

MULTIPLEXED AUDIO/DIGITAL SERVICES FOR THE BLIND, DEAF AND DISABLED

Glenn Ralston
Donald Kendrick
Alar Kruus
Thomas Freebairn
David Othmer

In our 600,000 hour lifetime, future adults will have typically spent 50,000 hours watching TV. Some of these 50,000 hours will of course be of considerable quality--most will be "more of the same."

In order to accomplish this feat, we have presently supplied ourselves with 100 million TV sets (and have already junked an equal number). Today, somewhat more than half of these are color; approximately 65% of all US households will have color TV this year (Japan will reach 75%). Thus, the ubiquitous color CRT (cathode ray tube) has become one of America's most common household instruments.

These simple industrial facts may portend an elaborate arrangement of individualized home information services tied into the conventional TV receiver as the home CRT display screen, and presently a number of prototype community information utilities are in various stages of development. Some use regular telephone circuit to dial up a computer sharing resource. Others are shaped similarly around the greater communications capacity of a local CATV system. 13% of US households are now on CATV (with an average penetration of about 54% of homes passed) and by 1984 perhaps as many as 40% of all households will be wired.

Whatever the particular variations in format, it appears that:
--the technology of cable communications is inevitable,
--the impact is already beginning to be apparent,
--we must shape it for humanistic concerns.

The following then is a brief description of the proposed audio multiplexed system which provides 96 access tracks to cultural, educational and general interest information that could be made available to eligible users at their residences or at services centers such as libraries and hospitals over a regular CATV system that accomodates this proposed sort of quasi-institutional use channel. The New York Public Library has assisted in presenting a limited demonstration of these services at their Inwood Branch. They are exploring the feasibility of another temporary installation that would provide a larger

area for the ad hoc committee to work with potential users. We anticipate that various organizations will help in assessing the needs of handicapped persons so that the system itself can be responsive and easily manageable by persons with differing disabilities.

The objectives of these proposed demonstrations are presumably to determine whether telecommunications may offer some promise of economically delivering compensatory services to the handicapped, and further, whether telecommunications are an effective means of outreach to the socially isolated.

It may be important to consider whether the proportion of eligible clients that would be served within a particular community is modest or large in relation to the total population (usually somewhat more than 5%). We note for comparison that the utilization of any one of the lesser watched Cable TV channels out of 20 would usually capture an audience ratio of less than 1%, being those people actually watching a typical limited interest program. More importantly, because of its dual qualities of outreach and significant capacity, this communications capability enables compensatory services to be offered to those of us who are unfortunately deprived of access to cultural and community resources by virtue of lacking normal mobility or lacking normal sensory powers. Our Federal and State guidelines have established the principle that parity of access to public resources is a basic right of all.

Descriptively called "AUDIO 96," this broadband communication system has the capability of transmitting and receiving up to 96 tracks of audio and digital information on a single 6 MGHZ TV channel, utilizing standard microwave and CATV distribution equipment.

This system offers a cost effective way of delivering full-scale audio information with a high degree of selectivity, from a custom designed audio library. The audio library can be divided into various categories, with selected subcategories, such as the following examples:

I EDUCATIONAL

- A Career Development
- B Special Education
- C Academics
- D Foreign Language

II CONTEMPORARY WORLD

- A World Affairs
- B Perspective on America
- C Changing Culture
- D International Shortwave
- E Consumer Information

III SPECIAL INTEREST AREAS

- A Novelty
- B Sports
- C Cinema & Theatre
- D The Arts

IV MUSIC

By reformatting the audio tapes to master reels, the system all but eliminates the need for the individual user--who desires special interest programs--to have on hand countless and expensive audio cassettes or reel tapes, which are inevitably lost or erased mistakenly. There is also the elimination of tape playback units which are costly.

Selective access is provided by special "channel time-frame techniques" (time division multiplex). Since the system has a channel selector to handle programming for the 96 tracks, it can actually eliminate the need for tape players. The channel selector offers the flexibility of 96 programs within one time-frame, making it possible for any eligible person to choose his desired material in his home or residential facility.

This system is made up of four basic units: 1) an audio player, 2) a transmitter, 3) a broadband distribution net, 4) a track selector and receiver unit.

1) PLAYBACK UNIT: Because of the multiple input requirements, a special audio input will be used which has a unique format. The usual method of providing the audio source would be to input a standard multi-track audio taped output into the transmitting unit; these tapes would provide the audio signal as an analog source; the standard reel-to-reel format

would have been used. In place of this standard analog input, this system will provide the audio to the transmitter in a digital format. The information will be placed on a standard one-inch video cassette tape, to be played back using the AUDIO 96 Playback Unit. This format provides all 96 tracks of audio data as one tape source, thus eliminating the number of playback units required for source information. Locally selected programming, scheduling and sequencing will be easily provided by the selection of audio source tapes that can have different programming sequences provided.

2) TRANSMITTER: The AUDIO 96 Transmitter will be installed at the Cable TV studio or distribution studio from which the audio materials will originate. It is designed to handle from 6 to 96 tracks of programmed materials for transmission. The transmission will utilize one video bandwidth channel on the microwave link or cable.

3) NETWORK: A conventional CATV system, omnidirectional or point-to-point microwave serves as the distribution network.

4) RECEIVER & CHANNEL SELECTOR: In the AUDIO 96 Receiver, the transmitted signal is detected, demultiplexed and made available through the individual track selectors. The individual user equipment consists of a small box with a selector switch, volume control, headphone jack, audio output or speaker. The track selector is integral with the receiver and operates independently of any of the other user selector units.

In consultation with potential users, the terminal equipment would be designed to achieve the greatest ease of use for those with different disabilities.

Thus far the development of program requirements included the participation of the following organizations: Eduplex, Inc. (Technical Design); New York Public Library and the Deafness Research Center (Software Programming); and The Mayor's Office of the Handicapped (User Orientation).

DIGITAL COMMUNICATIONS FOR THE DEAF AND FOR THE BLIND:

It is expected that several of the audio tracks could instead be utilized for digital

character generation for subtitling the regular television programming to be read by the deaf. A standard video field grabber would intercept and momentarily hold the character display. Additional tracks could also be utilized for programmed remedial literacy courses for the deaf in response to a characteristic need of this disability.

As you may know, the Deafness Research and Training Center in New York has been exploring the ability of television to more effectively meet the needs of the hearing impaired population. Some 15 or 20 major urban areas do originate programs which have some signing for the deaf, including 8 or 9 that routinely sign the news. Another 30 or so areas carry signed programming when made available to them. Signing is easier, cheaper, and quicker than captioning, but a relatively minor proportion of the hearing impaired community are able to understand the sign language. Of the 13.4 (6%) million hearing impaired, only 1.8 (.9%) million are totally deaf, and signing is used by about 95% of the smaller number. Captioning then reaches everyone, including those with normal hearing. But captioning that is received by everyone can be irritating to some.

"Closed" captioning is being developed in cooperation with PBS and can be broadcast under temporary and experimental FCC authorization and only received by the user's decoder (\$100). A similar effect can be achieved over CATV. In a limited survey of deaf people (who were TTY users) in the New York metropolitan area, 75% of the respondents "enjoyed" a partially captioned WNET Christmas program. Of these, 53% preferred both captioned and signed, 44% preferred captioned only, and 3% preferred signed only (Freebairn, 1974). Captioning as we noted, is much more time-consuming and therefore more costly.

As we understand it then, captioning does have widespread utility in the mass communications mode of broadcast TV. But captioning is also the graphic mode used by the TV Phone for individualized and point-to-point interactive conversation by the deaf. The TV Phone has a keyboard for output and provides a modem interface to adapt the home TV receiver into a CRT character display. Connections with other users are made over conventional telephone dial-up. The TV Phone is compatible with the teletypewriter (TTY) and is also compatible with the conventional 8 baud computer access terminal. It is not unlike the conventional

office keyboard CRT teleprocessing display terminal, but differs in that it adapts the home TV receiver instead of providing its own CRT. For these reasons, there are understandable tradeoffs between cost and reliability.

It would appear that the only relatively large demonstration of the TV Phone was administered by the University of Massachusetts with 40 sets in the New York area and 30 sets in the Boston area. This demonstration has recently ended. The results seem to have been mixed, and most observers felt that the six month duration was a severe time constraint and that the number of users did not establish a sufficiently large "environmedia" for significant extrapolation of user experience. A number of additional observations, characterized by respondents as intuition, were offered: The use of TV Phones does awkwardly tie up a home TV receiver during phone calls. If the set is not a large model solid-state device, clarity of image suffers, and the warm-up time on older sets is inconvenient for incoming calls. The unexpected expense of telephone bills had a discouraging effect on some deaf users. The level of quality control on these 100 prototype units forced some deaf users to be displeased with their experience of interrupted service. Some of the apparent advantages of the TV Phone over the TTY were its faster operation (more useful for computer access), quiet operation (doesn't bother one's family), and is relatively moveable.

It was also reported that some deaf users expressed that the lack of a written record offered them less assurance that they had understood the communication. Perhaps this reluctance is not unlike the early resistance and critical observations on the invention of the telephone, which was initially considered a useless novelty for businesses because it too didn't provide a written record. There is perhaps considerable unanimity by users on two overall constraints: the devices are still somewhat costly, and their friends and business contacts don't have one with which they can converse (ie, lack of ubiquity).

Of the estimated 6.4 million persons (3%) in this country with visual impairments, 400,000 (0.2%) have no useful vision (Goldfish & Marx, 1973). Only 43 US cities offer comprehensive low vision care even though there are over 800 service organizations for the blind (Scott, 1966).

Rather quick processing of printed resources into either audio or braille format is obviously of great utility for those of the blind who are students or who have professional responsibilities. One proprietary device, the ARTS system, uses dial-up telephone connections to a computer program that takes the output from a standard keyboard typewriter and quickly translates this output into embossed grade II braille. Alternatively, in the voice mode the same system can produce computer generated human speech. Thus, the typist is able to hear what he is typing and mitigate errors. Any "written" material can be composed and edited in privacy with full confidentiality and without sighted assistance. In the same manner, a sighted person without knowledge of braille is able to produce a braille record for his communication. Again alternatively, devices are independently under development that optically scan (OCR) and convert conventional printed material (as well as computer printouts) via photo cells into a computer-generated audio format of "spoken English" (Stereotoner).

EFFECTIVE INTEGRATION:

If one were to then schematically overlay these several different teleprocessing systems that are amenable to use by either the blind or by the deaf, the resulting pattern would show a converging at several complementary intersections, even while respecting the important and considerable differences between individualized and mass modes.

It seems that both the vision impaired and the hearing impaired can benefit from the utility of existing telesensory devices, teleprocessing programs, and telecommunications linkages if there is sufficient ubiquity of these instruments to provide a suitable "environmedia."

LIBRARY OF CONGRESS REGULATIONS: Eligibility of Blind and Other Physically Handicapped Persons for Loan of Library Materials.

A) "Legally Blind"--those whose visual acuity is 20/200 or less in the better eye with correcting glasses, or whose widest diameter of visual field subtends an angular distance no greater than 20 degrees. The degree of such blindness shall be certified by a duly licensed physician, ophthalmologist, or optometrist.

B) "Visually Handicapped"--those whose

visual disability, with correction and regardless of optical measure with respect to "legal blindness," are certified as unable to read normal printed material.

C) "Physically Handicapped"--those who are certified by competent authority as unable to read or use ordinary printed materials as a result of physical limitations.

D) "Competent Authority" is defined as including doctors of medicine, ophthalmologists, optometrists, registered nurses, therapists, professional staff of hospitals, institutions, and public or welfare agencies (e.g., social workers, case workers, counselors, home teachers, and superintendents). Certification of physical disability sufficiently severe to prevent reading or using conventional printed materials may be made by professional librarians or by any person whose competence under specific circumstances is acceptable to the Librarian of Congress.

The reading (software) materials for the blind and physically handicapped, including sound reproducers, may be loaned not only to individuals who qualify but also to hospitals, institutions, and schools and centers for the use of such readers (users).

PROPRIETARY CLEARANCES:

Many of the 50-60,000 titles of software presently available in audio format are produced with proprietary restrictions by about 7-9 national sources. It is contemplated that most, if not all, of these software resources can be cleared of proprietary restrictions if used in full accord of LOC eligibility requirements.

The user terminal can be so designed that only its particular features provide access to these proposed services. The New York Public Library for the Blind and Handicapped would authorize or loan the terminals only to eligible users or certified institutions.

NEW YORK PUBLIC LIBRARY FOR THE BLIND AND PHYSICALLY HANDICAPPED:

This facility serves as a Regional Library for special services of the Library of Congress. Adults and children residing anywhere in New York City or Long Island, who are unable

to use regular print materials, may apply for talking book service at home and at school. Additionally, institutions having eligible residents, students, patients or clients may also be served.

The library also provides four additional services:

a) Information and Referral: General information on, and referral to other agencies serving the blind and physically handicapped.

b) Telephone Reference Service: Simple reference information is given over the phone.

c) Consultation: Advice on making maximum use of Library services and materials is available by appointment to teachers, agency directors and librarians.

d) Promotion: Demonstrations of equipment, information brochures, and applications for service are offered to agencies serving eligible clients.

THE PRINCIPLE OF COMPENSATORY SERVICES:

It is important to consider whether the proportion of eligible clients that would be served is modest in relation to the total population (5%). We note for comparison that the utilization of one Cable TV channel out of 27 (about 4%) would probably capture an audience ratio of less than 1%, being those people actually watching a typical public service program. More importantly, because of its dual qualities of outreach and significant capacity, this communications capability enables compensatory services to be offered to those of us who are unfortunately deprived of access to cultural resources by virtue of lacking normal mobility. Our Federal, State and City guidelines have established the principle that parity of access to public resources is a basic right of all.

CATV'S FRACTIONAL AUDIENCES

If we performed a hypothetical abstraction based upon CATV's economy of abundant channels, rather than scarcity, an array of captured audience percentages might look something like this:

audience percentage	stations	# channels (totals 20)	audience aggregate percentage	cumulative audiences
22%	network			
20	"			
18	"	----- 3	<u>60%</u>	
10	strongest independents			
8	"			
6	"	----- 3	<u>24%</u>	
5	educational station			
4	marginal independents			
2	"	----- 3	<u>11%</u>	
		<u> (9)</u>		<u>(95%)</u>
plus 11 channels, each more or less than 0.5%--		<u>11</u>	<u>5%</u>	
		<u> 20</u>	Totals	<u>100%</u>

It appears to some observers--
admittedly on the basis of unsubstantiated abstrac-
tions--that these latter fractional audiences (11
channels attracting less than 1% each) could not
support standard programming production costs.
Nor are all of these fractional audiences likely
to be attracted by standard production values--
the distancing effect of overproduced programs,
particularly if re-run interminably.

On the other hand, since video is
likely to be an involving experience in these
fractional situations--where viewers or users are
probably highly motivated in their selected
interests--let's retire the shibboleth that all
television experience must be costly to be effec-
tive.

Have I done the world good or have I added a menace?

Guglielmo Marconi

*For all who in a world of untold beauties are consigned
to unremitting darkness,
Here is light.*

Guild for the Blind