

Technical report

Conversion of a traditional image archive into an image resource on compact disc

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Abstract

The conversion of a traditional archive of pathology images was organised on 35 mm slides into a database of images stored on compact disc (CD-ROM), and textual descriptions were added to each image record. Students on a didactic pathology course found this resource useful as an aid to revision, despite relative computer illiteracy, and it is anticipated that students on a new problem based learning course, which incorporates experience with information technology, will benefit even more readily when they use the database as an educational resource. A text and image database on CD-ROM can be updated repeatedly, and the content manipulated to reflect the content and style of the courses it supports.

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Two years ago the undergraduate medical curriculum at the University of Manchester changed from traditional teaching to a problem based learning course.¹ The new curriculum includes formal instruction on how to use computers and various software packages; students from the old curriculum (the last cohort of whom are now in their second clinical year) received very little formal instruction in how to use information technology (IT).

Patterns of access to teaching resources are very different in the new curriculum, with more time spent in libraries and using computers, and less time in lectures and tutorials where there are opportunities to view slides. It became apparent that there was a shortage of computer assisted learning materials suitable for student needs: generally, they are aimed at the American postgraduate market and are prohibitively expensive. It was decided to take advantage of a coincident rapid expansion of IT resources in the faculty, and to use resources already available in the department to develop a computerised database of images. This database ("PathPix") became available for student use in January 1996.

Preparing the computer assisted learning material

A program database called "Idealist" (published by Blackwell) was used. This is a non-relational database designed originally for cataloguing medical and scientific bibliographies. Records are simple to design and fields can consist of text, numbers, or graphic images. All words entered into text fields are automatically entered into a searchable index.

The images were taken from 35 mm Kodachrome slides in the departmental teaching collection, and selected to give examples of macroscopic and microscopic pathology, radiographs, and relevant clinical signs from all body systems. Some images were scanned locally on a Kodak Rapidsan scanner and stored on the hard disk of a personal computer (PC); others were sent to Kodak (Wythenshawe, Manchester) where they were scanned professionally, stored on a compact disc (CD) as 32 bit images, and returned to the department in that form. Image processing and storage were performed on a PC with a 1 gigabyte hard disk and a pentium processor.

The master images, all in the form of 32 bit images (16 million colours) were then processed using Paint Shop Pro image handling program, version 2 (JASC Inc, Minnetonka, Minnesota, USA) to reduce the number of colours to 256 (8 bit). This ensures compatibility with the computers available to medical students, which are PCs with 486 processors and colour monitors capable of displaying 8 bit (256 colours), 640 × 480 pixel images. Colour balance and contrast were altered as appropriate and the images cropped to fit the size of the database records, approximately 400 × 300 pixels, on the computers used by students. There is some detectable loss of definition between the image on a projected slide and the final image on screen, but small details are seen easily. For instance, thrombotic vegetations remain visible on cardiac valves, even in photographs of whole mounts, and nuclear pleomorphism is obvious in histological preparations of tumours photographed at routine diagnostic magnifications.

Once the images were in the database, members of the department dictated short descriptions of each one on to audiotape, and the text

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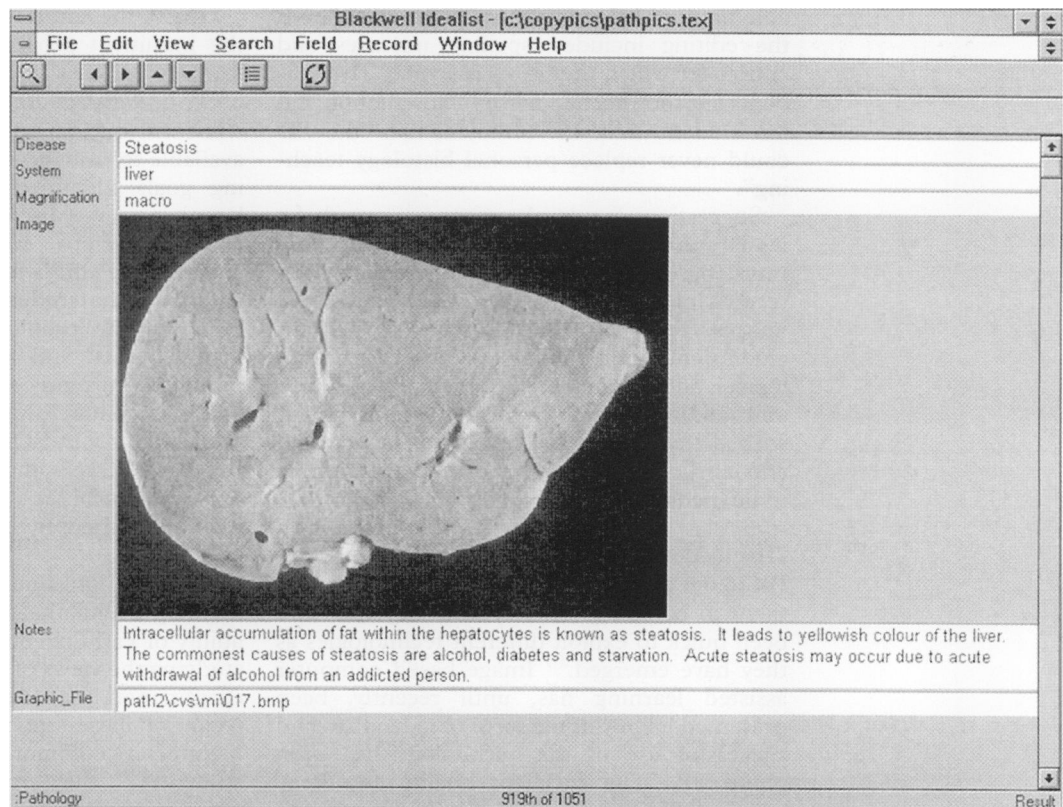


Figure 1 Full screen capture from the PathPix database, illustrating the relative sizes of image and text. The text in this example is written for undergraduate clinical medical students.

was entered into the records by a secretary. After editing, the final version included 820 records, each with one image and a block of text (fig 1). This was transferred via the University of Manchester computer network to a PC in a central facility, where it was written on to CDs. Compact discs written in this way cost the department of pathological sciences £8 each (the cost of the blank CD). Adding images to the master file is easy, and the current version contains over 1000 images. It is planned to make a new edition available to students on an annual basis.

An insert for the CD box was produced on a colour printer, and laminated within the department of pathological sciences. This bore full instructions on how to use the CD on the facilities available to the students.

Evaluating the CD

Posters advertising the CD were placed on notice boards in the medical school, and announcements of its availability were made in lectures. In January 1996, five copies were left in the medical school library for loan but because of high demand from students, five additional copies were supplied. Records were kept by the librarians during April and May 1996, showing that PathPix was borrowed 46 times on overnight loan during the eight week period. In addition, 10 copies were sold for £15.00 (the approximate cost of preparation and packaging) to students who had access to a multimedia PC at home, or who wished to share the resource with students in other medical schools; pathology trainees also have used the system with enthusiasm.

A brief questionnaire was given to a random sample of 100 students at the beginning of the

last lecture of the third year lecture course, in early June 1996, and collected after the lecture. Ninety two questionnaires were returned; 53 students reported that they had used the package and 39 that they had not. Reasons given for not using the CD are summarised in table 1.

Of the 53 students who had used the resource, the majority judged it to be quite or very useful for revision of 3rd MB ChB pathology (not useful, 1; a bit useful, 13; quite useful, 29; very useful, 10). Generally, the text was thought to be adequate, but some students would have preferred more detail (inappropriate detail, 1; not enough detail, 20; just right, 30; too much, 1; no response, 1). The picture quality was thought by the majority to be adequate for their requirements (not good enough, 1; good enough, 51; no response, 1).

Freehand comments made at the end of the questionnaire can be broken down into three main categories: those indicating that students did not fully understand the technology (7), criticisms of the editing (7), and suggestions for development (25). Typically, those who failed to understand the technology requested better ordering of the subject matter, thereby revealing their failure to understand the fully search-

Table 1 Reasons given by 39 students for not using PathPix

Reason	Number
Did not know about it	9
Not interested in using it	7
Could not get to the library	5
Could not get the CD from the library	2
Could not get access to Microlab III	5
Could not work out how to use the computer hardware	7
Could not work out how to use the CD software	5
Time pressures	3

able nature of the database. Comments about the editing included spelling mistakes and entries for which the text was sparse. Two students felt they needed more IT instruction and one student made the comment that "the CD could never replace personal histology teaching".

Suggestions for development were made by many students. Eight suggested self-test features, based on simple question and answer records or case histories to accompany some images. Ten suggested additional matter, including fundoscopic images, more gynaecological and paediatric material, blood films, and audio records of heart sounds. Eight wished the histological images to be arrowed and labelled, and two would have liked PathPix to be included on a Web site.

Discussion

Pathologists have had a long history of involvement in computer assisted learning and have been quick to exploit different technologies as they have emerged.^{2,3} Image based computer assisted learning has, until recently, been presented largely in the form of videodiscs and successful use of this technology has been reported.⁴⁻⁸ The excellent quality and large number of images that can be stored on videodiscs make the method attractive for the storage and access of images, but the discs and players are expensive and individual departments are likely to have only very few, or even no, videodisc players. Another approach to computer assisted learning administration is to use local area networks so that students can download images and text to their own terminals. This approach has been used in California,^{9,9} but access of British students to such a network is still too limited. It may be that computer assisted learning will become available on the World Wide Web,^{10,11} but at the moment, in the UK, such applications are seriously limited by the long period of time that it takes to download even the simplest image. In our experience, this can take over five minutes, and access to North American sources effectively is denied during the afternoon and evening when popular sites are used heavily. Although PathPix provides fewer images than are available potentially over the Internet, rapid and reliable access to these images is important to students who are only able to use computers for a limited time because of other commitments. The Internet has great potential in medical education¹² but this potential has not been fully realised.

The development of the annotated image database PathPix, presented to students on a CD-ROM, occurred in response to a need for new ways of presenting existing learning resources, coupled with a lack of existing computer assisted learning resources suitable for British medical students. The material was developed in a form that could be administered easily by library staff, required no capital investment by the department, was usable on computers available to students in the faculty, and was complementary to other learning methods used in the faculty.

One of the stimuli for this development was the imminent progression of problem based learning course students into the clinical years of the undergraduate medical course.¹³ PathPix will form one of several information sources available to students setting out to meet learning goals identified during problem based learning course discussion groups, and as the course develops, we intend to tailor the contents of PathPix to match the issues that we anticipate the students will wish to look up. Some of the problem based learning cases include visual and auditory material that is presented currently as videotape, radiographs, and so on, but in future, these also will be made available on CD-ROM, in parallel with PathPix. PathPix lacks images of normal tissues, but these are available as part of a parallel development organised by colleagues in anatomical sciences.

Gradual introduction of problem based learning meant that evaluation of the acceptability of PathPix could only be carried out by studying the views of students preparing for an examination in a relatively traditional course.¹⁴ Many of these students are barely computer literate, a common state among medical students^{15,16}; they are much less familiar with computers than their problem based learning successors who have a formal course in IT. Even so, a majority of students was prepared to use the CD-ROM and considered it to be of educational benefit, and even though our evaluation of student views is not directly relevant to planned developments in Manchester, it has direct bearing on developments in other medical schools where CD-ROM databases might support more traditional courses. Eventually the CD should also be useful as a source of images for incorporation into student projects in the form of electronic presentations or posters, and by staff as a resource for the production of further computer assisted learning materials. Combined with a glossary of terms and case based interactive tutorials, it will prove to be a very powerful educational tool.

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