The Use of Terminals by Visually Disabled Persons

editors
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Medical and Health Research Programme of the EC

Biomedical Engineering in the European Community

The involvement of the European Community (EC) in the field of Medical and Health Research started in 1978 with the first Programme which contained three projects. Since then, it has steadily expanded and it will include about 120 projects by the end of the fourth Programme (1987-1991).

The general goal of the programme is clearly to contribute to a better quality of life by improving health, and its distinctive feature is to strengthen European collaboration in order to achieve this goal.

The main objectives of this collaboration are:

1. Increase the scientific efficiency of the relevant research and development efforts in the Member States through their gradual coordination at Community level following the mobilization of the available research potential of national programmes, and also their economic efficiency through sharing of tasks and strengthening the joint use of available health research resources,

2. Improve scientific and technical knowledge in the research and development areas selected for their importance to all Member States, and promote its efficient transfer into practical applications, taking particular account of potential industrial and economic developments in the areas concerned,

3. Optimize the capacity and economic efficiency of health care efforts throughout the countries and regions of the Community.

The current programme consists of six research targets. Four are related to major health problems: cancer, AIDS, age-related problems, and personal environment and life-style related problems: two are related to health resources: medical technology development and health services research.

Funds are provided by the Community for relevant "concerted action" activities which consist of research collaboration and coordination in EC Member States and/or in other European participant countries. Networks of research institutes can be set up and supported by means of meetings, workshops, short-term staff exchanges/visits to other countries, information dissemination and so on: centralized facilities such as data banks, computing, and preparation and distribution of reference materials can also be funded. The funds are not direct research grants; the institutes concerned must fund the research activities carried out within their own countries - it is the international coordination activities which are eligible for Community support. Each such research network is placed under the responsibility of a project leader chosen from among the leading scientists in the network, with the assistance of a project management group representing the teams participating in the network.

The Commission of the European Communities is assisted in the execution of this Programme by a Management and Coordination Advisory Committee (CGC - Medical and Health Research), and by

Concerted Action Committees (COMACs) and Working Parties, composed of representatives and of scientific experts respectively, designated by the competent authorities of the Member States.

Other European Countries, not belonging to the EC but participating in COST (Cooperation in Science and Technology) may take part in the Programme.

The present work was conducted according to the advice of COMAC-BME which supervises the coordination of research in biomedical engineering (BME) within the Medical Technology Development target.

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Introduction

The basic goal of the workshop was to identify priorities for future research on terminals for use by visually disabled persons. The workshop was held in Gandia, Spain from 9th to 13th April 1989. The meeting was chaired by Dr Jan-Ingvar Lindström and Dr John Gill.

Before the workshop, participants submitted papers as a basis for discussion. Since an important aspect of a workshop is the discussion, the following papers were revised by participants incorporating ideas discussed during the workshop.

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Network Terminals

John Gill
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About two years ago, a workshop was held in Datchet, England on "Network Terminals for the Visually Disabled". Following on from this workshop, four meetings are being arranged this year by the Project Management Group of the EEC Concerted Action on Technology and Blindness. This is the first of these meetings and is the broadest in scope. The other meetings are one at the end of May on "Access to Computer Systems by Blind Persons (including Windows, Icons, Mice and Pull-down Menus)", one in September on "Financial Transactions by Visually Disabled Persons" and possibly one in November on "Getting about with a Visual Disability".

At the meeting in Datchet, most of the time was devoted to discussing the current situation and the forseeable problems with visually disabled persons using network terminals. These terminals were grouped as:

1. For public access (eg automatic ticket machines).
2. Those which are more specifically adapted for sharing between visually impaired and sighted (eg adapted telex machines).
3. Dedicated for individual use (eg softcopy braille terminals).

Janet Silver concentrated on the problems of users who had some residual vision. For instance, at some railway stations, destination boards are being replaced by visual display units mounted 4 metres above the ground; typically these VDUs have an orange phosphor which is not ideal for many of those people who have retinitis pigmentosa.

An important aspect of the workshop was the discussion sessions which produced a number of interesting ideas. One proposal was that the magnetic stripe on a card for an ATM (cash dispenser) should include information about the size of characters needed for reading by the user; this approach could only work on ATMs with CRT-type displays which permit character size to be determined by the software. Another proposal was REACT which is a passive device, similar to the shop security tags, for indicating the presence of a visually disabled person; Gillian Whitney will be talking about progress on this project.

However an important part of the discussion was on the psychological aspects which varied from problems in finding the terminals to the optimal design of the man-machine interface. Prof. Boldt introduced the concept of the "clean" screen, and also broadened the discussion to human beings as non-technical terminals.

Ken Freeman taught us about visual display technology including characteristics of visual displays such as brightness, contrast, 'gamma', 'sharpness', colour and artefacts. Many displays are designed more with economic considerations than with optimum visual characteristics as the priority e.g. LCD displays.

Dr Lindström provided a model, using tactual displays as an example, of a project which systematically evaluated the problems, analysed displays which are already available or under development, and then proposed priorities for future development.

The important aspect of the workshop was the constructive atmosphere of lively discussion of the issues.

Overview of Existing Terminals

Jan-Ingvar Lindström
Swedish Institute for the Handicapped

Background

To give a complete overview of existing terminals is a formidable task, which, I am afraid, would not be possible within the limits of this conference. However, there is a Swedish tale saying, that one should not sacrifice the next best for the best. And I think that this is a relevant statement even in this case: although the task to scan the whole market and pinpoint advantages and disadvantages on behalf of visually impaired people - VIPs - is impossible, hopefully even a limited contribution will make sense.

Definitions

What do we mean with the word "terminal"? - By definition it is a device that terminates something. In this case it is the end of a communication link, including an interface between a technical system and the human user. With this definition we should not restrict ourselves to terminals connected with a physical communication network. The concept should also include terminals connected with non-physical networks, like queuing ticket dispensers and push button boxes for pedestrian crossings. Indeed, what we should look at are devices, which display or request information for human beings as part of an information system, may this system be real or virtual. The reason is, that this is the real situation people have to cope with - not least those who are visually disabled. Our task is to solve as many problems as possible.

The Target Group

The groups we should consider, consequently, are those with an impaired vision. It could range from no vision at all, to various degrees of acuity, contrast sensitivity or field of vision. When discussing terminals and visual disability, consequently, the task is something that concerns large parts of the population. If we could convince manufacturers and industrial designers to avoid the special "disability approach", but accept that there is a continuous scale of visual functions among the population and thus the group of possible terminal users, much would be gained.

Market Review

Much will be said during this conference about various kinds of terminals, and the (lack of) flexibility and adaptation, where hopefully the above mentioned definitions and approaches will be agreed upon. However, a short review with examples of the kind of terminals in question will be given in the following. A more thorough penetration was made two years ago and reported in "*Network Terminals for the Visually Disabled*", edited by Dr John Gill (RNIB), according to that report, the following categories could be identified:

- Stand alone devices
- Terminals connected with a communication network

and

- Terminals for communication
- Terminals for information

with display modes like

- Text information
- Pictures/graphics
- Digitized human or synthesized speech
- Sounds

In order to cover all aspects, including those of terminals especially adapted for VIPs, an n-dimensional matrix has to be designed where n is an integer of perhaps 4 or 5. As this is very difficult to do, and probably not worth the trouble, the above mentioned parameters should instead be used as check-words in the search for devices and systems.

Examples

Stand alone devices

Simple devices in this category are single push-button boxes with a control lamp and - sometimes - a buzzer or other kind of sound generator on posts at pedestrian crossings.

Others are queuing ticket dispensers in shops, post offices, banks, etc. Some of these are very simple, manually operated dispensers, some are more sophisticated with motorized ticket feed, visual displays and connection with a local communication network. They could easily be combined with a speech synthesizer, and are so, in a few cases.

Still other examples are systems for information on board buses, trams, trains and aircraft - and in stations, airports etc.
These terminals are all supposed to provide information, and could not normally be influenced by, or controlled by, the customer.

Terminals connected with a communication network.

Here a large variety of terminals are to be found, ranging from ordinary telephones to sophisticated data terminals.
The ordinary telephone normally doesn't cause problems to VIPs when using it, but the dialling procedure may be tricky due to lack of standardization of the key pad layout etc.

Around the corner lie terminals for the combination of data, sound, speech and picture communication. They will for sure be of benefit as well as cause problems to VIPs.

Text telephones should be accessible as well (for deaf/blind people), but no good solutions exist.

Terminals for data retrieval are becoming more and more widespread (eg Minitel-terminals in France), but their accessibility is being hampered, not least because of the mixture of text and graphics on the screens.

The worst example is the broadcast or video-recorded TV programs, where often pictures play an important part, and VIPs may get completely lost. Sub-titling may help to some extent, if this could be converted into braille or synthetic speech.

To some extent, terminals are used for very special purposes. One example is telefax machines being used for the transmission of documents from blind individuals to a "reading centre" where sighted persons read the text and describe the pictures via a telephone connection.

A final example may be the way of providing newspapers via the telephone or radio network. There are several methods, ranging from a continuous reading by sighted volunteers over special radio channels to access to the full content of the newspaper text in digital form. In the latter case one can make use of the telephone network, cable TV facilities or radio transmission and have the information stored and retrieved in a special terminal in a blind person's home.

Remarks

The overview above is not very systematic and far from complete. It shows however, that the concept "terminal" takes many shapes.

A critical point is the speed of development in general. It's likely that the problems experienced today will increase over time as the technical development goes on - if certain steps and measures are not taken. Standardization belongs with these steps together with research, development - and perhaps even legislation.

Access to Public Terminals by Blind and Visually Impaired People in the US

Elliot Schreier
American Foundation for the Blind

Finding various types of terminals is a significant problem for blind and visually impaired people. Identifying various slots for card and money insertion further complicates access. Cards must be inserted in some machines and passed through a slot in others. U.S. currency must be inserted in one orientation for acceptance into the machine. Ticketing machines are located in different areas of bus and train terminals. Once a ticket is purchased, the person must locate the turnstile and slot for inserting the card. Timing is critical; the barriers will often open only for a short duration of time. A person with a guide dog might not have enough time to pass through before the barrier closes. The location of monitors for arrival/departure times is usually overhead and difficult to get close to. Physical location of monitors is never consistent. Checkout line displays are usually dot matrix type and located adjacent to the cash register.

Automatic teller machines (ATMs) are becoming the preferred way of banking for many people. There are numerous types of machines which perform similar functions but operate differently. Most people use the machines to withdraw cash, transfer money from various accounts and check the balances of their accounts. ATMs have a numeric keypad and various function keys; information is displayed on CRT screens or smaller dot matrix displays. Some machines provide touch sensitive screens for user responses. ATMs have various slots for receiving the bank card, receiving envelopes and dispensing cash.

ATM centres are now prevalent, where numerous ATM units are set up without any manned teller facilities. Customer service telephones are available for problems that arise during use of the ATM. In many situations the screens change from time to time, presenting promotional news as well as changes to the system.

Transportation ticketing machines are available in train stations, bus depots and airline terminals. These machines dispense tickets to destinations and usually accept cash only. Some machines, such as those at airline terminals, only accept credit cards. Various levels of interaction are required depending on the type of ticket required (i.e. round trip, monthly, daily). Some machines dispense a card worth a certain dollar amount for a specific amount of travel. These machines will accept paper currency and often dispense change. Often the cards issued must be inserted into a turnstile to allow access to the train platform.

Public phone systems have displays to indicate instructions for dialing and echo the number being dialed. Public phones in certain locations accept a variety of credit cards for payment. Typical displays are LCD or green CRT types of screens.

Information systems such as bibliographic retrieval systems in libraries have become computerized. Some universities have bibliographic retrieval systems linked to those of other universities. Access is generally through a CRT screen conveniently located in the library. The systems contain card catalogue information and have a limited command set for retrieving information.

The post office is installing PCs with CD-ROMS attached that contain zip code information. By entering the address into the PC, the proper zip code is displayed.

Convention centres often have terminals for displaying current conference information. Many contain touch sensitive key pads and also display graphics information in colour. This information might contain pictures or maps. The displays can be changed according to the current conference.

Overhead displays, often monitors, are used to display arrival/departure times at train, bus and airline terminals. They are usually mounted overhead, frequently black & white CRT screens. Other types of displays are used for track announcements, train arrivals and gate information. Some of these displays include LEDs that scroll across a panel.

Other public displays include grocery checkout terminals that display price and item information; keypad access for security system to homes and hotel room and office technology such as xerox machines and fax machines.

Access Issues to Interactive Machines

Once the physical location has been determined access to the machines themselves needs addressing. On ATMs keyboards are used, either membrane or tactile. Calculator style or phone style layouts for numeric pads are used. Additional keys are used for various functions. Numeric keypads are not a significant problem; verification of information entered is what is needed. Other ATMs use touch screens which are not accessible at all. Synthetic speech and/or enlarging the image or the CRT screen are likely access modalities.

The cards used for ATMs may have user identification encoded on them. In a bank in Hawaii the card contains information about the user so the screens can be switched to Japanese if the card identifies the user as a Japanese speaking person. A user card can be used to alert the machine that a blind or visually impaired person is accessing the machine. The machine can then go into synthetic speech or enlarge the image on the screen. Synthetic speech can communicate the information that appears on the screen. That can be done via the customer service phone or headphones and can be used to allow complete access to these machines. Currency dispensed is usually in two denominations; perhaps the user can select certain denominations or the machine can dispense currency in a known sequence. Cards have raised numbers on them now so orientation to the slot can be achieved without too much difficulty. A person will usually perform the same types of transactions. With repeated use, transaction time can be minimized - which is of great concern to banks.

Ticketing machines for trains and buses require a different level of interaction because currency is received, change is dispensed, and transactions vary considerably. Machines can have an individual key for each type of operation or a keypad for entering information. On some machines a card is purchased for a specific amount. Enhancing the image of both the display and the keyboards is one approach.

Currency orientation is a problem. The machine will only accept bills in one orientation giving the user a 1 in 4 chance of getting the bill in properly. Some machines accept credit cards and bank cards. Change is usually dispensed in coins, not bills. Synthetic speech could also be used to prompt the user through the sequence of operations. It is likely that some training would be required before accessing these machines. This would hold true of ATMs as well. A user could "walk through" the type of transactions they would like to accomplish on a "dummy" machine before attempting access to the actual machine. Where currency is required, the alternative of bank card or credit card should be available. Once again, a "smart" card could identify the user's disability and switch the machine into an accessible mode. The tickets dispensed are printed and can also be the magnetically encoded type that need to be inserted into a turnstile and then retrieved. There can be tactual marks to identify the proper orientation.

Phone keypads are fairly standard and do not present a barrier. Some keypads in hotels are membrane types and are a disadvantage to ablebodied and disabled people alike. Cards to charge calls are passed through a slot at the appropriate time. Standarization of slot location and orientation of the card can be accommodated without much difficulty. Displays need modification concerning colour and size for access by visually impaired people. Once again synthetic speech output can be used.

Future Issues on Public Terminals

The movement towards broad band communication systems and future database linkages will make the use of ticketing systems and phones more sophisticated. Graphics will be used extensively. Ticketing machines will be multipurpose; one machine may be used to buy a train and theatre ticket at the same time.

Graphics presents a real access barrier. It is likely that a multi-mode approach of tactile, enhanced image and voice is required. Methodologies for presenting information through various modalities need development. The techniques for graphics presentation will affect access to PCs as well. Input mechanisms such as voice recognition are likely to assist blind and visually impaired users.

User cards will be encoded with information that could be used by ticketing machines and ATMs to select various features and functions automatically. The user card can be encoded with information concerning a person's visual impairment and switch the machine display to enhanced image or synthetic speech operation. As databases get linked together it is possible that one "smart" card could be used at various types of machines. The choice of high contrast colours would assist visually impaired users. Artificial intelligence techniques can anticipate a person's requirement based on past usage.
As broad band communication systems get developed, specification can include disabled user needs. In addition, data can be routed to utilities for pre-processing according to disabled user's needs.

Public terminal technology is increasing rapidly; careful planning at the design stage can ensure access by blind and visually impaired people.

Overview of REACT

Ms Gill J Whitney
Royal National Institute for the Blind, England

The idea of a Remote Activator or REACT system was originally suggested at the 1987 conference 'Network Terminals for the Visually Disabled'.

Increasingly people are having to make use of machines to function in normal life. Ticket machines, card entry machines, electronic displays and cash dispensers are now all standard items in most towns. Visually impaired persons are likely to have considerable problems with these items of new technology. One area that may cause major problems is the use of public transport which will become increasingly difficult to access as the use of ticket machines and public displays becomes mandatory.

This paper is about one way of overcoming some of these problems. If visually impaired people could indicate their presence to the various machines, the machines' behaviour could be modified to take into account the special needs of the user. A system which could be triggered when the person is still some distance from the machine would be useful. The machine could then make a sound to indicate its presence. It could also operate in a more user friendly way by for example using speech to issue its operating instructions. The REACT or remote activator system is intended to be such a system.

REACT is needed to overcome the limitations of automation which affect visually handicapped persons. When a ticket clerk is replaced by a machine some of the service needed by a visually impaired person is lost. The aim of REACT is to restore some of that missing service. The present social climate throughout Europe is to replace more service staff by machines. Also additional services can be provided by machines, for instance by operating antisocial hours. A system such as REACT will therefore become necessary in the future.

The system would consist of two parts - a portable tag carried by the visually impaired person and a stationary transmitter/receiver or transceiver. The transceiver would be located close to and connected to the machine concerned.

One possible example of a system which could be made to "REACT" is a public transport ticket machine. A REACT transceiver could be situated adjacent to the ticket machine. When a tag comes within the range of the REACT system it would trigger the machine to behave in the required way. The ticket machine could become useable by a visually impaired person by audibly signalling its presence and using synthesised speech to issue operating instructions. A REACT system used in conjunction with other design features such as good contrast and textured surrounds would be most useful.

At present many stations use large scale visual display units to indicate the destination and time of the next train. These are of no use to the majority of the visually impaired. By the use of a REACT system and a speech synthesizer the display could be made to speak its information, when a visually impaired person carrying a tag came within range.

The tags would be either worn as a badge or carried in an outside pocket. They would be approximately the size of a credit card, light in weight and either passive, or with easy to change batteries. They can be packaged to provide the robustness required. Existing systems using similar tags have shown that they can be made to withstand normal wear and tear. The high temperatures of professional laundries can damage the plastics used in electronic component casing.

The main part of the system is the fixed box containing the transmitter, receiver and the trigger to the system to be REACTed. This part of the system would be located beside the REACTed system, in many situations being fixed to the wall alongside the existing system. It would be powered from the original system.

The Tag and the Transceiver are the technical basis of the system. The specification for their design depends on the use to which the REACT system is put. For each application of REACT the minimum and maximum useful ranges must be evaluated. The transceiver can be set up to have a range of one to two metres. The range for many examples would be slightly larger than the width of the pavement. This would enable a person walking along the pavement to locate any REACTed machine on the pavement or on the wall beside the pavement. For different applications different power transceivers could be used with the same tags to minimise the running costs. It is possible that for some applications a REACT system may not be able to provide the range needed due to power requirements. A modern shopping precinct is too wide to enable a REACT system to be used to find a machine on the wall when the would be user is standing in the centre. Not only is the radio signal too small for the tag to be recognized, but a location signal would have to be so loud as to be impracticable.

As well as the two parts of the REACT system the machine concerned must be adapted by the addition of a modification box.

The reason or justification for having a REACT system is the machine to be adapted or REACTed. The expense of REACT is justified if it either enables a system to be used by a visually impaired person when it previously could not be utilised or sufficiently increases the user friendliness of a system. Although individual adaptions could be made to different designs of machine it would be more economical to have a multi purpose adaption "box". Various designs of adaption boxes could be produced, in effect a modular system would be created. This box would be controlled by both the transceiver and the REACTed machine.

Various methods of achieving a REACT system have been considered. They were compared on cost, physical characteristics of the tag, range of transmitted field, and other factors. Two systems which appeared to fulfil the majority of the requirements were an adaption of a shop security system or an adaption of a radio pager.

The first method of achieving a REACT system studied was an adaption of a shop security system. Shop security systems consist of plastic tags attached to the protected goods and a transceiver and alarm system at the exit to the shop. The transceiver triggers the alarm if an attempt is made to remove a tag from the shop. These were initially seen as the most obvious choice. A system consists of two parts. The first part consists of a stationary low power radio frequency transmitter and receiver. The second part is a small passive device or tag. The tags are not strictly passive as they are powered remotely from the transceiver. The tag is normally connected to the item of clothes or goods which are to be protected but in the REACT system they would be worn as a badge or carried in the pocket of the visually impaired person. These systems are used in shops to protect merchandise and in hospitals/nursing homes to stop patients wandering. The systems utilise a method of permanent transmission at radio frequencies. This reduces the cost and complexity of the tags.

Another possible method studied was an adaption of a radio pager. Radio pagers normally operate by alerting the wearer of a call or message. They operate in one of three modes as a tone pager, numeric pager or message pager. The pager does not communicate back to its base station. Without a method of transmitting in both directions they would not be suitable for a REACT system since the tag must activate the machine.

For this project the radio pager chips would be utilised such that they formed part of the tag, but the tag would operate as a radio receiver and transmitter. The tag would therefore have to be battery powered. This would make the tags more expensive to use and difficult for people with restricted use of their hands. The extra design work for this approach and the need for a powered tag makes this a less attractive option. But it cannot be ignored at this stage.

An initial evaluation of a shop security system took place at the RNIB offices in London. The purpose of this test was to ascertain whether any normal road or pavement traffic triggered the system. To test the mode of operation sample tags were carried past the system by members of the RNIB staff. Tags were also carried past attached to white sticks and guide dog harnesses. This evaluation will assist in the formation of the technical specification of a REACT system. Further research into the social aspects will have to be undertaken.

For the system to be acceptable to the clients the tags must be shieldable when not required and active at all other times.

For the final system a different frequency to the shop security systems will be utilised so that the users do not set off every security system that they go past.

The costs of a system would be cheap for the tags and of the order of thousands of pounds for the transceivers. The costs of adapting the machines to be used with REACT can not be easily evaluated. The cost will depend totally on the adaption and the connection circuitry required.

A REACT system is technically feasible. As the number of public access machines increases the cost per REACT system will come down. The cost of synthesised speech will get cheaper. The cost of radio power generation is unlikely to get cheaper.

The possible sites for a system such as REACT can not be easily evaluated, as well as transport REACT and bank REACT there could be supermarket REACT and even tourist REACT.

An ideal REACT system would be part of a composite system. The machine could have a contrasting colour surround and be designed for ease of use of all the population. This will require considerable cooperation from the owners of the different public access terminals.

Consumer Views on Partially Sighted People.

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The problems of the totally blind are well recognised by the lay person. He merely has to shut his eyes to understand how difficult it must be to live in a world populated by sighted people. Also, he believes it is necessary to use other sensory systems such as hearing or touch to acquire information.

In Europe over 90% of the people recognised as blind are continuing to function to a greater or lesser extent using their sight. The visual capability of persons within this group can be anything from an image blurred to the point where mistakes are frequent, through to people who hardly have form vision The actual effects of the disorder may be very variable in themselves, and it is barely an exaggeration to suggest that no two visually impaired people perceive the environment in precisely the same way.

My own responsibilities include what is probably the largest Low Vision Clinic in Europe and I am in daily contact with a wide spectrum of visually handicapped people. I have therefore prepared 'first person' accounts to illustrate the difficulties that might be encountered by two fairly typical people in a normal day, using terminals of course. Problems like these are mentioned frequently in my clinic:-

Example 1) Businessman mid-fifties.

I guess as visually handicapped people go, I am really very fortunate. They told me, when I developed diabetes in my twenties, that I might have eye problems; and I am fortunate that my business is now well established. My secretary often acts as my eyes, and I have ensured that my terminal of the firm's mainframe is placed in the best position for me It is connected to a CCTV reader, so that so long as stuff is accessible to the computer I can magnify it as much as I like.

I know my route to work pretty well, though the introduction of new ticket machines at the station has made life very difficult for me, and it proved simpler to buy a season ticket than wait in line every day.

Today I am off on an international sales trip. My first major problems come at the airport. They have put the screens where I cannot possibly see them, it is quite impossible to get close enough to them and they are not very well placed either, so far as external light is concerned.

Later I find that the telephone in my hotel bedroom has an unfamiliar layout and, of course, I cannot read the instructions on how to operate it. At the host organisation I find some of the screens quite impossible on the local computer and wish that I had some special personal gadget that would adapt them to my optimum character size.

Example 2) Lady aged 70.

I guess that at my age I am fortunate that the only real problem I have is that my central vision is now so poor that I am unable to see any detail on things, but I am determined to maintain my independence and continue to live alone.
Today I am going to do a little shopping, and then go to see my daughter. I need some extra cash, but I find that even with my magnifying glass I cannot use the cash dispenser at the bank. The display is just too difficult for me, I cannot see the numbers I am tapping in, the people waiting behind me get very annoyed when I delay so I have to make certain that I get to the bank when it is open. The same thing happens at the Underground station. I cannot use the new machines and have to queue up to buy an individual ticket. I know that there are some systems now that are completely automatic, and I very much fear that I will not be able to travel at all if they become more widespread. In the supermarket I really have to trust the checkout girls not to make mistakes, the display is impossible for me, and I really hate to ask for help all the time. They tell me that soon I am going to be able to shop from my armchair at home using my own TV, but I can't read the captions now, never mind recognise the faces, so I doubt if it will be very much help to me.
The shopping takes me longer than I expect, so I go to a nearby public telephone to tell my daughter I shall be late. The number is very difficult to read with a liquid crystal display so I mis-dial more than once.

These are typical of the every day problems that people who do not work with terminals all the time will encounter. In most countries in the EEC disabled people at work can be provided with extra assistance, but the widespread use of remote terminals has crept in insidiously, so that now almost every manager, clerk and shop assistant finds himself confronting a terminal during his normal duties. There is no recognition for special needs and problems that can occur when people who are quite competent to do much of their job as a fully sighted person in this situation

Certain guidelines are already well understood by workers with the partially sighted:-

Ideally, the image should be white on black with high contrast levels which can be readily modified by the individual observer. He is likely to need to enlarge the character size and certainly he will need to approach to his own optimum position.

Consumer Views of Blind People

Maria del Carmen Bonet Barras
IBM Madrid

1. Introduction

The Communication I introduce on this event has been elaborated by a group of members of the "Advimot", - a Blind People Professional Association. All of us are integrated in the general work market, and are related with Informatic Data Processing and, generally speaking, with new technologies: Analysis and Programming, Computer Assisted Design, Stenography, Telephony.

The ideas that we expose here are the result of a discussion between us in which our opinions were supported by our own experience.

Working permanently in contact with the technological resources and inside the general work market frame implies competitiveness and the need of permanent education. That is why we have special sensibility in relation to the importance of a careful planning and coordination when solutions for blind people's access to technological resources are proposed to the proper organizations.

The wide range of possibilities offered by the new technologies from the point of view of blind users, has made it difficult for us to choose a specific subject, but due to economical reasons, our association has only a few resources, and the fact of being under time pressure, has forced us to put aside such interesting subjects as Marketing Research or the Evolution of the current Spanish environment.

We are going to centre us in an opinion article in which we want to treat certain points that we wish will contribute to the definition of the course of action (basic lines of action) to follow in order to solve in a satisfactory way the problems we are dealing with at this time.

2. Action Approaches

Following down, we propose some general action approaches that in our opinion should configure an efficient and logical politic in order to meet our objective: "The approach of the Data Processing and the New Technologies to the handicapped end-users".

a) Participation:

When designing an informatic product for handicapped people, it is of vital importance to consider the end-user's opinion, during the process of its development: awareness of needs, problem definition, solution research, prototype validation.

Following our discussion, it should be desirable that some blind people were selected because of their own training and capacity so as to participate in the technological adjustment work for the blind, getting integrated in technical groups or in resolution teams created for each case.

b) Effort Rentability

It is not in our mind and it is less our intention to ignore the social reality in which we are moving around - a free market society where every firm may introduce those products that it is able to sell to the public. However, when this free market activity is directed at a reduced and unwealthy collectivity, this activity can turn against their own interests.

Research involves an effort in time and money that must be made profitable through sales.

In order to get this profit, the prices of the manufactured products are too high, which makes it difficult for these small collectivities to buy them, this may result in a very poor sale, which by the way may lead to a manufacturing blockage of these kind of products (adjusted equipments for handicapped people).

This is a problem that we believe already exists. Looking upon this complex situation we think that it is reasonable to plan a coordinated effort in order to avoid product duplication trying to get profit from doing a correct evaluation of the existing fundamental product components in order to be able to determine the basic lines for Research and Design, this not meaning in any case a closed mind to new ideas.

c) Finances:

Because of the social nature inherent in this discussion, handicapped people as social elements as they are must reach in society the highest possible integration level, from which the same society will get the best benefits.

We understand that each country along with International Organisations such as the EEC must assign a part of their social funds to cover the price increases derived from the technological equipment adjustment for the use of handicapped people, not as an individual loan but as a subsidy for the prototype designs and their commercialization.

d) Price Regulations:

As the acquisition of specialized technology is not optional but a real need for handicapped people, we believe that this technology must be exempt from any kind of taxes. In the same way it would be interesting to establish some kind of approach about selling prices in all countries in the EEC.

e) Research:

We think it is fundamental to fully use all the resources that technology offers to adjust or design equipment for handicapped people, leaving specific technology for those cases that do not allow any other alternative.

In any case it should avoid any kind of exhibitionist design thought more in order to get public attention than to get any true improvement in the technological equipment adjustment for handicapped people.

f) Technical Homologation Approaches:

It would be convenient to be able to get an homologated normative that would provide new equipment with compatible complements on standard adjustments basis.

g) Diffusion and Awareness:

Information through the Mass-media becomes more and more relevant and powerful nowadays.

We think it is convenient to take advantage of these resources to make society aware through them of the real possibilities that handicapped people could get from the New Technologies in order to smooth and even suppress the difficulties derived from their handicap.

We believe that it would be of the highest importance to dedicate special attention to the Information, Management and New Technologies in Education Plans including specific programs in order to get children closer to these subjects. We think this would contribute to the resolution of many problems that adults must face every day.

3. Some Practical Questions.

Now, we are going to point out some real difficulties that we can find anywhere in a common daily development of our living and working.

a) Input Data:

Thinking on the way information is entered in computers, or, generally speaking, in any kind of machines with electronic components, we may talk about three aspects:

a1 Keyboards:
When we think about the difficulty for a blind person in using a keyboard, we can say that this is not a real difficulty, because, after a short training, this person is able to write without any kind of help, but what is much more complicated, is to be familiar with a lot of different keyboards at the same time. That's why we consider it very important to get a standard for keyboards. By the way, we are sure that it would be very comfortable for sighted people too.

a2 Sensors:
The use of sensors, smooth sensitive surfaces, in electronic machines, is nowadays growing very quickly, visual marks are put on them, lights, graphics, icons, labels.., just looking at them, it is possible to press on the right place, we, blind people, can't use these machines at all, and we are convinced that it is not really very hard to find solutions for these problems, even more, in many instances it is absolutely simple. When the sensor is just a numeric keyboard, tactile signals can be placed. For more complicated, situations different audible tones may be implemented, we think it has been discovered, for instance fruit machines and many toys have those kind of signals. If these features are studied and

installed during manufacturing, it would probably not represent an important increment on the price. On the other hand, most of the times, beauty and practise, may go together.

a3 Optical pens, mouses, digitalizing tablets or sensitive screens:
Other kind of systems for entering information in computers are sticks, mouses and so on. They are very attractive, as we know, but problems arise: software prepared for their management often makes useless systems already implemented so that blind people could use computers. For example software developed for talking cards is not compatible with those systems.

It would be desirable to obtain some kind of standardization for the development of this special software, in order to avoid, the need of having just one adaptation for each product in the market. Of course, we do not think about putting limits to research, but, perhaps, it would be interesting to define some basic rules to simplify this important problem.

b) Output Data:

We find every day at least one or more features which give us some written information. Although blind people are sometimes able to use those features, it could be much more comfortable for us, to know all the information they give. In this way, the risk of mistakes would be reduced and the unexpected situations could be avoided. We think that it is possible to associate some recorded information, or digitalized voice, or so, in these sort of devices. It is actually easy, we think, to get a spoken copy of each menu. We cannot say the same about the possibility of doing this, with the user's answer, in any case, most of the time the number of different answers is limited even, probably low, so, we consider it not too difficult to analyse and to read in voice these answers.

These kind of dispositives ought to be optional, that is to say - they could be used or not, depending on the user's will. For example, pressing a button or not, perhaps just with a connection for headphones, and this way, we will get an advantage - nobody else can hear the information.

Although we are mainly dedicated to study the access to advanced technologies, we would like to point out, something very important for us - recorded information in cassettes and printed braille, the oldest systems used to adapt books or any other information for blind people, were, are and will keep on being, absolutely necessary and actually important for us.

Big solutions like computers, scanners with optical character recognition, and so on, would never be so friendly as a braille printed book is.

That is why we think that the responsible organisations in each country organised depending on their possibilities should give the necessary support for attending those kind of transcription when it is convenient.

Finally, just for closing the speech, we want to express here something to think about.

Blindness is not a reason for people to be limited to make only a few and simple activities, we are able to earn our bread and butter, in a large number of different jobs. We ask society what we think is actually a right - the opportunity of showing this.

Many of our difficulties are only functional ones, not real difficulties. General international agreements on the standardization of those signals commonly used, such as telephone tones, telephone numbers of public services, traffic light sound, and many others, would reduce those kind of difficulties to a minimum.

Hearing is the only sense open at all times, it does not need to be directed to a concrete objective, nobody can touch anything more than two metres away, and nobody can see what is behind him. But everybody can hear all around him, so we think it would be interesting, not to substitute audible signals for visual ones, if it is not really necessary.

We want to finish offering you our collaboration anywhere you consider it could be convenient.

Consumer Views of Deaf-Blind People

Sari Isaksson
Finnish Central Federation of the Visually Handicapped

Some Information of My Studies as Deaf Blind

I am studying a computer programmer course at the Vocational School for the Visually Handicapped in Espoo (close to Helsinki). So far I am the first and the only deaf blind student studying this course in Finland. Normally this course takes time, two and a half years including half a year general period of business studies and two years period of programming.

My problems:

The biggest problem in my studies I meet is getting all kinds of information. Most lessons are written down by students in Braille, there isn't much books available. Teachers are giving lectures by talking and it is difficult for me to follow the speech in the help of my personal interpreter of sign language and afterwards to write down everything the teacher has told.

All the other students are visually handicapped and when attending lectures they can write down everything in Braille at the same time.

Although I can read very easily from lips, it is difficult to follow lectures with the help of lip reading.

Written text I can read at present both in paper and on screen. There is some problem for me in colours of monitors; they are not necessarily good for my eyes. They become overstrained very easily because of the dazzle and exact working at computer terminals.

In the very beginning, teachers were not firmly convinced that I could succeed as deaf blind in this course and there was quite a lot of pre-conceived attitude against my possibilities, but now in the long run they have disappeared. I hope I could finish my course this spring.

Network Evolution Towards ISDN

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The combination of digital transmission and switching systems is presently underway in many countries, based on the recommended 64 Kbits/s channels with the capability to carry both voice and data.

The ALCATEL System 12 Digital Exchange is a fully digital switching system with fully distributed control. Instead of control at the centre, control logic resides in discrete, easily handled units throughout the system. Thus there is no longer any single point in the system where most of the memory is stored or most of the logical functions are integrated.
This method of control offers a number of major advantages; the straightforward addition of features, smooth cost profile during expansion, flexibility in operation, and acceptance of further features in future. At the same time advances in large scale integration (LSI) chips have made distributed control arrangements practicable and economically advantageous.
This system is now poised to exploit the full benefits offered by integrating digital line extensions to subscriber premises. Such enhancement has been made possible mainly by the concept of distributed control. By allocating control processing and memory facilities to the terminals and to the individual switching elements several aims were achieved.
At present, when an ordinary telephone subscriber is connected to a digital exchange, his (analogue) voice must be converted into a digital form before it can be switched through the exchange. It then becomes possible to transfer speech (encoded according to the A-law) and any kind of data via a 64 Kbit/s channel. This is the result of technical investigations as to the highest digital transmission speed which can be achieved over normal telephone pairs already wired into domestic premises. The two most important kinds of access channel are the following:

- basic access channels and primary access channels.

The basic access channel is composed of two B-channels at 64 Kbit/s and one D-channel at 16 Kbit/s (2B + D).
The two B-channels are independent, this means that they can be used simultaneously for different connections and different services (in other words, the B-channels are handled in a circuit-switched way of operation). The D-channel carries signalling information between the user and the exchange; in addition, it can carry packet type data (p-information) and telemetry (t-information). While the B-channels are assigned to a specific terminal for the whole duration of the call, the D-channel is shared among all active terminals (that is to say the D-channel is packet switched).

The primary access exploits the European primary rate multiplexed channel structure at 2048 Kbit/s; such a speed cannot be reached over existing copper pairs, but requires either coaxial cables or optical fibres.

ISDN Network Capability

In the System 12 Digital Exchange the addition of new services can easily be achieved by the addition of new modules

The ISM (ISDN Subscriber Module) directly interfaces digital lines at 144Kbit/s each. Each digital subscriber will have a number of terminals, each of which is connected via a specific TA (terminal adaptor) to the NT (Transparent Network termination for STAR distribution). The TAs have the main functions of translating the terminal interfaces (R1, R2, R3 and R4) into the common standard S interface. The LT at the exchange side and the NT1/LT at the subscriber premises contain the same transmission functions with respect to the digital line.

Another important module is the Packet Switching Module which has been developed for the handling of X-25 terminals, therefore it can be considered to be the gateway to the Packet Switched Data Network.

These two modules can be considered as the most important in the evolution of telephone networks, the ISDN can be considered an important evolution of telephone network because it makes use of end-to-end digital connectivity integrating new services which are digital with the telephone service which requires A/D conversion.

This means that it is possible to use different terminals to integrate more services to avoid the proliferation of separate networks for each service. In fact: digital telephone, teletext, facsimile terminals and personal computers can be connected to the system digital exchange.

In theory, an evoluted telecommunications network can offer a wide number of services each one characterized by its peculiarities. According to the OSI model, services are provided using both standardized interfaces and protocols involving appropriate network functions. So, services like facsimile and telex can be easily carried on the existing telephone network, while electronic mail and videotex services require a certain degree of specialization of the network.

Step Toward an Integrated Wideband Network

Main telematic services, like videoconferencing and videotelephone, are being considered as principal candidates for wideband applications. In terms of implementation, telematic services strongly impact on actual system architectures so that the Broadband ISDN will be the logical enhancement of the narrowband ISDN.

Future Technology Applicable to "Smart Housing" for the Blind

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Introduction.

The "intelligent house" or the "smart house" is considered to be a modern concept. The basic notion is that one supposes that the use of microelectronics and computing will allow more optimal situations. It is thought that putting intelligence into the house itself will help the habitant/dweller of this house in his functioning. This paper will review the intelligent house and especially what aspects might be relevant for the visually impaired. Before that, a few words will be spent on intelligence put in technology.

Whose intelligence.

To define precisely what intelligence is, seems to be a difficult job. It is seen in the research area of artificial intelligence that difficult problems like computer chess-playing is defined as an intelligent job. Until somebody succeeds in designing a computer programme which does this job. Then the computer programme is seen as a set of rules and iteration loops. Human chess-playing is still considered intelligence. Thus, it seems that intelligence could be defined as something which is solely related to human thinking, intuition, reasoning. Human intelligence, whatever it is, can be and is used in designing products, systems for years and decades and centuries. Putting intelligence into a product as a manageable part of that product ("active intelligence") is new. This paper is not considering intelligence to make products and systems, but only the active intelligence. This process of artificial intelligence can be considered as the design and development of a model of a relevant human activity or function, like planning the cooking of a meal. This model is converted to a computer programme and is then available for use.

A fundamental question is whose intelligence is taken as the example to be modelled. Is it the blind user of a house, is it the intelligence of the therapist, physician or rehabilitation engineer who should know how it is done, is it the intelligence of a caregiver, friend or member of the family, or, is it based on aggregated knowledge of researchers? A well-known cartoon illustrates this problem. The cartoon shows a policeman who is telling a guide-dog where to go with the blind person. If designing a electronic guidedog, should it be based on the policeman's intelligence, the dog's "intelligence" or the blind person's intelligence?
Of course, the answer depends on what function is required. In case of a "literal" version of the dog, the intelligence of the dog has to be modelled: the function obtained is a machine which "listens" to the blind persons instructions. If the function which a map gives has to be provided, the policeman is the basis for the model. Finally, if a system is needed which takes care of collision avoidance and direction guidance, it is wise to make a machine which is based on and complementary to the blind person's intelligence.