BOOKS WITHOUT PAGES *

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ABSTRACT

Computer Graphics has been a vector oriented
high technology for interaction and its
images have been those of a silent movie.
Current trends toward raster scan in
general are bringing together the previous-
ly disjoint communities of image process-
ing, broadcast television and computer
graphics. Present implementations in
video format are making computer graphics
ubiquitous. Jointly, these events are
leading to broader definitions of man-
machine interaction and more generalized
applications of computer resources. The
user community is growing to include
people like: presidents of companies,
housewives, six year old children.

In this light, this paper is about not
throwing away the message with the medium
while offering new technological
opportunities for communication. In many
regards the old fashioned book remains the
best random access information resource we
have, but new opportunities include:
personalization, sound synchronization,
spatial data access.

INTRODUCTION

Currently, computer-assisted communication
and information access is used at work.
As such, it is rather easy to evaluate the
powers of computational search and mani-
pulation in terms of productivity and
effectiveness, without great concern for
the more subjective and subtle matters of
human comforts and deeper meanings. How-
ever, as soon as such methods are used in
the home, as leisure systems, or for
personal reasons, users will become
significantly more demanding of the
qualities of interaction (1) and less
tolerant of the previously justified
discomforts of computer usage.

The book is a wonderful random access medium
for information retrieval and perusal. It
is inexpensive, portable, and offers the
occasion for personalized landmarks like
annotations and dog ears. While such ob-
servations can be construed as nostalgic
or wishful thinking, their computer sur-
rogates should not be dismissed out of
hand. At first we may be limited to trying
to copy the old, but ultimately the new and
dynamic media of interactive information
processing and communication will find
their own formats for supreme usability.
Such features are no longer a luxury but a
necessity.

Combinations of telephone, television, and
microprocessing are emerging in a number
of different forms, in the service of the
consumer. The impetus for these develop-
ments is large because consumers come in
large numbers. We are beginning to see a
number of technological innovations in-
vented for the consumer, but creeping into
the more institutional marketplace of in-
formation management. The optical video-
disc is a specific example. It, along
with others, will offer richer media for
communication, on the one hand. But, on
the other hand, it will precipitate con-
sideration of the human qualities of the
interface, previously limited for the most
part to physical and video typewriters.
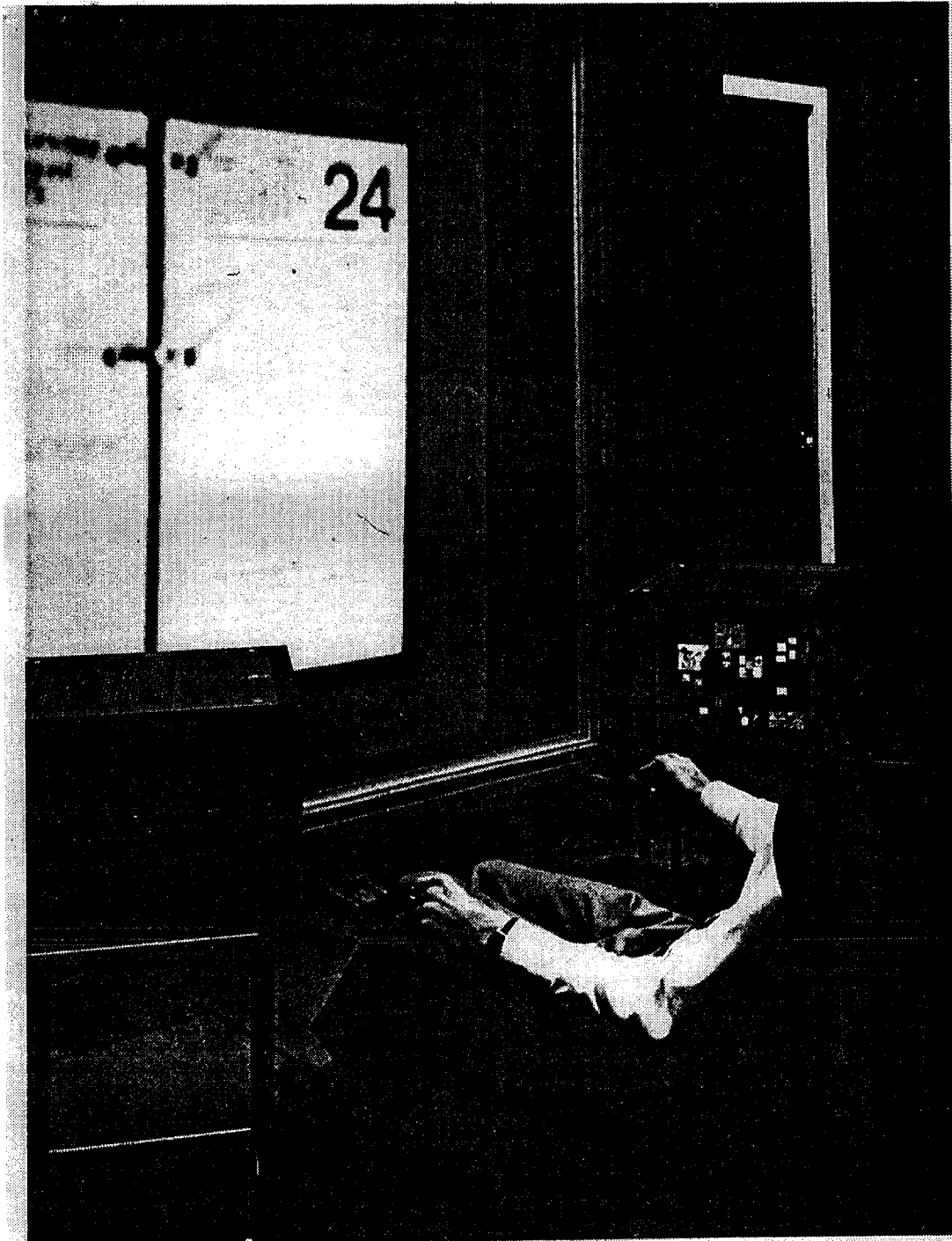
View of the Media Room as used in the Spatial Data-Management System. The world view of Dataland is to the user's right. Note the arms of the chair are each equipped with joystick and touch sensitive pad (the right one of which is being used to flip the pages of the calendar).
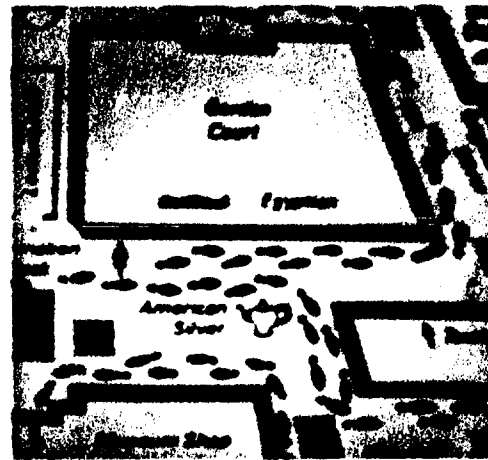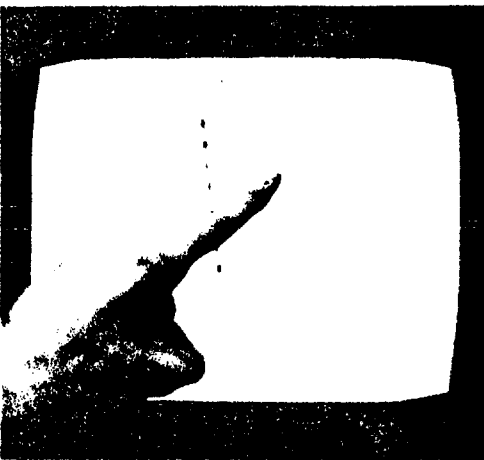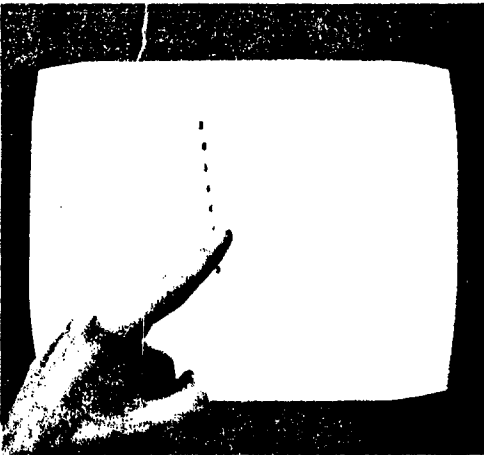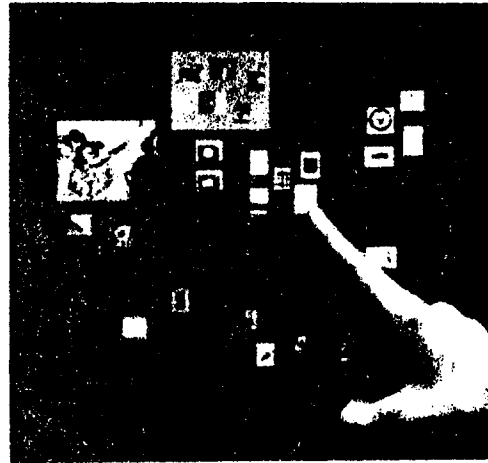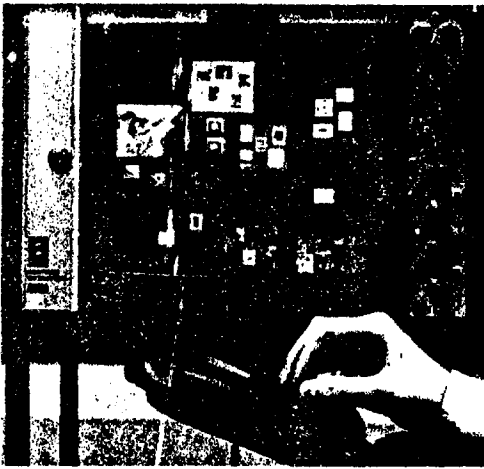
Top left: close-up of joystick control. Middle and bottom left: a touch sensitive index of SDMS Workbook. Right top, middle and bottom: using a touch sensitive world view to move from book to museum map, to the Southeast.

THE PAGE AS A SYNTACTIC CHUNK

Scrolling text on a computer terminal is so commonplace that it may be alarming to question it. But really it is rather dreadful. Most of the time it cannot be read when moving. Almost all of the time it gives the user absolutely no sense of where he or she is vis-a-vis some whole.

We take for granted the semantic constructs of grammar. A sentence carries a statement or question and a paragraph can be said to develop or support an idea. One way or another, chapters, subsections, paragraphs and sentences can be seen as descending, semantic boundaries.

But there are also syntactic boundaries tied to the medium of presentation more than to the information content. The page is an excellent example. The ideas in a letter or a book clearly do not fall on page boundaries. But one remembers a three page love letter or nine hundred page novel partly as such. A recent directive from the National Science Foundation has limited proposals to fifteen pages.

Unanswered questions about computer media include: are there similar chunks? what purposes do they serve? what use does the sense of place serve? are there meaningful gestalts? The purpose of this paper, accompanied by video tapes and verbal presentation at the IEEE meeting on communications, is not to answer these questions, but to pose them as serious issues.

PAGES WITHOUT PAPER

The optical videodisc illustrated below is a particularly new and important medium for information dissemination. The page counterpart is a frame, of which 54,000 are available today, on a randomly access- ible basis, at very low cost. In the computer community 54,000 or 54K is an insignificant number when measuring, for example, bits, bytes, or words of memory. But 54,000 slides or 54,000 pages is quite a different matter. A PhD student of Art History does not encounter 54,000 art slides in his or her education, probably career. 54,000 pages is more than the Encyclopedia Britanica with all its annual updates.

The pictures on the following page are taken from a student thesis (2). As illustrated, the text is almost print quality, does not scintillate, and has all the letter size and spacing variables common to printing. In addition, with the small overhead of animation, pages are flipped from the upper right to the lower left. On the previous color page, user interaction is illustrated as an actual finger flipping gesture on a touch sensi- tive pad embedded in the arm of a leather easychair.

"Simply stated, human factors is designing for human use."
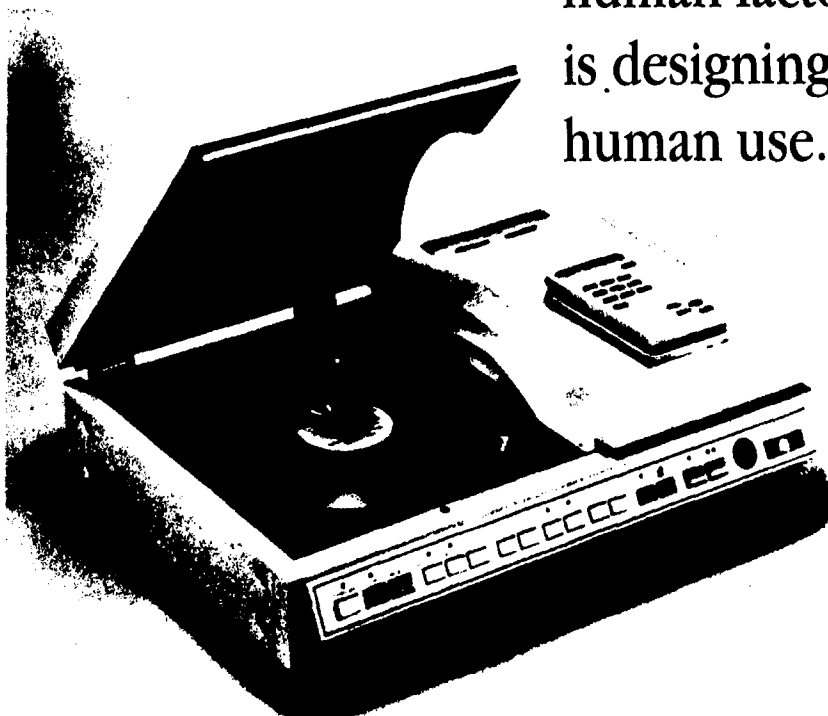
ASCII TEXT DISPLAY

This is a page of ASCII text displayed by the new 85 font system. The font master is stored "off screen" starting at page 0 of the extended memory. As the ASCII text is parsed, each character is "moved", via the microcode, to the appropriate spot in the currently visible space.

The fonts are two bits per pixel. Associated with each font is a location table giving its cooordinates on the invisible read-image. Also with the font is a one dimensional kerning table. The kerning table is stored in program memory during the formatting phase of display.

The page is flipped by scratching

...e appropriate direction on a ...h-sensitive joy-pad. A "page" ...ly consists of two pages of ...one occupying the low ...8 bit per pixel ...other ...o bits. By ...trix, display ...ne page to

The fonts ...re a template Associated wi... ...er four bits of location tabl... ...modifying the cooordinates ... ...entioned above, read-image. ... ...e template are one dimension... ...ows back and kerning table ... ...As the page memory during... ...posed is of display. ...dows.

The page ... ...t page is

This is a p... displayed by the new 85 fo... The font master is stored "... starting at page 0 of the e... memory. As the ASCII text ... each character is "moved", ... microcode, to the appropri... the currently visible space...

The fonts are two bits p... Associated with each font i... location table giving its cooordinates on the invisib... read-image. Also with the ... one dimensional kerning tab... kerning table is stored in p... memory during the formattin... of display.

The page is flipped by ...

the appropriate direction on a touch-sensitive joy-pad. A "page" actually consists of two pages of characters, one occupying the low ...der two bits (of the 8 bit per pixel ...play image) and the other ...pying the next two bits. By ...ing the color matrix, display ...switched from one page to

...shadows are a template A... ...e high-order four bits of l... ...image. By modifying the co... ...changes mentioned above, re... ...nts of the template are one... ...y the shadows back and ker... ...the page. As the page ...e being exposed is of... ...gh the shadows. ... ...the current page is

...appropriate direction on a

disp... The fon... starting at ...pixel memory. As the ASC... each character is "... microcode, to the a... the currently visib...

The fonts are tw... ...late Associated with eac... ...its of location table givi... ...the cooordinates on the... ...above, read-image. Also v... ...e are one dimensional ker... ...and kerning table is sto... ...age memory during the f... of display.

The page is fli...

TALKING PAGES

In the same way that it will become difficult to buy a calculator or television that does not tell time, it is this author's feeling that it soon will become difficult to buy machines that do not talk. The recent introduction of the toy 'Speak & Spell' is a marvelous example of sound synch display.* Applied to the more general concept of books without pages, two particular applications are being examined at this time: mode and medium switching, spatial sound.

It is a common programming practice to assume a mode and medium of presentation for particular data. This is especially true in computer graphics, wherein the database is frequently polluted by the "line" construct of drawing practice. It is also true for text. However, there are many reasons to wish for switching between media, with the same information. For example, it is hard to browse through sound. At the same time, one can imagine addressing a piece of equipment with hands and eyes, wishing for the assembly instructions to be spoken, one by one.

The spatiality of sound is more adventuresome. Here we are suggesting a cocktail party effect, where quadraphonic or octaphonic sound systems produce spatially localized sound. A proposed example is for verbal annotations to be placed on a page, in specific places, by a specific reader. Return to these annotations is achieved by a kind of Flatland where the user can roam about the surface, listening to all the sounds in parallel, but properly attenuated as a function of their distance. How many times have you overheard your own name at a cocktail party?

* The technological achievement of this particular device is remarkable and well acclaimed. In the context of this paper, it has an additional property which is so obvious we tend to overlook it. That is: portability. The unit and its batteries are small and light enough to curl up with in bed, take on airplanes or in cars, and to put on a shelf!

PERSONALIZED PAGES

As computational resources increase in power and decrease in cost, we hear more and more about the so-called "personal computer." This is an unfortunate name, given the true thrust of the movement at this time. The computers about which people are talking are not really personal and in no sense personalized (3). Instead, they are available at sufficiently low cost so as not to have to share them.

Personalization comes in two flavors. The easiest form of personalization to achieve is that of variety. If the choices are large enough, individual selection can be seen as a mild form of personalization: print in preferred type fonts, right handed versus left handed, and the like. At the other extreme, the most difficult to achieve, is personalization that comes from knowing. Human-to-human discourse enjoys a wide range of abbreviations and subtleties gained through familiarity, shared metaphors, and the complicated mechanisms of inference making.

There are some middle-ground examples that begin to illustrate a kind of Z-axis for books without pages. Early implementations of our Spatial Data Management System (SDMS) (4,5) were a laminar of "pages." More information or elaborations were gained by literally flying through words or pictures. Their expansions can be made very personal and invoked implicitly. A simple example in a text processing application is the automatic expansion of acronyms that one does not know or has forgotten since last reading.

A slightly more ambitious example of a personalized page can be derived from work currently being done on "personalized movies." These are movies whose apparent content, form and medium is the intersection of a set of resources and a model of the user contained in a computerized playback system. A cookbook created this way is an exemplar: Consider the proverbial instruction "cook until done." (6) This is meaningful to the experienced chef. A less qualified cook may need to know the time and temperature; a beginner may need to be reminded to preheat the oven, and to place the dish on the center rack. Revisiting this recipe, the fast learning tyro may need only a reminder of the oven heat, whereas a forgetful expert may need to be reminded of all of the steps again, but in brief form.

BOOKS IN WHICH WE MIGHT LIVE

SDMS has the added theme of the human interface. The terminal is itself a room, currently equipped with floor to ceiling display (twice as large as the one illustrated), octaphonic sound, position sensing devices for body and arm movements, and soon to get a formidable eye tracking system and continuous speech recognizer. This gaggle of equipment is assembled with the idea of going to the fullest extreme of human interfacing, leaving no channel untapped and no mode or medium of presentation unused. We propose that later one can retrench from such hyperbole, evaluating the effectiveness of one method or another, but that the human interface can no longer be ameliorated by baby stepping with small incremental changes.

The Media Room (9) is a place. The user is not perched in front of a small black and white window (polluted by fan noise). Instead, the user is invited to engage with human size displays, arm wave, or rest back and listen. At first thought one can imagine a circus or world's fair. But more like books without pages, one can envisage a universal encyclopedia that takes you to Patagonia, sings Cosi Fan Tutti, animates the preparation of Coulibiac, or monitors the progress of herpes zoster.

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