Importance of computerized information to the visually impaired.

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1 Benefits of computerized information.

The benefits of having information in electronic form are numerous. The advantages most often cited are speed of access, ability to search large amounts of information, and with the coming of high speed networks, the ability to efficiently deliver this information to the end user.

There is yet another aspect to these benefits. Electronic documents free us from having our information tied down to any single "display" form. Information present on paper for instance assumes a visual mode of input. This constraint is not inherent in computerized information. It is for us to choose in what form we wish to access and manipulate the information we possess.

Thus computerized information can be printed, transmitted over the network, displayed on a high resolution display, or with the advent of speech synthesizers spoken.

What does this mean in terms of making information more accessible?

2 Relevance of above to the visually impaired.

Till now information has been present on paper in the form of visual documents. Such information is essentially static and requires a human to process the information. Thus the only way we have been able to make such information accessible to the visually impaired is by producing recorded books and in the more recent past by exploiting optical scanner technology. The former is expensive and time consuming, while the latter only handles a fairly restricted class of documents. Thus the resources spent in translating information from one "display" form to another are enormous. This means that not all information becomes universally accessible. The latest research papers, the latest federal publications, the latest newspapers, to cite but a few are all readily available as visual documents, but except in a few cases are rarely if ever *immediately* accessible to the visually impaired. The keyword here is immediately, since often information present in these documents goes out of date faster than the documents themselves can be made accessible in alternative media.

Freeing information from its "display" form has a major advantage in making information more universally accessible. Providing computerized information in a universal format at once solves a whole range of problems. The principal advantage in this approach is that it frees the information provider from having to produce the same information in different forms since this "translation" activity can now be taken over by the computer. Fitting things within the client/server model, the information provider or server makes the information available and different clients use this information in a manner most suitable to the individual consumer, e.g., deliver a printed copy, transmit the information over the network and display it on the user's workstation, display it in large type, translate to Braille, generate spoken output etc.

3 Pitfalls to be avoided.

The scenario as presented so far looks exceedingly promising and we appear to be at the threshold of the solution to making information universally accessible. It appears that with the advent of electronic documents, merely possessing a talking computer will make a vast amount of information accessible to a visually impaired person. However there is a major pitfall to be avoided.

Notice that the previous paragraph referred to making computerized information available in a universally accessible form. In a world dominated by high resolution visual displays, producing and delivering visual documents is naturally of the highest priority. But making only such high-quality visual documents available to the average user rather than the actual information itself as in the client/server model introduced in the previous section, will miss out on all of the positive features mentioned earlier with respect to achieving universal accessibility. This is because if information is only available in a "processed" form e.g., as a visual document, then it leaves us in exactly the same situation as we are at present in the world of paper documents.

By unduly restricting access to the actual information we would cut ourselves off from a whole range of user applications that would exploit the availability of the information in electronic form. A typical example of such a scenario in a world dominated by copyrights is the information provider only making a postscript file or a bit-map image of the document available. With network speeds increasing, and storage becoming increasingly inexpensive delivering high-resolution visual documents to the end-user becomes increasingly practical. Hence if we do not realize the additional benefits that are to be achieved by having access to the information itself, we are likely to accept a situation where we only deal with electronic documents that are essentially visual in nature. This is not to say that we should not be producing high-quality visual documents. The point to be made is that the conversion of the information to a high-quality visual or audio document is the responsibility of a client, not the information provider or server.

The importance of making the right decision now at a time when computerized information delivered over the network is just getting off the ground cannot be over-emphasized. The information resources present on the internet are vast, and we have only begun to scratch the surface. The information explosion that we are likely to see in the near future is an exciting prospect. If we make the right decisions now, we will be able to provide an information delivery system that provides equitable access to all at no extra cost. If at this time, we overlook the points raised in the previous paragraph and tie ourselves down to any single "display" form of the electronic document, we will miss the great opportunity that we have.

Failure to do this will mean that five years from now, we will be spending an increasing amount of our resources in once again trying to convert information between various display forms. The resources necessary to do this will only increase since we are likely to have a lot more information around that we will need to convert.

4 The internet and information delivery.

The electronic library of the future where users will have documents of their choice delivered at the personal workstations is not something of the distant future. In fact it is already with us at present. Though in its infancy, it is growing fast and growing in different directions. I use a talking computer and have full access to the INTERNET. The amount of information this makes accessible is amazing. Here is a sample list of information resources that have become accessible to me since getting a talking computer. I have chosen those items that would typically not become accessible in alternative media within any practical time frame. Other examples cover information resources that are too vast to be converted to Braille or recorded on cassettes by human readers. All of the examples given below cover information that is available in a form that can be accessed by a talking computer. They reflect the variety of information that is currently available on the internet.

The following is just a taste of things to come!

1. Federal documents: All of the federal documents available through project Gutenberg and other internet resources.
    - The CIA World Fact Book.
    - US State Department Travel Advisories.
    - Soon: the US Constitution.
    - 1990 US census figures.
    - Campaign '92 documents: All the documents, speeches etc. relevant to the recently concluded Presidential campaign.
2. The latest news:
    - The UPI news feed provided by Clarinet. This is my daily newspaper providing about a megabyte of high quality news on all topics. There are other similar services, but this is the one our site subscribes to.
    - USENET: The vast repository of information present in the USENET world.
3. Reference works:
    - Three dictionaries and a thesaurus.
    - The CIA World Fact Book.
    - Current contents: Searching the latest research journals.
    - The periodic table of elements.
    - The Complete Works of Shakespeare.
    - Oxford Dictionary of Quotations.
    - Bulletins of the AMS.
    - Communications of the CACM.
    - A geographic database.
    - An edition of the FW encyclopedia. (local to our site)
    - United States Area Codes.
    - The library catalogues from all the major universities in North America.
    - Library catalogues from several major European libraries.
    - RLIN a library catalogue service.
    - Campus information from all the major schools in North America.
4. Directory information and phone books: locating people!
    - The telephone directories from all major schools.
    - Telephone and email directories provided by other major institutions on the INTERNET.
5. General information:
    - An interactive weather service for all of North America.
    - An Economics Bulletin Board.

- Information on current shuttle missions and other space projects from NASA.
- A geological database and earthquake predictions.

6. Electronic books:

   - All the books made available by project Gutenberg. All these books are in ASCII.
   - Technical reports at major universities accessible by anonymous ftp. (Only some of these are available in an accessible form: there are quite a few technical reports that are only available in postscript.)[1]
   - The electronic version of the recently released review on Common Lisp. This is a 1200 page document!
   - The TEX Book by Donald Knuth which comes with the TEX distribution. (Note: This is in TEX and raw TEX takes some effort reading.)
   - A manual for the language SML.

I access the resources a few of which are listed here using a talking computer. In general I have not had to make any extra effort to gain access to these resources, i.e., I can access them with my talking computer as is. The necessary tools for navigating the internet are improving all the time. Two years ago when I started using my talking computer on the network, it was a matter of luck in terms of locating useful resources on the network. Today with the advent of the INTERNET Gopher and WAIS, navigating the network is becoming much more practical and far less time is spent in locating resources. Resources I once located using email tips from the USENET community, and remembered by compiling by own directory of resources can now be accessed with a few keystrokes using a Gopher client. The last two years of wandering around the network have been a really thrilling experience and the potential presented is difficult to describe in words.

5 Libraries of the future: equal access to all.

It is to be hoped that over the next few years, we will build ourselves an information delivery system that will provide equitable access to all. The benefits of the electronic libraries of the future will be felt by one and all, but the biggest impact will be on the visually impaired. If we make the right choices, we would end up in a world where for the first time the latest information would become accessible to a person with a visual impairment at the same time as it becomes generally available. At the same time, making the wrong choices now will leave a significant proportion of users, principally those with special needs even more cut off from the latest information than at present. The choice is ours to make!

[1] Some postscript documents can be converted to an accessible form using ps2ascii, a postscript to ascii converter.