You Believe You Know What Multimedia Is? And What Internet Will Do For You? Well .... Think Again!

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Abstract:
In the first part of this paper we argue that the terms "multimedia" and "hypermedia" need redefining to reflect latest developments in converging technology. We propose new forms of "interactive" and "annotated" movies, to be created using advanced digital techniques. In the second half of the paper we suggest that some of the problems that users of Internet are currently experiencing are due to "first generation" systems, but that "second generation" answers have already emerged.
Key Words: Converging technology, multimedia, hypermedia, interactive and annotated movies, Internet, Hyper-G.

1 Introduction

Converging technology, multimedia, hypermedia and Internet. The buzz words are being used by all comers from children to politicians. Everyone knows what's meant – right? No, wrong! For example, the convergence of media into computerised (digitised) form is "multimedia". Right? No, there is so much more to it that it must be re-defined to reflect a whole new shift in quality (in the sense of essence and character). The uniting of computer users through the introduction of worldwide networks is turning Internet into the "super-highway" or "infobahn" of the future. Obviously not! Internet development has repeated the railway history of several continents – disparate systems radiating from different centres. Now that unification becomes imperative, the incompatibilities and the proliferation present a mess to work with. Still, we believe that present evolution is following an extremely exciting development curve, as we shall elaborate presently.

So first, what do we mean by "multimedia"? Yes, we do expect it to include a rich mix of text, graphics, pictures, video, and audio, in digitised form. However, partly because users expect more and more interaction, multimedia is now developing a much broader scope and must be given a higher-order definition. For example, any new definition of multimedia must at least include the latest advances in panoramic picture viewing techniques, Interactive and Annotated Movies, 3D objects, and 3D scenes.

2 Panoramic Pictures

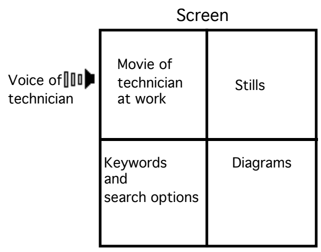
New digital techniques let viewers look up Mt Everest or down from the Eiffel Tower, or pan up and down and around a whole 360° circle. Filming of soccer games is being done with as many as forty different cameras so that users can choose which part of the action they want to watch or replay. Viewers are able to put themselves right in the centre of the action.

3 Interactive Movies

Interactive movies [Jayasinha, Lennon and Maurer 1994] have developed far beyond the CD-I type where interaction meant little more than choosing varying places in the movie to skip to. New high-resolution technology is augmenting the lenses in our eyes with zoom, microscopic and telescopic capabilities, opening the way for movies of T.V. quality that let viewers zoom in and out of sections without any loss of resolution. We shall also have films where the actual "set" is several times larger than the viewing window, letting the user pan around the scene following visual clues such as clouds of dust (maybe the dinosaurs are coming) or auditory clues such as the sound of drums. Techniques such as these invite us to be virtual participants in multimedia productions of festivals, concerts, and ballet performances.

4 Annotated movies

Annotated movies, [Jayasinha, Lennon and Maurer 1994], expand the definition of multimedia still further. Take, as an example, a training video that describes troubleshooting in a network. If the video of the technician giving step by step instructions is shown in just one quarter of the screen, then the remainder of the screen can be used to new effect. The second quadrant may show detailed parts such as connectors, perhaps as three-dimensional models that can be rotated. A third quadrant may show diagrammatic representations of the network. The fourth may give key terms from the film dialogue for which the user can obtain detailed definitions.



And still, at any stage in the movie, the user can pause and zoom in for more details using the high resolution technique mentioned in the previous section.

5 3D Objects and 3D Scenes

3D in models and scenes is obviously leading us towards something like virtual reality. We are not, however, thinking of users togged up in helmet, boots, and gloves – data gloves or any other kind. If we really believed all the hype about this sort of virtual reality we would buy shares in "Laundromats for data gloves" to cope with the lines of perspiring participants! No, we predict that the real thrust of virtual reality will be from three-dimensional, animated data-modelling programs that model the real world on a computer screen and provide total-immersion learning environments. To take the example of the technician given above, with the aid of a lightweight shutter or polarising glasses, the viewer will be able to "surf the net" or "fly through" the inside of a faulty computer component using 3D (stereoscopic) vision. Simulations of this sort have to be included in any definition of multimedia.

6 Internet: Mess or Messiah?

Few doubt that networked multimedia (i.e. hypermedia) will be an essential part of our future, but there is still too much hype concerning Internet.

Internet is certainly:
- the largest library mankind has ever had,
- the messiest library mankind has ever had,
- the most amazing communication/cooperation tool,
- one of most chaotic structures devised by man.

6.1 Internet: The Problems

Finding what you need: How do you know where to look for what? How many times does your query for information come back as either a "zero entries found" response or a list of 500 or even 1000 entries!

Getting lost: Take one small "side track" to follow something "interesting" and you can't get back to where you were in the first place.

Speed: Information retrieval at the speed of light? For hypermedia documents? How many people who make these assumptions have actually tried to transmit over the net a single picture, let alone a whole movie?

Costs: Here too we hear extravagant claims from people who may have successfully transmitted a few kilobytes of text information over the net but are quite unaware of the cost to transmit even one movie. For example, since the cost of transmitting a movie from New Zealand to anywhere overseas is $3 per megabyte, the cost of a one-and-a-half or two-hour movie is in the four thousand dollar range (U.S. $2,000)!

Censorship: Unrestricted access for everyone? To everything? It certainly doesn't take school children long to find the news groups that their parents disapprove of!

Billing: Who is going to pay? And for what?

Validation: How can you really be sure that a particular piece of information downloaded from the net is accurate? If, for example, you retrieve an article from, say, Stanford University's database, can you really be sure that it was written by an authority on the subject? Was it perhaps written by a student, or even worse was it a particularly clever hoax?

Advertisements: Free advertising? The notorious "Green Card" war that erupted when two lawyers put one "small" advertisement onto every active bulletin board on the net gives some indication of consequences. In spite of being flamed down by thousands of responses from angry users, who claimed advertising like this was against the spirit of the net, the authors still came back "fighting". Obviously commercial interests of this sort could swamp Internet.

Junk mail: 100, 500 or 1000 pieces of mail per day? We know of managers, enthusiastic e-mail correspondents, who now have completely given up reading any e-mail. Their secretaries now act as human filters, processing e-mail along with the standard mail. Some is forwarded, some is printed out and filed, together with relevant documents, for personal attention. And of course much is simply discarded.

Encryption: Is the Clipper chip good, bad, or simply a necessary evil? The debate continues on – and off – the net.

Data Privacy: How can I be sure that you have access to this bit, and not that byte, of my data? How can we ensure that my credit card number is only accessed where and when it should be?

6.2 Internet: The Solutions

First generation Internet tools, in particular hypermedia systems such as Gopher [Alberti, Anklesaria, Lindner, McCahill and Torrey 1992], WAIS [Stein 1991] and WWW [Berners-Lee, Cailliau, Groff and Pollermann 1992], address many of these problems, but none of them really cope with all, or even most, of them. Second generation systems are now emerging that address all the above issues.

6.3 Second Generation Answers

Finding what you need: Unified access to various types of server for various types of client is now supported by second generation hypermedia systems. For example, pioneer efforts are Intermedia at Brown University [Yankelovich, Haan, Meyrowitz and Drucker 1988], and Hyper-G, [Kappe, Maurer and Sherbakov 1993], at Graz Institute of Technology, the latter probably the first widely available second generation system. We are at last seeing seamless interfacing between different platforms. The modern filtering and searching algorithms used by these systems are also dramatically improving search hit rates. Problems remain, but these systems have come a long way.

Getting lost: Graphical browsers on top of hierarchical structures are providing history trails and three-dimensional maps of the hyperspace.

Speed and Costs: New compression techniques such as JPEG and MPEG are helping reduce data transmission speeds and costs, while other methods are being explored. For example, preloading data is one solution for LANs. In this case, since most hypermedia documents have a basically linear structure, data can be downloaded from the net before it is actually needed for displaying. This is not such a good solution for WANs, especially where significant costs are involved. One suggestion is that supervisory programs should be developed that keep statistics, and by assigning weights to various links, can make intelligent guesses on what should be downloaded when.

Censorship: Since to many people Internet is a symbol for freedom of speech, censorship is an exceedingly complex problem – particularly since so much new material is being added to the net daily. We believe that where censorship is a sensitive issue, such as in schools, one solution may be to have specialised servers, i.e. censorship by source. There may be "green" servers suitable for children and "red-hot" ones that are out of bounds. School administrators will have the responsibility of setting filters for which servers may freely be viewed by students, and what is open only to staff.

Encryption and Data Privacy: There have been tremendous strides made in the design of cryptographic protocols. These will ensure user privacy once legal and political issues have settled down.

Billing: Detailed billing systems are already in place in many systems, providing a range of options from yearly subscription fees to individual item charges controlled by swipe cards.

Validation: In second generation systems, each document may be accompanied by the author's electronic signature together with information fields that list relevant professional details. With this information we can at least make certain value judgments about the authority of the author.

Advertisements: Certainly filtering is one option to be seriously considered in the short term, but we look forward to the day when advertising, as we know it, becomes obsolete. For example, on commercial nets, particularly those controlled by small businesses, buyers may spurn advertising altogether by letting their electronic agents rove the net and supply all pertinent information. We may also see new forms of sponsoring. For example, access to electronic magazines and journals may have to be controlled by license agreements based on usage. Popular journals may require more than one license just as traditional libraries buy more than one copy of books in demand. These licenses may be provided by sponsors in return for some form of carefully targeted advertisement such as a small but clickable icon on the cover of the book.

6.4 Where We Stand

We await with interest the result of the promised upgrade to WWW resulting from a collaboration between CERN and Berners-Lee from MIT. With similar high expectations we are waiting for Jim Clark's entry with his hypermedia effort based on "buying" a large segment of the Mosaic group. One second generation system, addressing most of the above points and now available, is the previously mentioned Hyper-G system. This system, adopted by the European Space Administration, has been singled out for use by over a hundred universities all over the world, not only as a distributed database and gateway to Internet but also as the platform for a fully refereed electronic journal – the Universal Journal of Computer Science.

6.5 Moving Towards a Third Generation

Technology is certainly converging. Computers can now be used as televisions, and vice versa. They can become Video Digital Recorders (VDRs) where TV programs are downloaded for later playback. Game machines may be the forerunners of virtual classrooms. Multimedia is much more than a mix of new media in digitised form: it is virtually a new world. To be explored and enjoyed it must be supported by modern hypermedia tools. Unfortunately, underneath the surface Internet reminds us of old Assembly Language programs: spaghetti-style messes of GOTOs. Unfortunately too, first generation hypermedia systems are being heralded with as much hype as BASIC and FORTRAN languages were back in the early sixties. Nevertheless, second generation hypermedia systems are emerging that can certainly be compared with high level programming languages. And third generation systems are in the wings!

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