their accession. At the very least the 'technical identification' [discussion of provenance and composition of a given object] must be open to 'review'. Such a review implies that the technical choices made by the originator of the pictorial information system can be assessed. Thus the 'filters' created at the time when data was setup in the system can be identified and made the subject of separate comment. Some of this comment may be best 'dealt with' by techniques which derive their inspiration from certain tenets of artificial intelligence, some may not.

Whether or not this is achieved through artificial intelligence, authoring links must be available to be criticised, and cannot be embedded. This is vital because basic information about objects certainly ranks as interpretation, especially when this contains inferential data on the artist. For original authors of a pictorial information system may well have filtered out data that they thought was not relevant to their purpose, yet subsequent scholars felt worthy of inclusion. In this context it is essential that the interpretations

[extended information] inferred by successive authors be preserved in such a way that they can be identified as separate by third parties and submitted to extensive analysis.

These arguments are central to the canons of our discipline, which are thoroughly non-Ranckean in their disavowal of the 'definitive' interpretation of evidence. They therefore favour the use of a software platform which works in such a way that it enables 'individual authorial work' to be separately stored and accessed. But that is only the start — such software must not only provide access to stored images, as well as systematic and consistent descriptions of the contents of those images and the ability to manipulate them, but must also provide for the separate and identifiable storage of the 'comment' which might be made on them. This allows for the effective argument of 'interpretation' as successive scholars are able to compare their 'readings' of an image. Even though the presentation of large numbers of images might provide some means of 'validating' interpretation, the ability to record and 'structure' evaluation and criticism is vital.

These issues are clearly not those at the forefront of commercial manufacturer's concerns, and conventional multimedia authoring systems do not provide the facilities we outline above. Neither do the current generation of hypermedia systems. At first sight this is strange since the classic notions of hypermedia ([2], [3]) were developed to exploit the need for lateral thinking which is inherent in the scholarly activity which underpins the creation of a pictorial information system.

In the current generation of hypermedia development environments, such as Apple's HyperCard, Asymmetrix's Toolbook and OWL's Guide, links are typically stored within each artefact, whether text or image. Such links are integral to the file containing such data, which is therefore irrevocably altered. Consequently there is the danger that a link cannot be distinguished from the material in which it is embedded. Furthermore the reader cannot easily isolate the argument which led to the link being placed in a particular piece of information and has to infer the reasoning behind the author's choice in devising the link. As has been argued of the impressive work of the Hartlib Papers Project 'the process is once more analagous to story telling, finding a good fit between conventions of communication and material experience'. While this has a certain intellectual charm it is hardly to be recommended as scholarly endeavour which can be effectively questioned and hardly conducive to the type of argument which should be encouraged. There is constantly the uneasy awareness that many of the material's significances will not be noticed simply because we cannot recognise the signs of its different resistance. This seems to us to be the nub of the argument.

For though, as 'buttons', specific links have something to recommend them, they are 'overt classification'. As such they have been used to devise 'filecard-like systems' which have some utility as a means of straightforward classification and 'branching. When the formal clarity of the systems involved can be understood by another expert. The HyperCard stack is perhaps the best known of such devices, and has been found effective in providing initial classification. Whether or not the stack has great utility in a discipline such as history, where the interpretation of the argument is as important as source itself is open to question.

A number of authors have suggested that existing hypermedia systems are not satisfactory for large information sets in any discipline ([4], [5], [6]). Many hypermedia systems are

now being developed with an open integrated architecture in order to address this problem. The key difference between open and closed hypermedia systems is in their relationship to the user's working environment [7]. Existing hypermedia systems are typical of closed systems: they are separate applications that are isolated from the user's other applications such as word processors, database management systems and spreadsheets. In contrast, a typical open hypermedia system will act as a virtual linking layer abstracted from the information bound to various existing applications. Whenever possible it will use existing applications to present the information consequence transform the user's previously discrete set of tools into a fully integrated information environment. The hypermedia system simply acts as a framework that provides the relationships between documents [data]. For example, in the open hypermedia system Microcosm described below and in [4], [8] and [9] no linking information is embedded within the documents; link information is maintained in external link databases. This has a number of side effects, the link information is easily analysable, the applications that generated the documents can still be used to edit and maintain them, and the user is able to configure link sets according to their own requirements.

For historians the open system, defined as one in which authoring is explicitly recognized and can be subject to separate processing from the materials in the dataset, is an intellectual imperative. In traditional hypermedia systems, embedded links which cannot be separately processed have crucial disadvantages for the historian, especially where 'large corpora' [in excess of 100 images with associated data], are concerned. At this level formidable barriers to navigation and authoring can only be dealt with by rather complex and cumbrous navigation systems, which often owe more to ingenuity than elegance. The wealth of links to be invoked could hardly be displayed within a GUI without engulphing the reader in a 'chaos of stimuli'. The barriers to rapid and distinctive authoring become formidable.

For once, the cyclopean struggle between software and hardware manufacturers for dominion of the US business market has meant that open systems are coming within the range of the historian. The DOS based system, so long so unfriendly has, with the application of various graphical user interfaces such as Microsoft Windows, evolved into a more powerful platform than was previously offered to the scholarly world. The Windows environment enables the scholar both to take advantage of the enormous strides which have recently occurred in the field of image-processing, storage and retrieval and to process the data [extended information] which have been compiled by other scholars. One particular platform, Microcosm was developed in order to overcome the difficulties encountered by many different scholars, including historians of the moving image, and to handle corpora of significant size and orthogonal shape.

Microcosm ([4], [7], [8], [9]) is an open hypermedia system which has been developed in the Department of Electronics and Computer Science at the University of Southampton. Within Microcosm it is possible to browse through large bodies of multimedia information by following links from one place to another. In this respect, Microcosm provides all the services that would be expected in any hypermedia system. However, Microcosm adds many significant features to this basic model, which place it at a higher level than most currently available hypermedia systems, and make it a particularly suitable environment

for integrating data and processes. It is currently implemented on Microsoft Windows 3. Versions are under development for Apple Macintosh machines and for Unix machines running X-Windows. In order to understand the facilities that Microcosm provides it is necessary to examine the underlying model. The following description is taken from the Microcosm Pre-Release Documentation [10].

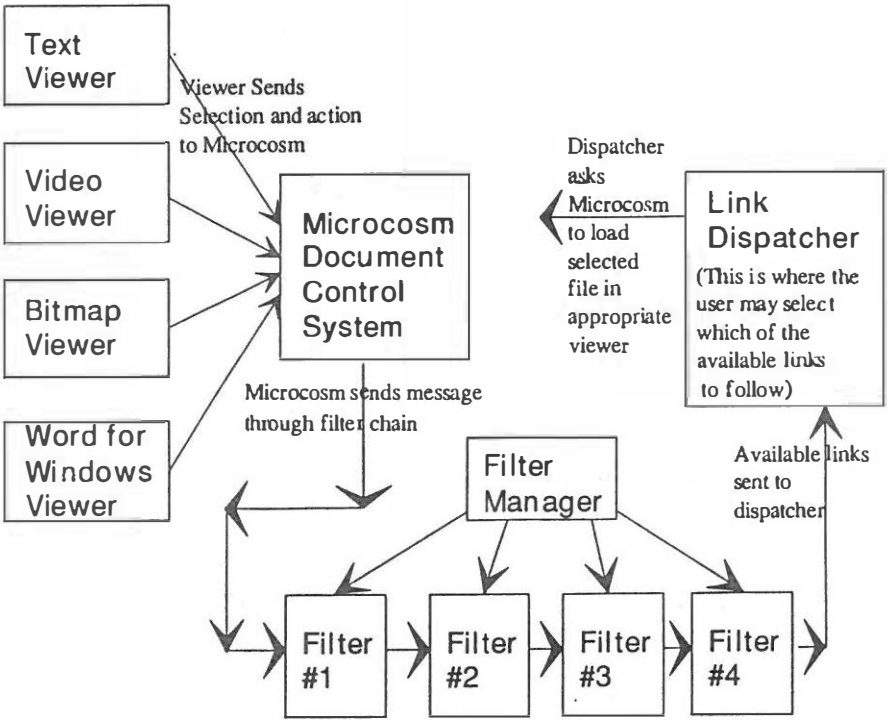

Figure 1: The Microcosm Model

Microcosm consists of a number of autonomous processes which communicate with each other by a message passing system (currently based on Microsoft Windows Dynamic Data Exchange). No information about links is held in the document data files in the form of mark-up. All data files remain in the native format of the application that created them. Link information is held in link databases, which hold details of the source anchor (if there is one), the destination anchor and any other attributes such as the link description. This model has the advantage that it is possible for processes to examine the complete link database as a separate item, and it is also possible to make link anchors in documents that are held on read only media such as CD-ROM and videodisc.

Microcosm allows a number of different actions to be taken on any selected item of interest. The user selects the item of interest (e.g. a piece of text or an area of a picture) and then chooses an action to take. A button in Microcosm is simply a binding of a specific selection and a particular action — the end-effect to the user in this case is the same as a button in conventional hypermedia. A particular feature of Microcosm is the ability to generalise source anchors. In most hypertext systems the source anchor of any link is fixed at a particular point in the text. In Microcosm it is possible for the author to specify three levels of generality of link sources.

1) The 'generic link'. The user will be able to follow the link after selecting the given anchor at any point in the document.
2) The 'local link'. The user will be able to follow the link after selecting the given anchor at any point in the current document.
3) The 'specific link'. The user will be able to follow the link only after selecting the anchor at a specific location in the current document. Specific links may be made into buttons.

Generic links are of considerable benefit to the author in that a new document may be created and immediately have access to all the generic links that have been defined for the system.

The basic Microcosm processes are viewers and filters. Viewers are programs which allow the user to view a document in its native format. In the current implementation there are viewers for text, structured text, images, video, audio, mimics (guided tours), animations and micons (moving icons). The task of the viewer is to allow the user to peruse the document, to make selections and to choose actions. Any Windows application might be used as a viewer, with the proviso that it is possible to select objects, and at least copy them to the clipboard. Current applications that are used as viewers in the Windows environment include Word for Windows, Guide, Toolbook, Superbase and Excel. A major strength of Microcosm is its ability to integrate other applications. In fact Microcosm may be seen as an umbrella environment, allowing the user to make links from documents in one application package to documents in another application package.

Filters in Microcosm are processes which are responsible for receiving messages, taking appropriate actions, and then handing the message onto the next filter in the chain. The actions that filters take are of the nature of changing the message, or adding or removing messages. Current filters provided by Microcosm include the link databases, show links, compute links (a full text retrieval mechanism), navigational aid filters and a link

construction filter. The order that the filters appear in the chain is under user control, and may be dynamically re-ordered and re-configured.

The software platform described above has several crucial advantages for the historians in question. In the first case it meets some of the major objections to traditional hypermedia systems by providing for the separation of text and authorial comment. It does this by 'storing' the 'links' created by authors in a free-standing 'linkbase' which could be accessed from any software or dataset resident within Windows 3.1 or above. This means that versions of existing interrogation routines such as HiDES running in C can be accessed [11], so that domain files created to provide authorial comment can also be ported, and earlier authorial efforts and learning is not lost. More importantly has the ability to exploit and integrate other application packages running in the same environment which are powerful enough in their own right to handle very significant datasets. Typically enough a database in excess of 30,000 records could be accessed and brought to bear to study the occupation of major town houses 'palacetes' in Viana do Castelo, Portugal. The open system approach means that years of experience with database management, spreadsheet and graphics handling packages need not be lost in the adaptation to the new platform and the creation of pictorial information systems running on more powerful hardware platforms. This is significant since authoring a dataset containing tens of thousands of datafiles (both text and image) is a non-trivial task.

We have arrived at a definition of a research workstation, one which an investigator uses so as to examine the assumptions reached by the person who has created a pictorial information system. Naturally enough the investigator would be anxious to preserve the approach of the originator, include their own work, run appropriate applications programs and include new data. At the same time the investigator might well wish to transfer the 'interpretation' to a new hardware or software environment. Given that changes in hardware and software technologies are extremely rapid this requirement is both non-trivial and vital.

Perhaps we should phrase this requirement in another way. The platform should enable the investigator to obtain practical and intellectual support from the system without overt 'editorializing' from the authors of courseware contained on it. At the same time the system should contain a full range of aids to navigation; comprising access to specific interactive help files [devised by initial author]; as well as access to information and tools of a generic nature. Needless to say the platform should also contain a range of 'intelligence', which would operate at both 'specific' and 'generic' levels. As already argued it must allow the student to use a range of application programs, so as to produce findings which can be assessed with reference to questions of historical debate and interpretation.

In other words the platform should operate an open system offering seamless integration to a range of media [text, graphics, still images, video and sound] and applications. Such integration must allow the investigator to compare data processed through such applications with other data held in the system. In this way the platform can provide for an open corpus of data. Since historical data is never complete, the system must allow for the handling of new data, whether text, sound, video or in processed form. Furthermore it should do this in such a way that the integrity of all such data is guaranteed.

There are several tools which may be used within this new platform, and are integral to the software. These tools can be sub-divided into two classes — those which can be used with any multimedia dataset, and those which are used to generate information that is specific to a particular dataset. Examples of the first class of tools in Microcosm include the 'compute links' facility enables investigators to invoke a sophisticated and complex search algorithm in order to provide them with an understanding of the resources available in the text files of the dataset. This allows the investigator to gain a sense of the extent to which 'extended information' provided in the system can be germane to a particular interpretation and can be supported from the images to which 'comment' has been made available. The 'compute links' facility is, in other words, a text retrieval systems with all the virtues and vices of such an instrument. Since its use is hallowed and apparently understood it might be regarded as a crucial beginning. A second instrument which a scholar might invoke is also traditional, a 'history' a device which allows for the tracking of a particular investigation. This is a listing [in chronological order] of all files used and is implemented as one of the navigational aid filters in Microcosm. In the current implementation it is provided with minimal 'intelligence' to indicate that a file has already been accessed. The device which allows an investigator to highlight a given text and invoke the 'show links' facility within Microcosm, allows for the display of any links which have already been authored. This is particularly apposite when an investigator is faced with the intellectual issues involved in the comparison of descriptions of the visual image, or the contextualization of a moving image.

At the same time such a platform should also provide tools for retrieving images using 'visual' methods of identification such as presenting the use with a set of 'thumb-nail images' or 'visual abstracts' as the result of a query to an image database. In Microcosm this facility has been extended to incorporate moving icons or 'micons', which are samples extracted from videotape or videodisc and stored in digital form on the hard disc. Such tools have a distinct advantage in that they allow an author to 'deconstruct' a particular sequence of moving images, juxtaposing still images, text or graphics. These should be accompanied by generic help files which are iconized by the platform.

The second set of tools which should be invoked by an investigator are those which are unique to that dataset. These 'unique tools' when invoked provide results which will only refer to materials held in that pictorial information system. The first of these are specific links, the classic 'buttons' well known to the users of hypermedia, which only apply at a specific point in a document. The second, known as 'generic links' in Microcosm, are arguably far more important. Such links explicitly provide interpretation, they can be used by one author to group all references to a given object [a type of dictionary] or, alternatively, they can be a means by which an author suggests a correspondence between a range of discrete references, as in the discussion of inference in images. The advantage of such generic links is that their individual nature is apparent, if 'further links' are added to them then the provenance of such authoring can also be clearly distinguished. In some senses 'generic links' are 'the ideal means of distinguishing authoring in a system.

The use of guided tours [mimics in Microcosm] also enables an author to put a 'thumbprint' on the way in which a given series of texts or images might by used as a means of developing an argument or interpretation. Juxtaposing 'traditional' with 'mod-

ern' in a sequence of photographs, especially if these are coupled to generic links through extended comment is actually a way of documenting the construction of images, while commenting intensively upon their interpretation.

On another plane, the building of individual 'expert mode' interrogation files within a platform such as that offered by Microcosm allows for various forms of argument to be adopted, and labelled, by a specific author. In the HiDES programs used at Southampton we have developed four modes by which authors can question evidence in either images or text; these are debate, progressive argument, exposition, and reconstruction. All can exploit Microcosm, but the latter two are particularly effective. This is because Microcosm also allows an investigator to examine the mode of argument used by a predecessor, by using 'compute links' or 'show links' on the domain files stored by the system. These domain files are clearly unique to a particular dataset and type of data, as are traditional arrangements of buttons into contents or dictionary files.

Though existing technologies can provide a wealth of material for discussion, and enable us to posit powerful arguments, it might be argued that the potential of new ones is such that they too cannot be ignored. Research and teaching in modern and contemporary history pose specific problems for the social and economic historian. Some of the more traditional of these have been anticipated by providing substantial, systematic, interactive help files designed to enable students who are not well versed in statistical method to exploit complex data and can be effectively exploited as iconized help files. Nevertheless there remains a plethora of material, (e.g. film, audio and facsimiles) which present certain inherent difficulties in that they cannot easily be utilised — stored, accessed and queried on the systems commonly available to scholars of the humanities. At the same time we have the problem that historians face two further difficulties, data is often stored and accessed via a range of very different technologies, some of which have long been incompatible, while it has proved extremely difficult to document usage of these data, e.g. which clips of film or stills were used as evidence to support a particular argument and how were they engineered. The result of such research in the past has often been unsatisfactory because it might be labelled impressionistic.

In conclusion, we have argued in this chapter that pictorial information systems for historians, and scholars in other disciplines where interpretation and debate are essential techniques for the classification of pictorial information, must be designed using an open systems approach. This involves the integration of several different application packages running under a unifying umbrella platform that provides linking, filtering and data viewing functionality. At Southampton we are currently using this approach to build a number of very substantial multimedia datasets and the results of this work are discussed in the following chapter.

An obvious and natural extension to the work described above is to integrate a set of image processing tools into the information system to allow users to interact with and process pictorial data in the same way as text. For example, generic links are only currently implemented in Microcosm for text data. Extending the model to apply generic linking capability to image data (both still and moving) is in principle very straight forward but the image processing techniques required to match any selected area of an image to a set of target images are as yet unavailable. It will however be possible to achieve useful results in

certain well-defined areas, such as cartography and manuscripts, which can be extended as developments in technology permit. We are moving towards the ideal of an 'image retrieval system' but this must be part of an open information processing environment if it is to serve as more than mere illustration.

References

[1] Hunter, L. "Hypermedia Narration: Providing Social Contexts for Methodology". Paper given at the ALLC/ACH'92 Conference, Oxford, April 1992.

[2] Bush V. "As We May Think". *Atlantic Monthly*, July 1945, pp 101-108.

[3] Nelson T.H. "Getting It Out of Our System". In: Schechter G. (ed.) *Information Retrieval: A Critical Review*, Thompson Books, Wash. D.C., 1967

[4] Fountain, A., Hall, W., Heath, I. & Davis, H. "Microcosm: An Open Model for Hypermedia with Dynamic Linking". In *Hypertext: Concepts, Systems and Applications*, Proceedings of ECHT'90 (eds. A. Rizk, N. Streitz & J. Andre) Cambridge University Press, pp 298-311, 1990.

[5] Malcolm, K., Poltrock, S. & Schuler, D. "Industrial Strength Hypermedia: Requirements for a Large Enterprise". In *Proceedings of Hypertext'91*, ACM Press, pp 13-24, 1991.

[6] Halasz, F. "Seven Issues Revisited". Keynote talk given at Hypertext'91, San Antonio, Texas, December 1991.

[7] Hill, G., Wilkins, R. & Hall, W. "Open and Reconfigurable Hypermedia Systems: A Filter-Based Model". *CSTR* 92-12, Department of Electronics and Computer Science, University of Southampton, 1992.

[8] Hall, W., Davis, H., Heath, I., Hill, G. & Wilkins, R. "Microcosm: the State of the Art". Computer Science Technical Report, University of Southampton, 1992.

[9] Davis, H., Hall, W., Heath, I., Hill, G. & Wilkins, R. "Towards an Integrated Information Environment with Open Hypermedia Systems". Computer Science Technical Report, University of Southampton, 1992.

[10] Davis, H. & Rush, D. "Microcosm Pre-Release Documentation". Department of Electronics and Computer Science, University of Southampton, 1992.

[11] Hall, W. & Colson, F. "Multimedia Teaching with Microcosm-HiDES: Viceroy Mountbatten and the Partition of India" *History and Computing*, Vol.3, No. 2, pp 89-98, 1991

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Introduction

Manfred Thaller

This book is the product of a workshop held at the International University Institute in Firenze on November 15th, 1991. The intention of that workshop has been to bring together people from as many different approaches to "image processing" as possible. The reason for this "collecting" approach to the subject was a feeling, that while image processing in many ways has been the "hottest" topic in Humanities computing in recent years, it may be the least well defined. It seems also much harder to say in this area, what is specifically important to historians, than to other people. In that situation it was felt, that a forum would be helpful, which could sort out what of the various approaches can be useful in historical research.

To solve this task, the present volume has been produced: in many ways, it reflects the discussions which actually have been going on less, than the two companion volumes on the workshops at Glasgow and Tromsø do. This is intentional. On the one hand, the participants at the workshop in Firenze did strongly feel the need to have projects represented in the volume, which were not actually present at the workshop. On the other, the discussions for quite some time were engaged in clarifying what the *methodological* issues were. That is: what actually are the topics for scholarly discussion beyond the description of individual projects, when it comes to the processing of images in historical research?

The situation in the area is made difficult, because some of the underlying assumptions are connected with vigorous research groups, who use fora of scholarly debate, which are only slightly overlapping; so, what is tacitly assumed to hold true in one group of research projects may be considered so obviously wrong in another one, that it scarcely deserves explicit refutation.

We hope, that we have been successful in bringing some of these hidden differences in opinion out into the open. We consider this extremely important, because only that clarification allows for a fair evaluation of projects which may have started from different sets of assumption. So important, indeed, that we would like to catalogue here some of the basic differences of opinion which exist between image processing projects. The reader will rediscover them in many of the contributions; as editor I think however, that sumarizing them at the beginning may make the contributions — which, of course, have been striving for impartiality — more easily recognizable as parts of one coherent debate.

Three basic differences in opinion seem to exist today:

(1) Is image processing a genuine and independent field of computer based research in the Humanities, or is it an auxiliary tool? Many projects assume tacitly — and some do so quite outspokenly — that images on the computer act as illustrations to more conventional applications. To retrieval systems, as illustrations in catalogues and the like. Projects of this type tend to point out, that with currently easily available equipment and currently clearly understood data processing technologies, the analysis of images, which can quite easily be handled as illustrations today, is still costly and of uncertain promise. Which is the reason why they assume, that such analytical approaches, if at all, should be undertaken

as side effects of projects only, which focus upon the relatively simple administration of images. Their opponents think, in a nutshell, that while experiments may be needed, their overall outcome is so promising, that even the more simple techniques of today should be implemented only, if they can later be made useful for the advanced techniques now only partially feasible.

(2) Connected to this is another conflict, which might be the most constant one in Humanities data processing during the last decades, is particularly decisive, however, when it comes to image processing. Shall we concentrate on levels of sopbistication, which are available for many on today's equipment or shall we try to make use of the most sophisticated tools today, trusting that they will become available to an increasingly large number of projects in the future? This specific battle has been fought since the earliest years of Humanities computing, and this editor has found himself on both sides at different stages. A "right" answer does not exist: the debate in image processing is probably one of the best occassions to understand mutually, that both positions are full of merit. It is pointless to take permanently restrictions into consideration, which obviously will cease to exist a few years from now. It discredits all of us, if computing in history always promises results only on next years equipment and does not deliver here and now. Maybe, that is indeed one of the more important tasks of the *Association for History and Computing*: to provide a link between both worlds, lending vision to those of us burdened down by the next funding deadline and disciplining the loftier projects by the question of when something will be affordable for all of us.

(3) The third major underlying difference is inherently connected to the previous ones. An image as such is beautiful, but not very useful, before it is connected to a description. Shall such descriptions be arbitrary, formulated in the traditionally clouded language of a historian, perfectly unsuitable for any sophisticated technique of retrieval, maybe not even unambigously understandable to a fellow historian? Or shall they follow a predefined catalogue of narrow criteria, using a carefully controlled vocabulary, for both of which it is somewhat unclear how they will remain relevant for future research questions which have not been asked so far? — All the contributors to this volume have been much to polite to phrase their opinions in this way: scarcely any of them does not have a strong one with regard to this problem.

More questions than answers. "Image processing", whether applied to images proper or to digitalized manuscripts, seems indeed to be an area, where many methodological questions remain open. Besides that, interestingly, it seems to be one of the most consequential ones: a project like the digitalization of the *Archivo General de Indias* will continue to influence the conditions of historical work for decades in the next century. There are not only many open questions, it is worthwhile and neccessary to discuss them.

While everybody seems to have encountered image processing in one form or the other already, precise knowledge about it seems to be relatively scarce. The volume starts, therefore, with a general introduction into the field by J. v.d. Berg, H. Brandhorst and P. v. Huisstede. While most of the following contributions have been written to be as self supporting as possible, this introduction attempts to give all readers, particularly those

with only a vague notion of the techniques concerned, a common ground upon which the more specialized discussions may build.

The contributions that follow have been written to introduce specific areas, where handling of images is useful and can be integrated into a larger context. All authors have been asked in this part to clearly state their own opinion, to produce clearcut statements about their methodological position in the discussions described above. Originally, four contributions were planned: the first one, discussing whether the more advanced techniques of image processing can change the way in which images are analysed and handled by art historians, could unfortunately not be included in this volume due to printing deadlines: we hope to present it as part of follow up volumes or in one of the next issues of *History and Computing*.

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Introduction

Manfred Thaller

This book is the product of a workshop held at the International University Institute in Firenze on November 15th, 1991. The intention of that workshop has been to bring together people from as many different approaches to "image processing" as possible. The reason for this "collecting" approach to the subject was a feeling, that while image processing in many ways has been the "hottest" topic in Humanities computing in recent years, it may be the least well defined. It seems also much harder to say in this area, what is specifically important to historians, than to other people. In that situation it was felt, that a forum would be helpful, which could sort out what of the various approaches can be useful in historical research.

To solve this task, the present volume has been produced: in many ways, it reflects the discussions which actually have been going on less, than the two companion volumes on the workshops at Glasgow and Tromsø do. This is intentional. On the one hand, the participants at the workshop in Firenze did strongly feel the need to have projects represented in the volume, which were not actually present at the workshop. On the other, the discussions for quite some time were engaged in clarifying what the *methodological* issues were. That is: what actually are the topics for scholarly discussion beyond the description of individual projects, when it comes to the processing of images in historical research?

The situation in the area is made difficult, because some of the underlying assumptions are connected with vigorous research groups, who use fora of scholarly debate, which are only slightly overlapping; so, what is tacitly assumed to hold true in one group of research projects may be considered so obviously wrong in another one, that it scarcely deserves explicit refutation.

We hope, that we have been successful in bringing some of these hidden differences in opinion out into the open. We consider this extremely important, because only that clarification allows for a fair evaluation of projects which may have started from different sets of assumption. So important, indeed, that we would like to catalogue here some of the basic differences of opinion which exist between image processing projects. The reader will rediscover them in many of the contributions; as editor I think however, that sumarizing them at the beginning may make the contributions — which, of course, have been striving for impartiality — more easily recognizable as parts of one coherent debate.

Three basic differences in opinion seem to exist today:

(1) Is image processing a genuine and independent field of computer based research in the Humanities, or is it an auxiliary tool? Many projects assume tacitly — and some do so quite outspokenly — that images on the computer act as illustrations to more conventional applications. To retrieval systems, as illustrations in catalogues and the like. Projects of this type tend to point out, that with currently easily available equipment and currently clearly understood data processing technologies, the analysis of images, which can quite easily be handled as illustrations today, is still costly and of uncertain promise. Which is the reason why they assume, that such analytical approaches, if at all, should be undertaken

as side effects of projects only, which focus upon the relatively simple administration of images. Their opponents think, in a nutshell, that while experiments may be needed, their overall outcome is so promising, that even the more simple techniques of today should be implemented only, if they can later be made useful for the advanced techniques now only partially feasible.

(2) Connected to this is another conflict, which might be the most constant one in Humanities data processing during the last decades, is particularly decisive, however, when it comes to image processing. Shall we concentrate on levels of sopbistication, which are available for many on today's equipment or shall we try to make use of the most sophisticated tools today, trusting that they will become available to an increasingly large number of projects in the future? This specific battle has been fought since the earliest years of Humanities computing, and this editor has found himself on both sides at different stages. A "right" answer does not exist: the debate in image processing is probably one of the best occassions to understand mutually, that both positions are full of merit. It is pointless to take permanently restrictions into consideration, which obviously will cease to exist a few years from now. It discredits all of us, if computing in history always promises results only on next years equipment and does not deliver here and now. Maybe, that is indeed one of the more important tasks of the *Association for History and Computing*: to provide a link between both worlds, lending vision to those of us burdened down by the next funding deadline and disciplining the loftier projects by the question of when something will be affordable for all of us.

(3) The third major underlying difference is inherently connected to the previous ones. An image as such is beautiful, but not very useful, before it is connected to a description. Shall such descriptions be arbitrary, formulated in the traditionally clouded language of a historian, perfectly unsuitable for any sophisticated technique of retrieval, maybe not even unambigously understandable to a fellow historian? Or shall they follow a predefined catalogue of narrow criteria, using a carefully controlled vocabulary, for both of which it is somewhat unclear how they will remain relevant for future research questions which have not been asked so far? — All the contributors to this volume have been much to polite to phrase their opinions in this way: scarcely any of them does not have a strong one with regard to this problem.

More questions than answers. "Image processing", whether applied to images proper or to digitalized manuscripts, seems indeed to be an area, where many methodological questions remain open. Besides that, interestingly, it seems to be one of the most consequential ones: a project like the digitalization of the *Archivo General de Indias* will continue to influence the conditions of historical work for decades in the next century. There are not only many open questions, it is worthwhile and neccessary to discuss them.

While everybody seems to have encountered image processing in one form or the other already, precise knowledge about it seems to be relatively scarce. The volume starts, therefore, with a general introduction into the field by J. v.d. Berg, H. Brandhorst and P. v. Huisstede. While most of the following contributions have been written to be as self supporting as possible, this introduction attempts to give all readers, particularly those

with only a vague notion of the techniques concerned, a common ground upon which the more specialized discussions may build.

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