Multimedia Formats

Workshop Report

Support Initiative
for Multimedia Applications

Part of the JISC New Technologies Initiative

Multimedia Formats - Overview of the Worlshop

Introduction

This workshop was part the JISC New TEchnologies Initiaitve's workshop programme hosted by the SIMA (Support Initiative for Multimedia Applications) project which is based at Loughborough Univiersity and monitored by AGOCG.

The workshop discussed a number of different types of formats (images, documents, delivery formats) but kept coming back to the need to recognise some form of taxonomy and to educate people about the issues relating to the selection of a file format. It was accepted that many people using file formats did not want to have to tcare about what format they saved their work in, but that the selection might well affect what they could do in the future with their courseware, images etc.

The Issues

The issues raised were:

Who are the users?

The workshop very quickly came to the conclusion that the "users" were not of one type and that we had to consider different requirements. These include courseware authors, archivists (with indexing requirements), courseware readers, support staff concerned with reading and converting a range of formats - and no doubt many more. Theses different needs have to recognised by any activities following the workshop.

What is the Lifetime of the Data?

If the data is to be stored and used within a shoret timescale then format issues are matters of convenience for the user. If, however, the information is to be archived for any length of time and widely used - or has the potential for this - then the selection of the right format is a real issue. It is essentail that we can be confident that the format will be readable in the future, thus an "open" standard - and probably a de jure standard - is appropriate. It is also important that the information is stored at the highest possible level of quality and that the information is not diminished by the storage method. Arhciving images at high resolution, for example, is clearly preferable to storing them using a lossy compression method which will reduce information. The information delivery may be in compressed form, but the archive should maintain data quality.

Cross Platform Compatiblity

This is important in Higher Education where we seem to have at least one of any machine that can be named. This should not be ignored when developing courseware, for example, for wide use.

Indexing Needs

Archived information needs to be searchable and accessed in a rnage of ways - some of these we may not even have thought about. Some of the simple solutions of scanning text and images and keeping them in raster from do not allow access to as much information as we might like. This is particularly true of "legacy" data which may be available on paper now and which we wish to convert to online form - the scanned "virtual paper" is often high in storage requirements and low on information.

Framework vs Content

This came up many times at the workshop. We need to get people to distinguish between the components of the application -- for example courseware - and the "glue" that sticks them together. Sometimes the packages we are using do not encourage this way of thinking. Yet, if the end products are to have a long life and to be updateable it is important that this is considered.

Proprietary vs Standard Formats

This distinction is not always obvious in that some proprietary formats do have publicly available definitions. It is clear that proprietary formats are not necessarily "bad" and formal standards "good". It is important that formats are suitable for the task. "Open" formats are however ones which people should be looking to use for long term storage. The danger of storing information in a way which depends on the supplier continuing to support a particular format can be fraught. Just as a format which is only supported on one platform can cause problems with the demise of that machine. The workshop agreed that we would keep in touch with the Interactive Mulitmedia Association (IMA) which is a consortium of major suppliers who look to develop and promote common interchange formats. This link might help us to get the balance right between proprietary and formal standards use.

Conversion Tools

This is an important area, particularly for support staff who have users with a wide range of formats which need to be converted for use in software and for output. There are good tools around (Utah Raster Toolkit, PBMPLUS, San Diego Supercomputer Center Tools) which can be accessed. We need to inform people about these.

Delivery Methods

There is a need to consider different delivery methods. There need to be different considerations for CD-ROM and for delivery across networks - this may not always be the case in the future but probably is so at the moment.

Multimedia and People with Disabilities

This has come up before at the last AGOCG workshop on mulitmedia. The new technologies can offer a great deal for people with sight and hearing difficulties and we heard of the use of SGML in structuring information so that it can be presented for people with print disablities. Yet, the overuse of visual infomation with no concern to store information in a way it can be represented in a variety of ways, can disadvatage those with sight and hearing difficulties.

Education and Training

It was agreed at the workshop that there was a need to educate users about the issues surrounding the selection of a file format. Associated with that is the need to develop skills for the use of multimedia. Mulitmedia will become as widespread in its use as desk top publishing and will not necessarily be used by those with the appropriate skills already. These need to be learned as the
investment in the development of, for example multimedia materials for learning, is high.

Recommendations and Future Work

It seems clear that we cannot say to people you should use a particular format in all circumstances. What we want to do is to help people to make the right choices in particular circumstances. The workshop recommended that the following projects should be carried out (in addition to this workshop report):

- a report should be written by a small group of experts who develop the issues raised above and use examples of formats and tools to illustrate these. This report would be aimed at the user who wanted to gain an understanding of the issues. It would contain a glossary and a review of books and publications in this area.
- a "live" online document should be created which has sections on multimedia formats with information about each in a standard way. The format of the document being defined using a forms interface and made available using World Wide Web. The information would have links to other sources of information. It would also have a second section on tools for conversion with pointers to further information. This work would build on other activities.
- AGOCG should do some work on good design in the use of multimedia tools through the SIMA project
- the recommendations and reports should be fed into other initiatives in HE such as TLTP and the Libraries Review.

The rest of this report contains summaries of the presentations made at the workshop and details of the discussions. It should be noted that the papers reflect the interests of the participants and should not be taken as an overview of the field. The recommendations reflect the need for overview materials with an even-handed approach to be available. The papers should be read in this light.

There was no consideration of copyright at the workshop. This reflects the focus of the workshop and not a lack of appreciation of this important issue.

For more information about the workshop, AGOCG or the SIMA project contact:

Dr Anne Mumford
Computing Services
Loughborough University
Loughborough
LE11 3TU

Email a.m.mumford@lut.ac.uk

Aims of the Workshop

The workshop set out with the following aims:

- to look at the range of file formats for multimedia, both formal standards and de facto standards
- to consider where these fit together and where there are overlaps of functionality and where gaps exist
- to consider defining a "Which" type guide to advise the community on what formats are appropriate and where and how they fit together
- to decide whether a report (or reports) advising the community on file formats is needed and to specify sections to be commissioned (with participants being able to "sign up" for sections)
- to develop advice for various committees, groups and services in UK Higher Education (e.g. Libraries Review Committee, dataset services, TLTP projects)
- to advise the JISC Standards Working Group on which standards should be targets for receiving travel and subsistence funding for delegates to attend meetings.

Support Initiative for Multimedia Applications

The workshop was held as part of the SIMA project which is designed to dovetail with AGOCG activities.

As part of its concern to underpin the provision of computer graphics, visualization and multimedia, AGOCG held a workshop in December 1993 to address the issues of "Multimedia in Higher Education: Networking and Portability" the results of which are published as AGOCG Technical Report 24. This workshop tied in with the proposal from AGOCG for the Support Initiative for Multimedia Applications which has now been funded by the JISC New Technologies Initiative. The New Technologies Initiative has funded projects in a range of areas which reflect new areas of technology and their application. The projects are concerned with demonstrating the use of new technology to the higher education community through example, setting up services, training, and dissemination of good practice.

The main elements of the Support Initiative for Multimedia Applications (SIMA) are:

- a Support Officer who will offer help to the community, run courses, survey activities nationally, disseminate information about national initiative and other deliverables, and be a source of information for the community Sue Cunningham of the University of Manchester has been appointed to this post
- workshops
- a series of evaluations leading to reports and recommendations
- a series of pilot projects

It aims to build on the model of AGOCG which will act as a steering group for the initiative. The projects in the first year will implement some of the recommendations of the AGOCG workshop. These recognise that multimedia is a technology which will be vital to many areas in higher education, yet the main developments will be industry-led. In higher education we need to be looking to support people using the new technology and to assist them in setting up an infrastructure with appropriate hardware and software.

SIMA Projects

The following projects have been funded in the initial phase and reports will be available between August 1994 and April 1995:

Evaluation of Video Conferencing Products on UNIX Systems to Support Help Desk and Advisory Activities in a Computing Service Environment.
University of Liverpool

Meeting Teachers' and Learners' Support and Training Needs - Use of Video Conferencing with PCs
Heriot Watt University

Desktop Video Conferencing on Apple Macs
University of Derby

Report and Guidelines on Image Capture
University of Bristol

Report and Guidelines on Image Capture
University of Aberdeen

Survey of Uses of Software and Hardware for Multimedia Applications in UK Higher Education
Robert Gordon University

Do's and Don'ts of Video Conferencing
Loughborough University

Do's and Don'ts of Video Conferencing for Teaching in Higher Education
Heriot Watt University

Do's and Don'ts of Video Conferencing - Experiences from LIVENET
University of London

A Review of Multimedia Networking Developments
Liverpool John Moores University

Report on the Provision of CBL Material over Network Information Servers
Heriot Watt University

Running a World Wide Web Server
University of Leeds

A subscription service is being set up for the output of SIMA. If you would like to subscribe, please contact Anne Mumford

Multimedia Formats What are the Issues?

At the start of the workshop Anne Mumford suggested there were many questions which needed to be addressed during the workshop:

- what are the range of file formats for multimedia?
- where do these these fit together?
- how do people use them?
- do people need to know and understand file formats?
- how do we get from this format to that one?
- what software deals are there?
- what public domain software is available?

Steve Morgan then suggested that it was important to:

- concentrate on file formats that are used
- encourage de jure standards where possible but not at the expense of de fact standards
- recognise the importance of PC/Windows
- not forget the outside world

and that the workshop should:

- identify the formats that are used successfully
- initiate the evaluation of tools which will encourage their use (i.e. make it easy and inexpensive)
- try to recommend community site licence agreements if at all possible this may involve central funding

Julian Gallop looked at the background against which we were having discussions:

Background

- technology (networking, discs, processors, compression) has removed many of the barriers to using media that were previously considered to be exotic
- there is a spread and awareness of world wide hyperlinks
- in the UK HE community there are heterogeneous platforms even within a single discipline
- the formats used are numerous
- at present, the pattern in the academic community is usage of multimedia produced by others plus development by multimedia experts the development of multimedia documents by non-experts is likely to increase
- multimedia has wide application for education and courseware with many communities being distributed

Workshop Considerations

Julian suggested that we should be considering the following:

- we need to distinguish between the "glue" (hyperlinks) and the objects to be stuck together (images, graphics, text, sound, video)
- we need to address the formal and the de facto standards and to consider platform issues
- we need to address the properties of the data captured:
    - information content how much information is preserved?
    - different types of media (graphics, text, images, video, sound)
    - do we understand what an image is?
    - distinguish between different methods of delivery network, CD-ROM? For CD-ROM, proprietary standards are often used for a particular target platform. However many scientific communities have diverse machine architectures. Could the same document structure be used whether using a CD-ROM or network?
    - different standards for use in a single stream (MIME for electronic mail) or in a web there is little attention paid to graphics rather than raster images. The use of vectors can reduce file size and increase information. What is the role of PostScript or CGM?
- we need to look at the differences between the standards (what is the difference between HTML and HyTime, between HyTime and MHEG?)
- we need to identify problems which are critical to the UK HE community e.g. what are the limitations of HTML and how can we set about changing these?
- a guide on formats would be useful but we need to address how this can be maintained
- when we are "recommending" formats, what does this mean:
    - that the rest of the world is going that way?
    - telling people how to convert to/from that recommended set?
    - the UK community will encourage the development of tools to support the preferred formats?
    - etc etc what do we want?

Discussion

The following points emerged from discussions:

- there is a needs to get tools and utilities to handle the different formats we need to ensure that we get free runtime viewers (or free at point of use)
- there is a need for WYSIWYG authoring tools more HTML authoring and editing tools would be useful
- there is a real need to transfer between platforms
- there can be difficulties in dealing with images when we want to retain some application level information associated with it, e.g. medical images
- it would be useful to have a table to include which packages and utilities will read/write which formats
- we need to be able to put pressure on industry to make the formats "open" some of this could be carried out through the Interactive Multimedia Association which has 300 members this is US based with no European equivalent
- there is a need for skills development in the use of multimedia novice guides, templates, style guides etc
- we need encouragement from the HEFC's Joint Information Systems Committee (JISC) on recommendations on standards and encouragement from them to use these this could be by adopting (and developing if necessary) tools which use mainstream standards
- we need to think about using databases for our information
- we need to remember that documents are often required on paper as well as online there is often a mismatch
- conversion tools are important
- the amount of effort involved in getting materials online is high and will only (in practice) happen once it is important to keep the content and hyperlinking/structure separate

User Needs

Multimedia File Formats, A Users View - Martin Beer

Martin made the point that courseware development is an expensive business and involves the collection of material from many sources. Different authors are often responsible for the various parts of the course, or at different stages in its development. The costs involved make it highly desirable to reuse material whenever possible. We need to be able to learn to utilise the creative talents available across disciplines.

Today multimedia facilities are provided in many different ways. These are often incompatible or at least require a significant effort to reconfigure them into a usable form. This leads to a mixture of presentation formats and qualities that often distract the user from the content of the material which they are studying. You have to have the right facilities to be able to use a particular set of material (which is likely to be unique so the costs are high).

The concern is that the current situation will continue or get worse. Lack of standards leads to a loss of existing material. It may then have to be written again as it is often too expensive to convert to more portable formats. There is a real danger that multiple authored packages give a uncoordinated and muddled interface to the reader the skills to make a consistent interface are not always available.

There are possible solutions emerging as formats seem to be sorting themselves out. Standards such as GIF and JPEG for images, MPEG for moving pictures, AVI for sound are all helping the situation. The problem is often at the application level. We need to have standards for multimedia authoring.

It is critical that we address issues of portability across machine ranges and also the use of "open" formats which have some future-proofing. The community continues to use closed, proprietary standards this gives no encouragement to suppliers to publish their specifications.

The formats chosen need to reflect users needs. The industry decides what they think users need perhaps we could influence this.

SuperJANET Shared Image Resource for Synchronous Applications
Richard Beckwith

This workshop is of particular relevance to another of the JISC New Technologies Initiative projects called SIRSA A SuperJANET Shared Image Resource for Synchronous Applications for which Imperial College is the lead site.

The objective of SIRSA is to establish a multi-technology shared image resource for the mass storage and retrieval of still frames and motion video sequences. The image resource will have fast access through SuperJANET for synchronous (real-time) applications, for example, lectures, surgical teaching and video-conferencing. Visual material will be contributed by the HE community.

Since SIRSA is a shared resource, the selection of formats for images and video is particularly important. Visual material will normally originate from HE sites and will be networked to the server in compressed digital formats. The aim will be to accept a range of input formats which are flexible and not prescriptive. This is a pragmatic approach based on the view that contribution of material is more likely from the HE community (and hence more beneficial to the community at large) if translation is not required at source.

Within SIRSA, translation (where necessary) will be targeted to a more limited set of formats for which very fast decoders are available (for example as low cost PC cards). This is to assist the primary real-time objective of the system. Non time critical access through browsers (e.g. WWW Mosaic) will also be implemented. The more general issues being considered are not, of course, limited to the UK HE community. Digital image libraries are being established world-wide, usually based upon GIF, JPEG and MPEG formats. Other formats such as Photo-CD and Fractal Transform (e.g. MS Encarta CD-ROMs) are in use. With SuperJANET, the UK has a wideband digital network capable of delivering large image files in real-time. In choosing a set of file formats, we can consider trade-offs between image quality, file size and encoding/decoding time. There will also be significant application related requirements e.g. the acceptable compression losses between X-Ray images and fine art pictures may be very different, and are also likely to be very subjective.

The project will provide the following:

- still image server with 100,000 images
- video-on-demand server with video clips
- 25 Gbytes of online storage
- real time (synchronous) access for playout, for example:
    - video conferencing
    - TLTP surgery project
    - lectures/seminars
    - resource based learning
- it will use SuperJANET TCP/IP (FDDI) and future ATM networking
- it will provide a facility for networked image input from the UK HE community

The issues which are relevant in the light of the workshop are:

- the selection of suitable storage formats for the server for both stills and video clips, with considerations such as the coded image size and the "level" of storage how close should the storage format be to the application level should "lossy" compression methods be used for the images on the server
- the project needs to define an allowable range of networked input formats (even if they are converted and archived in a different format)
- translating between formats is an issue and tools need to be available
- there is a need for software browsers for reading/viewing
- there is a need for hardware decoders for real-time playout

Use for Formats in Image Processing - Simon Perkins

Simon reported on a JISC funded project to develop a set of computer based teaching materials for use in image processing courses. Briefly the idea is to bridge the gap between textbooks which provide lots of useful tutorial detail, but do not generally provide very high quality or indeed very many example images; and image processing software packages which readily provide plenty of interactivity with real images and real computers, but often lack much in the way of a tutorial component.

The package being produced provides detailed reference information on a large number of image processing operators, together with example images for each operator showing typical input/output and illustrating typical problems. There are also student exercises, bibliographies and references to common image processing packages.

After some thought a two level package was designed. For people who have the hardware to support it (and that should be most people) the reference comes in the form of a hypertext document written using HTML and displayed using NCSA's WWW browser, Mosaic. This approach allows lots of cross referencing and is ideal for a reference document. It also allows example images to be displayed using simple mouse clicks on the appropriate hypertext links. The Mosaic software is also public domain.

For people who want a hardcopy version of the document, a LaTeX version is produced which can be read separately. It is still intended though that the example images (which are stored in GIF format) will be displayed using a computer screen.

A converter tool (latex2html) was considered in order to turn LaTeX into HTML, but was decided against for (mainly) portability reasons. Instead a simple high level and very specialised intermediate document markup language was designed, which is then converted into both LaTeX and HTML versions using a Perl program.

The main image format which is likely to be used is GIF, since that seems to be widely used, provides lossless compression, is fairly compact, and is accepted by a large number of image processing software packages. It is also the format required by Mosaic for inline images. However, the final choice has yet to be made. Other possibilities include TIFF and JPEG.

Consideration is also being given to various image format conversion packages to be distributed with the final release.

One issue which came up in discussion was whether the available bandwidth should influence the format used for transmission. We can use different formats for archiving and for delivery across networks.

Requirements of the ESRC Data Archive - Paul Child

The ESRC Data Archive services the data needs of the academic community for research data in such diverse areas as political science, sociology, economics, history etc. We primarily provide quantitative data in machine-readable form, together with explanatory documentation. This documentation is for the most part in paper format and we are currently investigating different methods for converting these paper documents into machine-readable format.

As a national archive we have certain requirements for the properties of any stored information that we hold: these include longevity, ease of distribution and independence from platforms, devices or software. The latter would of course greatly facilitate the first two requirements.

The first question we have been asking ourselves is should we convert this textual information (including tabular elements) into images or should they be converted at the character level, either by keyboarding or OCR scanning. In either case the second question is what format should the conversion provide.

More recently, documentation is being sent to us by the research community in word processed form, mostly Word Perfect. This is unproblematic if the users of our holdings are also using Word Perfect but will cause difficulties if we make these documents available on-line

Another aspect of the archives' holdings are teaching data sets. The potential with these is that they could become an important resource for courseware designers. Based on this idea, archive data documentation would need to be in a format suitable for porting into a variety of courseware authoring packages.

Having recognized some of the problems, we have been considering the question of file formats in some detail. SGML was the first possibility we considered and it appeared to offer some solutions to our problems. Given its basis in ASCII, longevity is assured and the idea behind it is of course software, device and platform independence. There are however, drawbacks. As mentioned above, many of the documents we receive are in Word Perfect format, as such the codes applied to these documents could be considered, in some instances, to be analogous to markup. For instance, one would expect the printed document to have headings that look the same, that is, have the same font and size properties. However what becomes apparent from looking at the coding is that it is often very inconsistent. Headings, subheadings, tables and other elements of the documents use different coding to arrive at the same appearance.

A secondary problem with SGML is persuading people to use it. There would need to be a fundamental change in the way people perceive documents, from an appearance to structural orientation. There would also, in many cases, need to be an increase in resources as input speed would reduce to ensure accuracy in marking up documents, given the tendency towards inconsistency noted above. Substantial investments would also need to made where organizations need to backdate marking up to existing documents.

Perhaps Adobe Acrobat is the answer, simply take any of your existing documents output them as PostScript and distill them into PDF. That problem of inconsistency however just will not go away.

Issues which need to be addressed include:

1. It would be useful to define the target population, and sub groups (if not already done). Requirements analysis might be used to assess population or sub-population needs. This would produce information to define, at what level recommendations should be pitched. Would broad based recommendations be adequate or would more detailed advice be needed perhaps dependent upon different working environments or document types? In addition is it worth considering the points at which the academic community interfaces with other organisations, in particular government departments?
2. Recommending the use of a common file format, for each media type may not be adequate to ensure standardisation throughout the academic community. It might be necessary to actively persuade institutions to change.
3 .In order for change to occur adequate tools need to be readily available, this may mean that pressure would need to be brought to bear on software manufacturers, to modify software .
4. The human behaviours involved in document creation need to to be considered if structural solutions such as SGML are decided upon. The potential problem of inconsistent marking-up (or coding for word processing) would be alleviated by good software tools and training or re-training.

The use of Microsoft Windows Multimedia File Formats

Martin P. Lee & Stephanie A. Robertson

Abstract

This paper begins by introducing Microsoft Windows together with some of its accessory programs. It continues with a discussion of its multimedia file formats for text, sound, graphics, animation, video, hypertext and hypermedia. The paper concludes by arguing for the adoption of the de facto multimedia file formats from the world of Microsoft Windows.

Introduction

Cartledge (1994) argues convincingly that since there are an order of magnitude more IBM compatible Personal Computers (PCs) than Apple Macintoshes and two orders of magnitude more PCs than SUN UNIX workstations, graphical user interface (GUI) based applications should be developed and deployed on PCs. He states that "the continued focus on UNIX in research is a barrier to the transfer of results into general use. PCs are cheap, effective and available from a huge range of suppliers."

This paper begins by introducing Microsoft Windows together with some of its accessory programs. It continues with a discussion of its multimedia file formats for text, sound, graphics, animation, video, hypertext and hypermedia. The paper concludes by arguing for the adoption of the de facto multimedia file formats from the world of Microsoft Windows.

Windows

Microsoft Windows is the dominant Windows, Icons, Menus and Pointers (WIMP) Graphical User Interface (GUI) on PCs. One of its attractive features is its integration of multimedia (Lee 1994a). In particular it allows the production of compound documents which are a cheap and easy way into multimedia (King and Murray 1992).

Windows comes with a variety of accessory programs including a sound recorder, a media player, an object packager and a paint program.

The sound recorder can be used to play, record and edit sound files. It has the four standard video recorder style buttons of play, stop, fast forward and rewind together with a waveform display. Various special effects, such as volume, speed reverse play and echo can be manipulated.

The media player controls hardware devices, such as a videodisc player, and thus plays multimedia files such as sound or animation. The player distinguishes between simple devices such as audio compact disc (CD) players and compound devices such as Musical Instrument Digital Interface (MIDI) sequences. Like the sound recorder it has video buttons, together with track and time information.

Media player uses the media control interface (MCI) so that one application can control a variety of devices and files. Quitting the media player ends the playing of animations, MIDI sequences and waveform audio files. Audio CDs and videodiscs continue playing back after media player has been quit.

The object packager can be used to create an icon that represents an embedded or linked object which can then be inserted into a document. It can be used to wrap a variety of data types including text, graphics, sound, animations, even DOS commands into a package depicted as an icon. The icon can then be embedded into a document and then activated by clicking on it with a mouse pointer. Icons can be moved, sized and customised (King & Murray 1992).

Windows paint is a capable bitmap graphics program which can be used to produce illustrations. It has a variety of graphic tools and palettes and supports both the Windows native bitmap (.BMP) and the PC paintbrush (.PCX) file formats.

Windows introduced a powerful scalable font technology in the form of True Type font (.TTF) files. These can be scaled, displayed and printed on a wide variety of graphical output devices. In particular a sans serif font (Arial), a serif font (Times New Roman) and a monospaced font (Courier) are bundled with Windows and are accessible to all Windows programs. In addition Windows has a native font file format (.FON).

Sound

Windows recognises three types of sound: wave files (.WAV), Musical Instrument Digital Interface (MIDI) files (.MID) and audio Compact Disc (CD) files. Whereas wave files are Windows' native sound format, MIDI files are examples of metafiles consisting of musical instrument sound instructions.

Graphics

Windows automatically copes with a variety of graphical displays (e.g. CGA, EGA, VGA, SVGA and XGA) and a very wide variety of graphical output devices (i.e. printers and plotters) as part of its comprehensive device independence policy. The Windows native raster graphics format is Bit-Mapped Paint (.BMP) files with 1,2 4, 8 and 24 bit colour planes, whilst the native vector graphics format is Windows MetaFiles (.WMF). The importance of graphics in education is illustrated in Peacock et al (1986) from the programming, rather than creative, angle.

Animation

Third party public domain software products, particularly Autodesk's Animation Player for Windows (AAPlay .FLI files), can be used to create animations from sequences of graphics files, to add sound in the form of MIDI or wave files, and create scripts that control playback.

Video

Microsoft's Video for Windows Audio/Video Interleaved files (.AVI) currently have rather limited capabilities and hardware support for data compression (MPEG) is really needed.

Hypertext

The Windows Help System (WHS) is a powerful hypertext system with hot words and hot spot graphics, glossaries, navigation buttons, tables of contents, indexes, search histories, searching and back-tracking (Lee 1994b). Fortunately the Windows help compiler (HC31.EXE) is in the public domain which facilitates the production of high quality hypertext files (.HLP). Input to the compiler consists of Microsoft's Rich Text Format (.RFT) files using double underlining to indicate hot words, hidden text to represent jump targets and footnotes to indicate keywords and topics.

Since over 50 million owners of Windows have a copy of WINHELP.EXE the Windows help viewer is far and away the most common hypertext system available.

Hypermedia

The Microsoft Windows Multimedia Viewer Publishing Toolkit is a small development of the WHS to include additional multimedia objects. Using these tools, Microsoft have produced a successful series of state-of-the-art CD-ROM based hypermedia systems, for instance their Cinemania product (CINMANIA.MVB).

Conclusion

This paper has argued for the adoption of de facto multimedia file formats from the world of Microsoft Windows. These are proprietary formats and not de jure standards, but they are supported by the marketplace. There is a risk of being 'locked-in' to one supplier but that has to be traded off against the benefits of cheap and readily available file formats. The following table summarises the recommended file extensions:

	Datafile	Metafile
Tex	.FON	.TTF
Sound	.WAV	.MID
Graphics	.BMP	.WMF
Hypertext	.HLP	.RTF
Hypermedia	.MVB	.RTF

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Framework and Content Standards

The workshop recognised that there were two very different types of standard which need to be addressed:

- the content standards, such as image formats, vector formats, text, sound
- the framework formats the "glue" which sticks the bits together and says how they relate.

One of the problems is that some standards try to do both and others have gone from being only one of these to doing both.

It may be that the successful standards in the real world are those which have some clear idea of being one or other of these.

The workshop did not address all of the relevant standards, or even attempt to conduct a classification that will come later as one of the outputs.

Examples which were presented at the workshop and which are included here are:

- the framework standards of MHEG and MIME
- the content standards for images, graphics and documents

It should be noted that the standards for documents (SGML, ODA) do have some aspects of being both framework and content. This is particularly the case for ODA which has become more of a framework for its content architectures. HyTime which is discussed under documents is clearly a framework standard.

The inclusion or exclusion of any standard in this report should not be seen as being of significance at this stage.

Framework Standards

MHEG - Thomas Casey

ISO DIS 13522-1 is a draft international Standard of ISO JTC1/SC29 WG12, the Multimedia Hypermedia Expert Group commonly know as MHEG. In fact the standard itself is usually referred to, and will be referred to hereafter, as MHEG. MHEG is one of the suite of standards being produced by SC29; others consist of JBIG, JPEG, and MPEG, all of which were implemented before the actual IS was approved by the National bodies. In this regard MHEG will be no different. Already implementers are working on MHEG engines in the USA, France, and Germany. It is suspected that enterprises in the far east and other European countries are doing similar work. Through out its development, testing of concepts has proceeded in parallel with the standardisation work of the WG12 committee. When the standard appears in its approved form it is expected to be "complete" and consistent with its scope.

MHEG provides standardised encoding for the interchange of multimedia hypermedia objects and supports real-time and non-real-time interchange of final form information objects, in interactive environments.

PBecause this workshop seems to be addressing the issue of recommending "a, or several" possible file formats for multimedia and hypermedia content data for use by UK educational institutions, it is important that the MHEG approach to the interchange of such objects be clearly enunciated and understood.

MHEG supports the philosophy that users (or using applications) provide for data file formats, and provides a hook or hook object to identify a variety of content types. Such an approach allows for interoperability among users, and flexibility for the user to choose its formats. An appendix to MHEG, which has now been made into a Technical Report, shows how mappings might be made between ODA document forms and MHEG content objects. The MHEG Hook provides for standard and proprietary media data to be interchanged.

SC29's work has been directed at encoding and compression of Hypermedia Multimedia data. Multimedia and hypermedia concepts have not been appended onto another standard that was developed for other purposes, consequently the focus and scope is to support standard interchange formats. One must assume that standard file formats are desired because users wish to interchange files and process them on a variety of platforms, i.e., they desire interoperability. Naturally each standards creating group would like to see its own file formats adapted as the universal format within as many domains as possible. MHEG is no different in desiring to see its standard adopted by a broad base of user groups, but the difference lies in supporting user preferences and multiple specific requirements with respect to file formats. MHEG supports interchange of heterogeneous file formats, and does not support the philosophy or view that hypermedia and multimedia information be constrained by the format of the file structure, since it can provide a standardised interchange mechanism independent of file content, or structure.

MIME - Multi-purpose Internet Mail Extensions - Martin Hamilton

Note that the master version of this document lives on the World-Wide Web
You can find it at: http://www.mrrl.lut.ac.uk/docs/mime.html

Introduction

MIME is a technique for encoding on-line information which provides a trivial mechanism for programs to exchange data. It was developed by a working group of the Internet Engineering Task Force (IETF), and is a standards-track Internet protocol.

You may already be familiar with the international standards community's efforts in this area - e.g. SGML/HyTime and ODA/HyperODA. The principal areas where MIME differs from these technologies are probably the simplicity of the MIME encoding, and the free availability of its specification.

MIME has achieved almost universal acceptance amongst its original target audience, e-mail software developers and vendors, making it the de facto standard for multi-media e-mail. Other groups are showing an interest in MIME as they become aware of its potential - e.g. the Gopher and World-Wide Web information systems make heavy use of portions of the MIME technology.

MIME objects

What distinguishes a MIME object from any other?

MIME objects begin with a series of e-mail style "headers", e.g.

```
Content-Type: image/gif
Content-Transfer-Encoding: base64
Content-Description: here's the cat, with the hat...
```

The MIME headers indicate important meta-information about the object, such as its type, how (or if) it has been encoded, and so on. They are followed by a blank line, and then the object itself.

MIME specifies the use of the following headers:

- MIME-Version - indicates a MIME object, and specifies the version, currently this should only say MIME-Version: 1.0
- Content-Type - object type, see below
- Content-Transfer-Encoding - object encoding, see below

There are several other optional headers:

- Content-ID - optional e-mail style identifier
- Content-Description - optional plain text description of the object
- Content-Disposition - under development, to be used to suggest a filename for the object
- Content-Language - under development, see the Draft RFC "Language tags for MIME content portions" (below)
- Content-MD5 - specifies an MD5 message digest for the object (see RFC 1544, below)

Content-Transfer-Encoding

The following values are specified:

- 7bit - no encoding, indicates object comprised of ASCII data
- 8bit - no encoding, object may contain 8 bit data (e.g. characters higher than 127)
- binary - object may contain 8 bit data, and lines may be too long for SMTP mail quoted-printable - as 8bit, but unprintable characters escaped
- base64 - portable ASCII encoding for binary data

In addition, encodings beginning with x- may be used for private and/or experimental purposes. There is a central registry of content transfer encodings maintained by the Internet Assigned Numbers Authority (IANA).

Content-Type

The MIME RFC specifies the following content types. You are free to register new ones with the Internet Assigned Numbers authority, and use experimental ones beginning with x-

This list is actually a subset of the currently registered list of MIME content types

- text
  - plain - plain text
- multipart
  - mixed - arbitrary collection of MIME objects
  - alternative - a number of objects, each of which is an alternative version of the same information
  - digest - a collection of message/rfc822 objects
  - parallel - a collection of objects to be processed in parallel if possible
- message
  - rfc822 - an Internet format e-mail message
  - partial - part of an e-mail message
  - external-body - e.g. retrieve via anonymous FTP
- application
  - octet-stream - fallback encoding for unknown types
  - postscript - PostScript page description language

- image
  - jpeg - JPEG image format, JFIF encoding
  - gif - Graphics Interchange Format
- audio
  - basic - 8 bit mu-law (PCM) audio encoding
- video
  - mpeg - MPEG video encoding

Note that the multipart/ content types provide a convenient way of creating collections MIME objects. These may even be recursive - e.g. a multipart/mixed which contains several multipart/alternative objects!

Examples

A simple MIME object

This specifies that the message is to be interpreted as a GIF image, and encoded according to the base64 algorithm in the MIME specification.

```
Content-Type: image/gif
Content-Transfer-Encoding: base64
Content-Description: here's the cat, with the hat...

R0lGODdhqAAKAfYAAAAAAL29ycm9vcnJvcnJyfHx8f/w/ykpLEVFSUdJTFdZ
XWpscWtuch8fHzU1NVNTU2BgYHl5eSQkJFBQUFlZWWJiYn9/f2dnZ0RERJCQ
kI6OjnJycouLi5+fn21tbYaGhpiYmJaWlmtra319faWlpZubm4aGgZ2dnaam
pq+vr6CgoL29vbi4uKqqqsHBwb+/v8TExNDQ0La2trm5ubGxsbu7u8fHx8zM
zNHR0cvLy9PT09fX193d3eLi4ubm5urq6uvr6+3t7e/v7wAAAAAAAAAAAAAA
[...]
```

A multipart message

Here we see the same image as before, this time accompanied by a short textual description in the form of a text/plain object.

```
Content-Type: multipart/mixed; boundary="the-dividing-line"

--the-dividing-line
Content-Type: text/plain
Content-Transfer-Encoding: 7bit

This is a GIF of me with a funny hat on!

--the-dividing-line
Content-Type: image/gif
Content-Transfer-Encoding: base64
Content-Description: here's the cat, with the hat...

R0lGODdhqAAKAfYAAAAAAL29ycm9vcnJvcnJyfHx8f/w/ykpLEVFSUdJTFdZ
XWpscWtuch8fHzU1NVNTU2BgYHl5eSQkJFBQUFlZWWJiYn9/f2dnZ0RERJCQ
kI6OjnJycouLi5+fn21tbYaGhpiYmJaWlmtra319faWlpZubm4GBgZ2dnaam
pq+vr6CgoL29vbi4uKqqqsHBwb+/v8TExNDQ0La2trm5ubGxsbu7u8fHx8zM
zNHR0cvLy9PT09fX193d3eLi4ubm5urq6uvr6+3t7e/v7wAAAAAAAAAAAAAA
[...]
--the-dividing-line--
```

Note that multipart objects use a parameter boundary to identify the boundary between one object and the next. The beginning of an object is marked with the boundary token preceded by two dashes, --*the-dividing-line*, and the end of the multipart sequence is indicated by the boundary token with dashes on either side, --*the-dividing-line*--

TPC-RP - Faxes via the Internet

TPC-RP (see below) is a technique which uses MIME to transmit faxes over the Internet. It has several permutations - in the most advanced one the content type application/remote-printing is used to hold the fax sender and recipient's contact information. This lives in a multipart/mixed object along with the contents of the fax itself. The contact information may be used by the TCP-RP software to generate a cover page for the fax:

```
To: remote-printer@3.9.3.5.6.2.9.0.5.4.4.tpc.int
From: Stephen Campbell
Date: Tue, 01 Feb 1994 13:38:41
Subject: TPC PDQ 4 U2
MIME-Version: 1.0
Content-Type: multipart/mixed;
boundary="faxing--for--free--feels--fine"

--faxing--for--free--feels--fine
Content-Type: application/remote-printing

Recipient: Martin Hamilton
Title: Research Student
Organization: Loughborough University of Technology
Mailstop: Computer Studies, MRRL
Address: Loughborough, Leics. LE11 3TU
Telephone: +44 509 222799
Facsimile:  +44 509 265393
Email: martin@mrrl.lut.ac.uk

Originator: Stephen Campbell
Title: Research Associate
Organization: Loughborough University of Technology
Mailstop: Computer Studies
Address: Loughborough, Leics. LE11 3TU
Telephone: +44 509 222648
Facsimile: +44 509 211586
Email: S.P.Campbell@lut.ac.uk

--faxing--for--free--feels--fine
Content-Type: image/tiff
Content-Transfer-Encoding: base64

kI6OjnJycouLi5+fn21tbYaGhpiYmJaWlmtra319faWlpZubm4GBgZ2dnaam
XWpscWtuch8fHzU1NVNTU2BgYHl5eSQkJFBQUFlZWWJiYn9/f2dnZ0RERJCQ
zNHR0cvLy9PT09fX193d3eLi4ubm5urq6uvr6+3t7e/v7wAAAAAAAAAAAAAA
pq+vr6CgoL29vbi4uKqqqsHBwb+/v8TExNDQ0La2trm5ubGxsbu7u8fHx8zM
R0lGODdhqAAKAfYAAAAAAL29ycm9vcnJvcnJyfHx8f/w/ykpLEVFSUdJTFdZ
[...]
--faxing--for--free--feels--fine--
```

Note that the creation and processing of this MIME message can occur without any human intervention, with MIME being used as an interchange format between the program which generates the message, and the program which eventually delivers it to the receipient's fax machine.

Safe-Tcl and Enabled Mail

Enabled Mail (see below) alters the traditional processes of e-mail delivery and message reading by allowing these to be controlled dynamically as a result of running scripts written in the Berkeley Tool Command Language (Tcl). A special dialect of Tcl, Safe-Tcl, has been written for the purposes of sending Tcl scripts over the network in e-mail messages.

This example, derived from one of the source code samples in the Enabled Mail distribution, shows a message which prompts the user to order a Bill Clinton T-Shirt, and plays a fanfare if they choose to do this:

```
Content-type: multipart/enabled-mail; boundary="enabled-mail-demo"

--enabled-mail-demo
Content-type: audio/basic
Content-transfer-encoding: base64
Content-ID:

8vp7cnRvc29ubWxcUebUX0tM1N5bauLZ5ejv2N5772hiX1lVVFdZWWPm0dDU1+LubmZhW1VX
XVlfdOnZ0tHPz9TY3/ZgV1VUV2Lw7e/0cmRcV1FPUFZeb+7g2dLOzc7U5HJfYFxYWF/66uni
3el0Zl5ZXFtdZnPx4djOyMXGz3FJPkzjXFVf/NfX2dzf5vj2fXn39OLe9k46N1zAwM1maM7w
VkxLW+bQ1dzi49zW0NDX4mBAOVfHyNDcdHfe4mdbUUtHTnXYz8/U09Ta2dTQ7UhJ1cvnT0VP
//fd2O9WRkI+PEVlzsC/yM7PycG+vcpFOO69zF9PbOx+YFJJOzY2MzM8X8i7u7y7uLOxtsRL
[...]

--enabled-mail-demo
Content-type: application/safe-tcl; version="6.7";
        evaluation-time=activation

proc ordershirt {} {
  SafeTcl_displaybody -background \
    [SafeTCL_getbodyprop "" all]
  SafeTcl_sendmessage  -to tshirts@nowhere.really \
    -subject "Shirt request" \
    -body [SafeTcl_makebody "text/plain" \
       [SafeTcl_getline \
         "What size t-shirt do you wear?" \
         "medium"] "" ]
  exit
}

set foo [mkwindow]
message $foo.m -aspect 1000 \
  -text "Click below if you want a free Bill Clinton t-shirt!"
button $foo.b -text "Click here for free shirt!" \
  -command {ordershirt}
button $foo.b2 -text "Click here to exit without ordering" \
  -command exit
pack append $foo $foo.m {pady 20} $foo.b {pady 20} $foo.b2 {pady 20}

--enabled-mail-demo--
```

Note that in this case MIME is used to encode not only the data - in the form of the audio/basic object, but also the program - in the form of the application/safe-tcl object. Whilst this script is intended to be run at activation time, as the user reads their e-mail, an incoming script could equally well be dealt with automatically.

Conclusions

Clearly MIME has potential for much more than just the interchange of multi-media e-mail. There are a number of innovative uses to which it is already being put.

Much of the power of MIME comes from the concept of a "helper" application. This is the name given to any program used in the processing of a MIME object. By divorcing the basic software for encoding and decoding MIME objects from the helper
applications, it becomes trivial for anyone to use MIME for their own purposes.

Software to process MIME objects is readily available. Pointers to two MIME encoder/decoder software distributions - mpack and metamail - are included in the references below, as are URLs for the other packages mentioned in this paper, and the RFCs which specify MIME.

References

Pointers to the MIME specification and software:

MIME (Multipurpose Internet Mail Extensions), Part One: Mechanisms for Specifying and Describing the Format of Internet Message Bodies (RFC 1521)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1521.txt

MIME (Multipurpose Internet Mail Extensions) Part Two: Message Header Extensions for Non-ASCII Text (RFC 1522)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1522.txt

mpack software distribution (160K)
URL: ftp://mrrl.lut.ac.uk/mail/mpack-1.4-src.tar.Z

metamail software distribution (260K)
URL: ftp://mrrl.lut.ac.uk/mail/mm2.7.tar.Z

Usenet MIME conference - comp.mail.mime
URL: news:comp.mail.mime

TPC RP info:

TPC-RP software distribution (180K)
URL: ftp://mrrl.lut.ac.uk/misc/rp.tar.Z

Principles of Operation for the TPC.INT Subdomain: Remote Printing -- Technical Procedures (RFC 1528)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1528.txt

Other info:

Principles of Operation for the TPC.INT Subdomain: Radio Paging -- Technical Procedures (RFC 1569)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1569.txt

Safe-Tcl / Enabled Mail software distribution (480K)
URL: ftp://mrrl.lut.ac.uk/tcl-tk/safe-tcl1.1.tar.Z

The text/enriched MIME Content-type (RFC 1523)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1523.txt

A User Agent Configuration Mechanism For Multimedia Mail Format Information (RFC 1524)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1524.txt

The Content-MD5 Header Field (RFC 1544)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1544.txt

Language tags for MIME content portions
URL: ftp://mrrl.lut.ac.uk/internet-drafts/draft-alvestrand-language-tag-00.txt.Z

The Extension of MIME Content-Types to a New Medium (RFC 1437)
URL: ftp://mrrl.lut.ac.uk/rfc/rfc1437.txt

Image Formats

The issues raised by a number of projects were reported to this group.

Uniform Access to (Remote) Image Data - Dale Sutcliffe

Standards for imaging and communication have been developed separately and in isolation from each other. Moreover, even the standards for imaging have been developed in an uncoordinated manner, each addressing the needs of a particular application area. Terminology has been developed in the different areas such that the same terms are used to mean different things.

The RACE II project AMICS (Advanced Multimedia and Image Communication Services) arose from the recognition of the need for a framework, that encompasses the characterization of images, identifies the operations on them, and relates the operations to the required standards.

The overall aim of the project was:

- To establish an image communication platform for advanced multimedia services.

Four specific subgoals were identified that needed to be achieved to fulfil the overall aim:

- To design a framework for image communication, the Image Communication Open Architecture (ICOA) (related to standardization activities);
- To develop software tools for the ICOA;
- To consider hardware support for the ICOA;
- To demonstrate the ICOA.

The project was completed in March 1994, having produced a design for the ICOA and software tools in support of it and demonstrated them as well as having a chip in fabrication.

The ICOA addresses the broad area of imaging and communication and fulfils the image communication requirements of a wide range of application areas including multimedia. Access to different file formats is encompassed by the ICOA. A means of describing the abstract storage order of image data was developed to allow a common means of addressing parts of an image independently of the file format.

An important requirement related to communication was that of providing uniform access to images whether they are stored locally or remotely. By providing such uniform access, communication services can be invoked as necessary, without the knowledge of the application, and other related services such as compression and conversion can be integrated.Hence, the IHI provides for the storage and retrieval of image data, the creation and deletion of images, and the setting and inquiry of image attributes. Within the AMICS project, the IHI was realized by means of the ICOA Image Handler which took the form of an Open Distributed Processing (ODP) object.

The IHI and the Image Handler were demonstrated in the context of a multimedia remote teaching scenario. The concepts were also shown in providing access to subsets of very large remotely sensed images.

Delivering an Image Archive - Joel Crisp

The following issues have been raised by the Bristol ETS/JISC project to deliver an image archive (including a digital version of the Bristol Biomedical Video disk):

- Standardisation of file formats across platforms, MAC, PC, PC windows, UNIX/X
- Image format conversion (We are developing batch processing tools for un-attended image format conversion)
- Image formats for X-ray images
- Reliability of compression for Medical images and any others with high resolution (high frequency) detail (We are currently funded to carry out an evaluation of different image capture cards for this purpose)

In addition to the above points, we feel that the following are also relevant in the context of multimedia :

- Standardisation of images sizes (x,y resolution and colour depth)
- Use of standard/common palettes across platforms (including reserved colours for the window systems in use)
- Use of thumbnail images and recommended sizes thereoff
- The necessity to look at increasing display complexity and colour resolution
- The 50 colour limit on in-line images in Mosaic
- Use of batch processing programs for archive development

We have investigated some areas of the palette problems, and have tested 60x pixel thumbnails for net delivery. We are currently using lossless compression in GIF file format, at 320x~244 (preserving aspect ratio) in 256 colours.

We are archiving at the highest resolution currently available to us so that we can increase the resolution on all our delivery images over a period of time to keep up with advances in technology.

The Virtual Teaching Collection - Lester Thomas

The Virtual Teaching Collection (VTC) project is funded under the HEFCs' TLTP initiative. This is based at Cambridge University Museum of Archaeology and Anthropology and the Whipple Museum of the History of Science. The aim of the VTC project is to permit the delivery in digital form of rich visual presentations of objects normally distributed in separate museum collections, thus providing an important teaching a research resource.

The project has had to consider different image compression methods. Issues which have been addressed include whether the compression technique used should be lossy or lossless. Lossy can be fine if the end result is viewing by humans but not if there is machine processing of the image.

The factors affecting the choice include the retention of relevant information and the resulting filesize. The VTC group have considered the merits of JPEG and fractal compression. JPEG has a symmetric compression and decompression, fractal has asymmetric with decoding being quicker. There is a problem with fractal compression being proprietary and available on limited platforms. The project are considering using IFS compression which is a type of fractal compression but one which is unlikely to be made public. It does offer high quality fractal compression software.

Image Formats and Material Science - Kate Crennell

Kate Crennell discussed the use of teaching materials in the area of material science. This relates to a TLTP project which is being conducted by 18 universities in liaison with the Institute of Materials. It is a cross platform project. Kate presented her work which is based on the Acorn platform which she feels is a good platform for introductory materials as it is available in many schools. A prototype database of images is being worked on for schools. This is to be available on CD-ROM using Acorn computers which allow use of multimedia presentation. Common image types which need to be considered include:

- bitonal document
- static grey scale
- static three colour
- static multiband
- static volumetric
- timed sequences

We need to recommend to people which formats they should use for images as there are so may around. Kate noted that Acorn have an agreement with Kodak for use of Photo-CD.

Kate concluded the following:

1. Although networks and the World Wide Web are useful places for finding information, she considers them to be virtually impossible tools for new users. Even experienced users need to know the time of day when the host server can give a decent response. The HE community needs a short tutorial, one A4 page, giving enough details to find the multimedia help they seek.
2. Networks are places for archival storage of source materials for educational software, they will always be too expensive, or slow for use by small colleges of further education, whose needs would be better served by improved access to courses on CD-ROM.
3. Mainframe computers and large workstations are not the most effective tools for teaching undergraduates. Microcomputers are much better, but there are problems in putting all our eggs in one basket of proprietary software, using PC clones and Microsoft products. Kate suggested that the report should recommend 3 micros, PC, Mac and Acorn. A comparative review of Acorn micros, PCs, and Macs shows that they are much better value for money (see reference below).
4. Any list of archival image databases should include ones for particular subject areas, medicine, astronomy, art history, as well as more general ones, such as 'Peipa' (described below)
5 .Although Kodak have not release details of their 'Photo-CD' format, there is no denying that this will be the simplest way for many people to get digitised images, no need for fancy scanners or digitisers, just take 35mm film in to your local holiday snaps processor (see reference by Thompson below). Then select the resolution you want, and store it in your image archive. The HE community cannot afford to ignore the format 'Photo-CD'.
6. The report should include a list of available methods of digitising images, hand held scanners, A4 flat scanners, capture from video recordings, etc. For the people who cannot get the images they need from an archive.
7. Kate recently came across something called 'TWAIN' which appears to be the name given to a standard range of scanner drivers, making it much simpler for people to interface scanners if the software has a TWAIN interface.
8. Image format converters are available for the PC as well as UNIX. Kate uses GWS, which she got from RAL PC Support. It's PD and should be included in any list of conversion utilities published in the report. Such utilities are often provided with scanner software, and it would be nice to know which formats are standard input/output for which popular PC packages, like 'Corel Draw' for example.

References

1.Peipa. The Pilot European Image processing Archive IAPR Newsletter Volume 16 No.3 Page 5, Adrian F.Clark, (email: alien@essex.ac.uk) see next page

2.The Risc PC vs Macs and PCs, Acorn User issue 142, May 1994 p 38, 39

3.Back in the picture, Acorn User, Colin Thompson, May 1994 P52-53

The Pilot European Image Processing Archive

A common practical problem in pattern recognition, and particularly those areas that are concerned with processing image data, is that of reproducing other researchers' results: either the data are difficult to obtain, or one must implement their techniques in order to make a comparison with one's own. The vast majority of researchers are, of course, quite happy to provide copies of software and data upon request; but servicing large numbers of such requests quickly becomes tedious and time-consuming. It is thus attractive to contemplate the idea of an archive, to which people may up-load their software or data for dissemination to other researchers. Indeed, with a central repository for storing software and data, time is saved in both distributing one's own material and acquiring that of others. Most important, the easily availability of such software encourages comparisons with existing techniques on accepted datasets.

An archive of precisely this type is running on a pilot basis. It is known as PEIPA, the Pilot European Image Processing Archive, physically located at the University of Essex in the UK and connected to the outside world by a (shared) 2Mbit/sec link. The host machine is a Sun Sparcstation ELC, kindly provided by the British Machine Vision Association for this purpose, and uses disk space from a number of research grants and contracts. Additional disk space will soon be in place, funded by DG III of the European Commission.

The archive is operated by the author, and is associated with Technical Committee 5 (Benchmarking and Software) of the IAPR. It aims to provide a convenient mechanism for exchanging software relevant to all areas of pattern recognition and image processing, and to make available datasets for testing and evaluating algorithms --- the benchmarking of techniques rather than systems.

What's in the Archive

Every item in the archive is available free of charge for research use. The principal contents of the archive are software tools, mostly for processing image data (though see below).

These include popular packages such as:

- Khoros, a visualization package with signal- and image-processing facilities, originally from the University of New Mexico;
- LaboImage, from the Vision group at the University of Geneva;
- pbmplus and netpbm, for inter-converting between image formats;
- a collection of Hough transform programs;
- neural network and genetic algorithm software;
- image synthesis tools;
- implementations of codecs for the JPEG, MPEG, and H.261 standards.

It is a matter of policy that source code be normally available for software packages. The vast majority of software is written in C and runs on Unix-based workstations. Software for other platforms, such as PC and Macintosh, is welcomed.

The archive also provides support information, such as descriptions of popular image file formats, back-issues of the VisionList and Pixel mailing lists, and electronic literature surveys and bibliographies, the latter stored in BibTeX format.

The area of the archive that is growing most quickly is that devoted to datasets. The existing entries include laser rangefinder data, calibrated stereo and motion sequences. A large database of face images will be made available as soon as disk space limitations permit.

Areas of the archive that are comparatively new include a European distribution point for documents associated with the 'Image Understanding Environment', a DARPA-originated but now international programme for developing a common vision environment, technical reports, and summaries of the activities of research groups.

Accessing the Archive

You may access the archive electronically by anonymous FTP, or using the Internet gopher, or via the World-Wide Web (WWW).

Anonymous FTP:

FTP to host peipa.essex.ac.uk, log in as 'anonymous' and give your email address as the password. The archive is in directory 'ipa'.

Internet Gopher:

Direct gopher to host peipa.essex.ac.uk and select the 'peipa' menu\item.

World-Wide Web:

The URL of the main page concerning the archive is

http://peipa.essex.ac.uk/index.html

This page also contains pointers to other information of interest on the Web. The numeric address of peipa.essex.ac.uk is 155.245.115.161.

How You Can Help

An archive is only as good as its contents. The archive currently concentrates on the processing of image data, since that is the author's research field. It is hoped to expand the archive by incorporating software intended for other data types or for general pattern recognition, and to make available other types of data (e.g., speech). If you would like to contribute to the archive, please contact the author at the following address:

Dr Adrian F Clark
Dept. Electronic Systems Engineering
University of Essex
Wivenhoe Park
Colchester
CO4 3SQ
UK
Tel: +44 206 872432
Fax: +44 206 872900
Email: alien@essex.ac.uk

If you would be interested in coordinating a particular subject area of the archive, please let the author know.

Vector Formats - Alan Francis

In the ideal world there would be only one file format for each type of application and it would satisfy the following criteria:

- device independent
- operating system independent
- platform independent
- vendor independent
- approved by an international standards body, eg ISO, CCITT
- specification in the public domain
- software to generate/interpret readily available
- conformance testing available
- satisfies requirements of application area

and

- it works!

However, the real world is not the ideal world so some compromises have to be made.

The Computer Graphics Metafile, CGM:1992 has good capabilities for image and vector graphics. It is an ISO standard and its use should be encouraged. There is a lot of software available on a variety of platforms which can generate/interpret CGM:1987 metafiles but some of it is of dubious quality. Software authors/vendors need to be encouraged to update their software to CGM:1992 and to submit it for conformance testing in order to improve the quality. TIFF is not one file format but a multiplicity of file formats. Although it is widely used the different flavours create problems for exchange.

References:

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Information Processing Systems Computer Graphics Metafile for the storage and transfer of picture descriptive information', ISO/IEC 8632, Parts 1-4, 1992.

SGML and HyTime - Paul Ellison and Michael Popham

The SGML Project is a three initiative funded by JISC, due to end in Autumn 1994. The Project has been dedicated to raising awareness and use of the Standard Generalized Markup Language (and related International Standards) within the UK Higher Education and research communities.

During the Project's lifetime, uptake of SGML has spread dramatically throughout the non-academic community. It has been adopted by industries as diverse as STM and legal publishing, commercial aviation, military aviation, international pharmaceutical agencies, the European Commission, the European Patent Office, HMSO and many others. Moreover, a significant number of commercial multimedia products such as the "Cinemania", "Encarta", and "Grollier Multimedia Encyclopedia" CD-ROMs have been produced from databases of SGML tagged files.

Within the academic community, SGML is having a profound affect on the development of HTML the markup language which underpins the presentation of information on the World-Wide Web). The production of the Text Encoding Initiative's "Guidelines for the Encoding and Interchange of Machine-Readable Texts" (founded on an SGML markup scheme) is also certain to have a fundamental influence on the work of scholars and information users/providers for decades to come.

Conventional opinion holds that as far as possible, the fact that a text has been marked-up with SGML should be concealed from the end-user. Yet however much SGML is concealed, we cannot afford to ignore it. SGML-aware tools make it possible to access, exchange and reuse information in ways that have previously been either too impractical, too expensive, or only possible within the restricting confines of proprietary, single-manufacturer environments.

HyTime the Hypermedia/Time-based Structuring Language (ISO 10744) is an application of SGML. It is currently the only available International Standard for structuring and linking files of multimedia, hypermedia, or other forms of time-based information.

HyTime relies on SGML, and just as an SGML document can hold information written in other notations (e.g. TeX, JPEG images, QuickTime movies etc.), HyTime hub documents can be used to structure and synchronize webs of hypermedia documents (e.g. PostScript texts, MPEG movies, SGML documents, HyperODA files, QuickTime 2 movies, holographic animations etc. etc.) Like SGML, HyTime places no constraints upon the types of document content only on the information that indicates how different content types interrelate.

Using HyTime does not preclude the use of other de facto or de jure standards which exist now or may emerge in the future; it simply offers a standard way in which other types of information can be combined and made to interoperate. SGML documents can be readily processed by a "HyTime Engine" (software which understands HyTime markup), and any existing SGML document can be easily extended to become a fully conformant HyTime document.

SGML is fast becoming the major International Standard for information representation. HyTime is likely to become equally fundamental in applications concerned with processing hypermedia and time-based information. The UK's H.E. community must remain fully aware of these Standards and their implications not least when considering what tools to buy and which long-term information strategies to implement. SGML and HyTime will be essential to the exchange and reuse of conventional and hypermedia information both within the H.E. community, and between the H.E. community and the wider, non-academic world.

Text Encoding Initiative Guidelines

The TEI was mentioned on a number of occasions at the workshop. The guidelines have now been published and the text below from Lou Burnard gives details.

On May 16, the Text Encoding Initiative (TEI) publishes its "Guidelines for Electronic Text Encoding and Interchange."

This report is the product of several years' work by over a hundred experts in fields ranging from computational linguistics to Ancient Greek literature. The Guidelines define a format in which electronic text materials can be stored on, or transmitted between, any kind of computer from a personal microcomputer to a university mainframe. The format is independent of the proprietary formats used by commercial software packages.

The TEI came into being as the result of the proliferation of mostly incompatible encoding formats, which was hampering cooperation and reuse of data amongst researchers and teachers. Creating good electronic texts is an expensive and time-consuming business. The object of the TEI was to ensure that such texts, once created, could continue to be useful even after the systems on which they were created had become obsolete. This requirement is a particularly important one in today's rapidly evolving computer industry.

To make them "future-proof", the TEI Guidelines use an international standard for text encoding known as SGML, the Standard Generalized Markup Language. SGML was originally developed by the publishing industry as a way of reducing the costs of typesetting and reuse of electronic manuscripts but has since become widely used by software developers, publishers, and government agencies. It is one of the enabling technologies which will help the new Digital Libraries take shape.

The TEI Guidelines go beyond many other SGML applications currently in use. Because they aim to serve the needs of researchers as well as teachers and students, they have a particularly ambitious set of goals. They must be both easily extensible and easily simplified. And their aim is to specify methods capable of dealing with all kinds of texts, in all languages and writing systems, from any period in history.

Consequently, the TEI Guidelines provide recommendations not only for the encoding of prose texts, but also for verse, drama and other performance texts, transcripts of spoken material for linguistic research, dictionaries, and terminological data banks.

The Guidelines provide detailed specifications for the documentation of electronic materials, their sources, and their encoding. These specifications will enable future librarians to catalogue electronic texts as efficiently and reliably as they currently catalogue printed texts.

The TEI Guidelines also provide optional facilities which can be added to the set of basic recommendations. These include methods for encoding hypertext links, transcribing primary sources (especially manuscripts), representing text-critical apparatus, analyzing names and dates, representing figures, formulae, tables, and graphics, and categorizing of texts for corpus-linguistic study. The Guidelines also define methods of providing linguistic, literary, or historical analysis and commentary on a text and documenting areas of uncertainty or ambiguity.

The TEI Guidelines have been prepared over a six-year period with grant support from the U.S. National Endowment for the Humanities, Directorate General XIII of the Commission of the European Union, the Andrew W. Mellon Foundation, and the Social Science and Humanities Research Council of Canada. The effort is largely the product of the volunteer work of over a hundred researchers who donated time to share their experience in using computers and to work out the specific recommendations in the Guidelines.

The project is sponsored by three professional societies active in the area of computer applications to text-based research: the Association for Computers and the Humanities, the Association for Literary and Linguistic Computing, and the Association for Computational Linguistics, which have a combined membership of thousands of scholars and researchers worldwide.

Many projects in North America and Europe have already declared their intention of applying the TEI Guidelines in the creation of the large scale electronic textual resources which are increasingly dominating the world of humanities scholarship.

The Guidelines are available in paper form or electronic form over the Internet. For more information contact the TEI editors by e-mail at tei@uic.edu or lou@vax.ox.ac.uk.

The SURFdoc project: Storing, Accessing and Processing Electronic Documents - Roel Rexwinkel

SURFnet bv offers electronic information and communication services for the target group of higher education and research in the Netherlands. Besides these services SURFnet also carries out several development projects by order of the SURF foundation.

One of these development or innovative projects is the SURFdoc project. Results and findings of this project may contribute to the topic of this workshop.

The SURFdoc project is divided into three project components, each component with its own objective:

1. A project to stimulate and establish the cooperation between university libraries and computer centres in the university.
2 .A project that deals with the storage and distribution of electronic documents on a document server, carried out by university libraries in close cooperation with the computer centres. Offering electronic documents to end-users in three academic institutes on the basis of cooperation between libraries and computer centres, and research into user response;
3. A project that deals with the processing of images in end-user environments, based on available hardware and software. Technical realization of facilities for the reception, processing and sending of scanned material (images) from the user's workplace.

The sub-projects 2 and 3 deal with issues of interest for this workshop and will be discussed in more detail in the following paragraphs. For the sake of simplicity the two sub-projects will be designated as SURFdoc/server and SURFdoc/Images respectively.

SURFdoc/Server project

At four universities in the Netherlands libraries and computer centres are working close together setting up servers for electronic text documents. At this moment tests are done with several formats for text (PostScript, PDF (Adobe Acrobat), SGML and ASCII) and ways to find and retrieve the text at the server (WAIS, Gopher, WWW).

SURFdoc/Images Project

In this project five institutes are creating environments for end-users to receive scanned documents (images) and process these images either by viewing/printing or further processing by editing or OCR (Optical Character Recognition). The scanned documents can be text(b/w)- and full-colour (slides, pictures, photographs etc.) images. Special attention is paid to image file-formats (TIFF (uncompressed), TIFF (FAX IV), JPEG, GIF) and the exchange of these formats in a multi-vendor environment (Macintosh, MSDOS/Windows and UNIX).

Special technical support is given by two laboratories which were set up at the beginning of the project. The laboratories have selected and tested various user platforms (Macintosh, MSDOS/Windows and UNIX) for working with scanned material (images).

The platforms ranged from a low-budget platform (for Macintosh and MSDOS/Windows only) with public-domain software to a more professional platform with commercial software. The software ranged from simple software to view an image to software packages that were able to manipulate and process the image.

The interchange of images between the different platforms was a major subject of investigation, leading towards a set of recommendations for image file-formats. TIFF(uncompressed), GIF, JPEG and PostScript were recommended, all formats with their pros and cons.

During the last year several developments in different disciplines (libraries, archives) pointed to the usage of TIFF (FAX IV) as the image file-format for b/w text-images. These developments made us decide to pay extra attention to this file-format. At this moment the two laboratories are testing and investigating TIFF (FAX IV) for its interchangebility and possibility to process at different platforms.

Discussion

Roel presented some results. SURFNet are using SGML, PDF, ASCII and PostScript for their work. Access is also being experimented with using WWW, WAIS and gopher. They have used TIFF with Group 4 compression for black and white documents. This cannot be used in a multivendor environment as there are no viewers for the Mac. SGML seems to be the way forward.

Steve Price had made some comments in a written input:

Features of SGML, ODA etc.:

SGML	supports string processability (there is no formatting information at all), publishing databases and input to intelligent layout processes;
ODA	(processable form) supports object oriented processability with layout directives to enable sensible layout to take place;
ODA	(formatted/processable form) layout with integrity and object oriented processing;
ODA	(formatted form) layout conveyed with integrity, also basis of raster image file formats (e.g. AIIM MS-53, Gp 4 fax);
Acrobat	page formatted form layout conveyed with integrity;
Postscript	page image form.

Alan Francis made the following points in his paper:

For document exchange he perceives problems with all of the existing formats. SGML is not widely used and the SGML specification alone is not sufficient to fully specify the document format. Extra information has to be provided in the form of the Document Type Definition (DTD) and this has to include the format(s) for any graphics. Until recently SGML was only being used within large corporate environments and so the software was expensive. However lower cost software is now becoming available making use by the HE community more feasible.

ODA, like SGML an international standard, has its supporters but ODA products do not seem to be widely available. CGM, SGML and ODA all "suffer" from the fact that they are not the "product" of one company and therefore do not have large advertising budgets promoting their use.

Acrobat, on the other hand, is a product of Adobe Systems and is being heavily promoted as a document interchange format. However it has a number of drawbacks. Firstly, it is the property of one company and so can be changed at will by that company. Secondly, while it does allow finished documents to be exchanged, the transferred document cannot be edited at the receiving end, only annotation can be added. Also the document structure is not maintained. Adobe claim that solutions to these latter two points will be forthcoming but not in the near future.

Fred Cole made the following points in his paper:

<u>SGML, ODA, Acrobat</u>

There is no clear winner among these formats until the needs of the users are clearly specified.

Acrobat is still rather experimental and currently seems to have little to recommend it, but I have access to a test version so I would find out more about it before the workshop.

ODA would be useful if we insist on using a variety of common word processors and can all afford commercially available converters between our own favourite word processor and ODA. Its two main main strengths are: (i) it allows users to insert idiosyncratic layout into transmittable documents and yet still allow the documents to be editable by the receiver, and (ii) there is little or no retraining needed by those already expert in the use of their word processor. SGML is an elegant general solution that allows a document to be formatted and re-formatted in different styles without further editing. There is a variety of public domain software to support SGML. I have a particular axe to grind here I believe that we should move towards the use of structured documents because they are more flexible and are re-usable. Although the underlying architecture of the ODA standard could support structured documents it is not actually used in that way, whereas structure is natural in SGML.

HyTime, HyperODA and MHEG

It is probably too early to make choices between these, but in any case they also have different target uses. The characteristics of HyTime and HyperODA are roughly the same as SGML and ODA respectively. MHEG, not mentioned in the workshop notice, should also be considered here, but it is still at a very early stage.

HTML

HTML was not mentioned in the workshop notice, but it should be considered. It is in some ways rather primitive (although an improved version is on the way) but it is up and running and has enormous popular support. It may be that we do not need to consider it however, because it seems that it has already arrived and is a defacto standard.

Mono-Media Files

There is no real need to make any rules about using particular formats for mono-media files such as JPEG etc. because converters and display tools are freely available.

Further Discussion:

If we want useful documents we need to put structure into them. The presentation can then be flexible.

Standards are needed to allow future-proofing. How do we tell people who do not want to know about the value of non-proprietary formats for long term storage and presentation?

We need to consider storing information, or maybe archiving and delivering information, using different formats. We may wish to provide an unalterable version to ensure integrity when delivering while archiving an editable version. Security is important note ODA has security enhancements.

It was noted that there are now a lot of SGML tools around, some of the WYSIWYG for both viewers and editors. We can expect to see considerable improvement in the tools over the next few years. DTD tools are also becoming available.

There are a lot of concerns re conversion and the storage of legacy data.

If the information is important over a long period we need to bite the bullet and got for storing information in structured ways.

Links are emerging between the word processor and the SGML worlds.

Noted that publishers all seem to have their own DTDs it gives them a competitive advantage.

Document Exchange and the Print Disabled -Tom Wesley

The development of Multimedia Applications within the UK Higher Education sector seems to make the implicit assumption that the users of such applications have normal vision. There is however a significant number of people with print disabilities who will be unable to use these applications, or at best, use them with difficulty.

Considerable research has already been done on increasing the access to information by people with print disabilities. This position paper briefly summarises the issues; makes it clear that the needs of people with print disabilities will have to be considered in the design stage of multimedia applications; points out the crucial importance of standardised structured electronic document formats and suggests some practical ways forward.

People With Print Disabilities

People with print disabilities include the blind, the deaf-blind, the partially sighted, the dyslexic and those with motor impairments which make it difficult to physically control paper documents.

One of the significant limiting factors for the print disabled is the difficulty they face in accessing the predominant form of information provision, which is almost entirely oriented to printed and other visual forms [1] [2]. The proportion of information easily accessible to the print disabled is very small. There is a growing understanding that a vital factor needed to improve access is to develop methods in which the provision of information for the print disabled is, as far as possible, an automatic supplementary process related to the normal information creation processes. Technologically, this can be achieved through application of the developments of standardised structured electronic documents.

Electronic documents are the key to linking into the commercial information production processes, as increasingly these processes are electronically based; and to the transformations required to make the information accessible to the print disabled.

The importance for the print disabled of structure in electronic documents can be realised when it is considered how the normally sighted reader obtains a significant amount of information from the layout of a document titles in bold, bulleted indents, emphasised sections in italics. These are crucial when browsing through a large document. To make this information available to aid the print disabled user to browse or navigate within a document, the structure needs to be defined explicitly within the electronic document.

Current Research

The main research into methods of improving access to information for the print disabled is being carried out by the CAPS Project and the ICADD Committee. The author of this position paper is connected to both of these, being a Partner in CAPS and Vice-President and member of the Board of Directors of ICADD. Also of relevance in the present context is work proceeding on making Graphical User Interfaces accessible to people with print disabilities.

The CAPS Project

The CAPS Consortium (Communication and Access to Information for People with Special Needs, is a European Union funded project in the Technology Initiative for Disabled and Elderly People (TIDE) Programme [3]. United Kingdom partners are the University of Bradford and the Royal National Institute for the Blind.

A major part of the CAPS Project is devoted to developing methods whereby SGML is used at the heart of a generic model for dramatically improving the access to information for the print disabled. Within the current phase of the Project, which will complete at the end of September, 1994, a Pilot Electronic Library is being set up. Access will be provided interactively using synthetic speech on both an adapted work station and also through the home telephone using a voice response system with high quality real time text to speech.

ICADD

In developing the concept of Associated Specifications to allow SGML documents to be accessible to people with print disabilities, the CAPS project has worked closely with ICADD, the International Committee on Accessible Document Design [4]. This Committee, a non-profit organisation, incorporated in the State of New Hampshire, has the aim of developing techniques and raising awareness to enable documents to be made available to persons with print disabilities at the same time and at no greater cost as the print enabled community enjoys. CAPS has through this cooperation gained advantage from the legislative push being provided by ADA, the Americans with Disabilities Act [5].

In a remarkable development, ICADD has managed to have its mechanisms for accessibility incorporated into a new ISO Standard DTD for Electronic Manuscript Preparation and Markup [6]. This is, as far as is known, the first time that disability issues have been directly incorporated into a standard for commercial use. If, as seems likely, publishers start using the standard, accessibility will be automatically built in to any document instances that are produced.

GUI Access

The growth of the graphical user interface (for example, Macintosh, Windows) has created an enormous problem for people with print disabilities, particularly the blind. Both in Europe and the USA there is considerable research and development being devoted to providing solutions [7]. It is already clear however that long term solutions will need the human computer interface design to take these special needs into account.

SGML and HyTime

There is a growing conviction that the Standard Generalized Markup Language, SGML, can play an important role as an enabling technology to increase access to information for blind and partially sighted people [8] [9]. By an obvious extension, it seems likely that for hypermedia applications, HyTime will be the key enabling technology.

Implications

The growth of information technology has enabled many people with print disabilities to take a more active role in society. This development is now threatened paradoxically by the further developments of information technology itself, in that increasingly information systems are conceived as having predominantly visual interfaces.

There are no easy solutions to this problem. However the following approaches seem fruitful:

- the use of International Standards for multimedia documents, such as SGML and HyTime;
- development of generic solutions to the human computer interface, which will allow predominantly non-visual access. A potential model for this is being developed in the MIPS ESPRIT Project [10];
- the provision within the application of alternate representations of visual material, such as textual summaries;
- the ability to interact with mathematical equations through an audio interface, being developed in the MATHS TIDE Project [11].

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3.Full details of the CAPS Consortium can be obtained from the Coordinator, Professor Jan Engelen at the Katholieke Universiteit, Leuven, Belgium. The Consortium maintains an ftp site, gate.esat.kuleuven.ac.be in the directory /pub/CAPS and its sub directories which provides access to its latest public documents.

4.The latest information about the International Committee on Accessible Document Design (ICADD) can be obtained from the President, Michael G. Paciello, 110 Spit Brook Road, Nashua, NH. USA 03062, phone: +1 603 881 1831, Email: Paciello@Shane.Enet.Dec.Com.

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11.Full details of the MATHS Consortium can be obtained from the Coordinator, Mark Elsom-Cook, Electric Brain Company, 13 Queen Square, Leeds, West Yorkshire, LS2 8AJ, United Kingdom, phone: +44 532 428696.

Conversion Issues and Tools

John Knight's paper presented a useful case study of the need for file conversion.

Electronic Publishing over the World Wide Web - Jon Knight

Publishers typically hold documents in an electronic format at some point prior to the production of paper based journals and books. Often this is in the form of author supplied electronic documents. These can be in any number of formats, usually dictated by what the publisher is prepared to handle. Some publishers accept files from some of the "heavyweight" professional word processing systems such as Microsoft Word or WordPerfect. Others, typically in the more scientific and technical fields, prefer the TeX and/or LaTeX typesetting language. PostScript files are also sometimes taken, although these are usually only used for review purposes with the data being re-entered when a document is accepted for publication. A very few publishers accept SGML directly from authors, probably due to the relative lack of widely deployed SGML authoring tools.

If the publisher wishes to make his documents available via the World Wide Web, it is to his advantage to make use of one of the widely deployed document formats so that the widest user base possible will be able to access his information with their existing tools. The three most common document formats in the Web are plain ASCII text, HTML marked up documents and PostScript files. Each has advantages and disadvantages:

- ASCII text is the easiest to create for simple documents and can be viewed by all currently deployed browsers. It is also is very space efficient but it can not convey graphical or typographical information, nor allow hyperdocuments to be linked out from it (it can of course be linked to),

- HTML allows documents to be linked together using hyperlinks which allows the readers to explore the structure of documents in a new and powerful way. It also allows citations and related objects (such as video or audio clips) to be linked to existing documents, and makes the incorporation of graphics relatively easy. However, it gives much of the presentation control to the user, which until now has been the preserve of the publisher. It also has limited presentation oriented tags, and no support for tables or mathematics (although that is coming soon with HTML 2.0),

- PostScript allows text, mathematics, tables and figures to be presented in exactly the same format as the printed page. However it is display oriented and is thus more difficult that the other two formats to index and search. PostScript files are also larger, cannot be previewed on some systems and, like plain ASCII, can only used as leaf nodes in a hyperdocument structure.

In Project ELVYN, a research project funded by the British Library Research and Development Department, the Institute of Physics Publishing agreed to allow electronic versions of an existing paper journal to be delivered to a number of sites in the UK and Europe. Each site was free to choose between TeX, SGML and PostScript for the document format delivered by the publisher and how this was delivered to its patrons. At Loughborough University of Technology we opted for the SGML format and devised a conversion process to generate HTML documents which could be viewed using normal WWW browsers such as NCSA Mosaic or MacWeb.

This project has demonstrated some of the short comings of the current HTML markup languages and the underlying HTTP transfer mechanism. Specifically, as the journal was very technical, the lack of mathematics and table generating constructs in HTML lead to the use of a large quantity of inlined bitmaps generated from TeX codes embedded in the publisher's SGML. This has resulted in unacceptably long downloading times for each page, even if each journal article is split into a number of smaller hyperlinked documents based on the logical sections in the paper. It has shown the need for multiple objects to be retrieved with one HTTP transaction using the MIME multipart response, as much of the overhead is connection setup (especially as we have to have identity information logged for usage profiling in the project).

It would also be desirable for a standard vector drawing package to be embedded in popular WWW browsers in much the same way as GIF and X bitmap rendering engines are. Vector graphics can deal with a whole class of figures (such as graphs), can be scaled and printed accurately and may not take up as much bandwidth to transmit as equivalent bitmaps. However, HTML does seem to be a good compromise between the simplicity of plain ASCII and the full scale presentation abilities of PostScript. The use of SGML as the publisher's own format also made conversion relatively straight forward as much of the mark up was structural in nature and mapped easily into the available elements in HTML's DTD.

In his presentation Jon also made the following points:

The project used the Copenhagen SGML Tool (CoST)

- CoST is a public domain SGML processing tool developed by Klaus Harbo at the Danish Euromaths Centre in Copenhagen.
- CoST is based on the sgmls parser, TCL and [incr tcl].
- CoST uses object oriented [incr TCL] scripts to process the data in the ESIS data stream from the sgmls parser.
- A 1200 line CoST script is used to convert docu ments conforming to the publishers own DTD in HTML documents.
- Although CoST is rather resource intensive, markup conversion only needs to be done once for each journal issue.
- The entire retrieve, conversion and mounting pro cedure can be done automatically.

"Classic" HTML has no markup for maths and tables (this is coming in HTML+). However, neither did the publisher's own DTD! The maths and tables in the publishers SGML source files appear as embedded TEX codes. The CoST processing script strips the TEX codes for maths and tables out into separate files, pro cesses them with TEX and then converts the resulting DVI files into X bitmaps for inlining in the HTML documents.

The figures are supplied as TIFF files. The filenames are included in the publisher's source SGML documents and are used to generate hyperlinks to the external figures. These may soon also appear as thumbnails inlined in the documents.

Points Raised in this Project:

- Content oriented document markup is easier to convert to other file formats than presentation oriented formats.

- CoST is an excellent tool for converting SGML documents between DTDs and to other formats.

- Publishers will need to either standardise on one SGML DTD or be prepared to aid libraries and users in processing their documents as each DTD requires a new processing script to be written.

- The WWW with HTML provides a very flexible document delivery mechanism but it will require a number of enhancements before it is able to deliver complex technical documents efficiently.

- HTTP server and client authors should be encouraged to support MIME multiple documents as the multiple connection setups and tear downs is a significant overhead when a document contains many inlined images.

Conversion Tools - Chris Osland

In his presentation Chris discussed a number of conversion tools. Many of these are public domain and are best found using network tools such as Archie. The choices when doing conversion are:

1. Use convertors built in to applications
2. Use convertors built in to applications
3. Use separate tools

RALCGM

This is held at:
UMXFE.CC.RL.AC.UK:
/PUB/GRAPHICS/RALCGM
It allows conversion from CGM in all 3 encodings to CGM in a different encoding or to PostScript, EPS, HPGL and X.

MPEG

Examples can be found in:

SRC.DOC.IC.AC.UK:
/WEATHER/MET.ED.AC.UK/ANIMATIONS/SRC/
MPEG_PLAY-2.0.TAR.Z

FTP WARWICK.AC.UK
utilities

FTP.DEMON.CO.UK
pub/ibmpc/mpeg

NIC.SWITCH.CH
MAC

JPEG

SRC.DOC.IC.AC.UK:
/COMPUTING/DOCUMENT/FORMATTING/TEX/UK-TEX/TOOLS/GOPHER
/MACINTOSH_TURBOGOPHER/HELPER-APPLICATIONS/
JPEGVIEW33.sit.hqx

Conversion

We need to consider:

- What is source?
- What is target?
- What content has to be preserved?

Tools

The available tools include:

- Utah raster Toolkit (URT)
- PBMPLUS
- San Diego Super Computer Center tools (SCSD)
- JPEG Consortium Toolkit
- MPEG Converters
- PC Applications
- RALCGM

URT is available via:
SRC.DOC.IC.AC.UK:

/COMPUTING/OPERATING-SYSTEMS
/LINUX/SUNSITE.UNC-MIRROR/APPS/GRAPHICS/
URT-3.1B-BINN.TAR.Z

and

IACRS1.UNIBE.CH:/PUB/
URT-3.1A.TAR.Z

Educating Users

Chris Lilley presented his paper on the need to educate users about the different file formats and enable them to make judgements.

What is the best file format? The question is unanswerable in the general case, as the criteria for judging vary greatly according to the intended uses of the data.

Chris suggested that the output from this workshop should be a report that aids users select an appropriate format for their needs rather than attempting to answer the unanswerable with blanket recommendations which would be inevitably influenced by the small pool of possible multimedia applications that the workshop attendees could collectively envisage.

Certainly there is need in the user population for guidance, but Chris suggested an approach of user education. There are a lot of 'graphics formats' which cause confusion. Let us lessen that confusion by providing a pragmatic classification so that like can be compared with like. Let us explain the factors that affect the choice, the consequences of particular choices, and the influencing factors such as cross platform portability, compliance with international and industry standards, and retention of information during conversion.

Chris noted that when writing the ITTI-funded 'Standards in Computer Graphics' training materials, he found that the ISO Computer Graphics reference Model, then newly published, was an excellent structuring mechanism. In the chapter on Data Capture Metafiles he used the CGRM to classify file formats. Having a good idea of the properties and capabilities of data captured at each environment in the CGRM ensures that users will not attempt to compare, say, IGES with TIFF, or RIB with PostScript. Equally, it explains why converting from CGM to GIF is possible, but involves information loss such that the reverse conversion cannot recreate the original file.

Chris believes that given clear information and a succinct description of the factors affecting the choice, users can then select an appropriate format with some confidence that the selection will be appropriate.

He suggested recommending a strategy of minimising information loss, so that (bandwidth and storage permitting) data is moved and shared in the form that preserves the most information, and down converted locally using recommended procedures. Also, there is a balance to be struck between an optimal file format for a particular situation, as against the growing trend to repurpose images. Again, this comes down to minimising information loss both in the format and in the conversion strategy.

Clearly this general information needs to be balanced by concise description of the capabilities and common uses of particular formats.

So for example TIFF 6.0 is able to hold a great deal more information about an image than, say, Iris RGB, which holds more than GIF. So if the intention is to maximise quality, transfer the images as TIFF and convert down to GIF locally using the NetPBM toolkit. But in some circumstances this is an inappropriate choice, if the intention is to share a library of icon images, TIFF would be a poor choice. If the intent is to provide 600 images on one floppy, it would also

be an inappropriate choice.

Discussion

This need to educate users was very much supported by the various speakers and in discussion. In fact, the overall conclusions of the workshop recognised a need to advise people on the options and to let them make informed decisions. By taking this approach, there is an element of future-proofing the information because people can extend their current knowledge to future versions of formats and to new ones and to fit them into the structure which they understand.

Another, but related, aspect, is that of educating people with new skills to help them use the new technologies. This again is something which AGOCG and other organisations need to address.

Any report needs to include a glossary.

Workshop Participants

Mr R Beckwith (Richard)
Imperial College of Science, Technology & Medicine
Royal School of Mines
(Centre for Computing Services)
Prince Consort Road
London SW7 2BP
Tel: 071 5895111 ex 4977
Fax: 071 8239497
Email: r.beckwith@imperial.ac.uk

Dr M Beer (Martin)
Dept of Computer Science
University of Liverpool
PO Box 147
Liverpool
L69 3BX
Tel: 051 7943672
Fax: 051 7943715
Email: mdb@csc.liv.ac.uk

Dr D R S Boyd (David)
Informatics Dept
Rutherford Appleton Laboratory
Chilton
Didcot
OX11 0QX
Tel: 0235 446167
Fax: 0234 445945
Email: drsb@inf.rl.ac.uk

Mr D Brennan (Derek)
306 Pinebank Craigavon
Co Armagh
N Ireland
BT65 5BZ
Tel: 0232 669501
Fax:
Email: D.Brennan@queens-belfast.ac.uk

Dr T J Casey, Jr (Thomas)
Computer Studies
BIMS
CIHE
Colchester Avenue
Cardiff CF3 7XR
Tel: 0222 551111 x 2289
Fax: 0222 496864
Email: tcasey@cihe.ac.uk

Mr P Child (Paul)
ESRC Data Archive
University of Essex
Wivenhoe Park
Colchester
Essex CO4 2SQ
Tel: 0206 872147
Fax:
Email: child@postman.essex.ac.uk

Mr F Cole (Fred)
Computing Laboratory
University of Kent
Canterbury
CT2 7NF
Tel: 0227 764000 ex 7692
Fax: 0277 762811
Email: fcc@ukc.ac.uk

K M Crenell (Kate)
P O Box 64
Didcot
Oxon
OX11 0TH
Tel: 0235 834357
Fax:
Email: kmc@rl.isise.ac.uk

Mr J Crisp (Joel)
Multimedia Resources Unit
Educational Technology Service
Bristol University
Royal Fort Annexe
Tyndall Ave
Bristol BS8 1UJ
Tel: 0272 303500
Fax: 0272 255985
Email: Joel.Crisp@bristol

S Cunningham (Sue)
Computer Graphics Unit
University of Manchester
Manchester
M13 9PL
Tel: 061 275 6803
Fax: 061 275 6040
Email: sue.cunningham@mcc.ac.uk

Mr R de Bie (Rene)
Leiden University
PO Box 9512
2300 RA Leiden
The Netherlands
Tel: +31 71277028
Fax: +31 71276967
Email: M.A.de_Bie@CRI.LeidenUniv.nl

Dr B M Diaz (Diz)
Dept of Computer Science
University of Liverpool
Chadwick Building
Peach Street
PO Box 147
Liverpool L69 3BX
Tel: 051 7943696
Fax: 051 7943715
Email: diz@csc.liv.ac.uk

Mr J Dyer (John)
Ukerna
The Atlas Centre
Chilton
Didcot
OX11 0QS
Tel: 0235 445724
Fax: 0235 446251
Email: J.Dyer@ukerna.ac.uk

Dr R A Earnshaw (Rae)
Computing Services
University of Leeds
Leeds
LS2 9JT
Tel: 0532 335414
Fax: 0532 335411
Email: R.A.Earnshaw@leeds.ac.uk

Mr A Francis (Alan)
Page Description
6 Spencer St
New Bradwell
Milton Keynes
MK13 0DW
Tel: 0908 316921
Fax:
Email: A.H.Francis@open.ac.uk

Mr J R Gallop (Julian)
Informatics Dept
DRAL
Rutherford Appleton Lab
Chilton
Didcot
OX11 0QX
Tel: 0235 445569
Fax: 0235 445945
Email: jrg@rl.inf.ac.uk

Mr M Hamilton (Martin)
Department of Computer Studies
Loughborough University
Loughborough
Leics
LE11 3TU
Tel: 0509 222799
Fax: 0509 211586
Email: martin@mrrl.lut.ac.uk

Mr J Knight (Jon)
Dept of Computer Studies
Loughborough University
Loughborough
Leics
LE11 3TU
Tel: 0509 222298
Fax: 0509 211586
Email: J.P.Knight@lut.ac.uk

Mr M P Lee (Martin)
Computing Information Systems Management Group
Royal Military College of Science
Cranfield University
Shrivenham
Swindon SN6 8LA
Tel: 0793 785267
Fax: 0793 783878
Email: lee@rmcs.cranfield.ac.uk

Mr C Lilley (Chris)
Computer Graphics Unit
The University of Manchester
Oxford Road
Manchester
M13 9PL
Tel: 061 2756045
Fax: 061 2756040
Email: c.lilley@mcc.ac.uk

Prof S Molyneux (Stephen)
Asymetrix Chair of Interactive Multimedia Communication
University of Wolverhampton
Stafford Street
Wolverhampton
WV1 1SB
Tel: 0902 322471
Fax: 0902 322739
Email: le1812@wlv.ac.uk

Dr J S Morgan (Steve)
Computing Services Dept
The University of Liverpool
PO Box 147
Liverpool
L69 3BX
Tel: 051 7943746
Fax: 051 7943759
Email: J.S.Morgan@Liverpool.ac.uk

Dr A M Mumford (Anne)
Computing Services
Loughborough University
Loughborough
Leics
LE11 3TU
Tel: 0509 222312
Fax: 0509 267477
Email: A.M.Mumford@lut.ac.uk

Mr C D Osland (Chris)
Atlas Facility
Rutherford Appleton Lab
Chilton
Didcot
Oxon
OX11 0QX
Tel: 0235 445733
Fax: 0235 446626
Email: cdo@ib.rl.ac.uk

Mr S Perkins (Simon)
Dept of Artificial Intelligence
University of Edinburgh
5 Forrest Hill
Edinburgh
EH1 2QL
Tel: 031 6504505
Fax: 031 650 6899
Email: simonpe@aisb.ed.ac.uk

Mr R Rexwinkel (Roel)
P.O.Box 19035
3501 DA UTRECHT
Netherlands
Tel: +31 30 310290
Fax: +31 30 340903
Email: Roel.Rexwinkel@surfnet.nl

Mr D C Sutcliffe (Dale)
Informatics Department
DRAL
Rutherford Appleton Lab
Chilton
Didcot
Oxon OX11 0QX
Tel: 0235 445214
Fax: 0235 445893
Email: dale@inf.rl.ac.uk

Dr L Thomas (Lester)
Museum of Archaeology and Anthropology
Downing Street
Cambridge
CB2 3DZ
Tel: 0223 333509
Fax:
Email: lt10005@cus.cam.ac.uk

Mr T Wesley (Tom)
Department of Computing
University of Bradford
Bradford
BD7 1DP
Tel: 0274 383902
Fax: 0274 383920
Email: t.a.b.wesley@bradford.ac.uk