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In the discussion so far today, we have concentrated on the capability of the Center to attend to the needs of persons in the learning environment. We have concentrated on the ways in which we can make information transparent to persons with impaired or no visual input. But the Center's tasks include an even larger purview, and I should like to touch upon these in my remarks.

First, we are undertaking a national sample survey of the braille and large print reading public, in collaboration with the American Foundation for the Blind. The results will document the areas in which the current system of provision of braille and large print product is ill served, in quantity, variety, and depth of material. In fact, some of the operating goals and priorities of the Center will be informed, in part, by our findings. Naturally, we also intend the scholarly publication of what we discover.

Second, there are at least three areas in which application of computer techniques can be made which we can pursue immediately - so great are the obvious needs. The first is the provision of tactual graphics: maps and other pictorial representations of the environment. Within a very few months, the Center will have in place a computer-assisted design and production system for tactual graphics capable of providing extremely high quality at very low cost. It will be the first facility of its kind in the United States. I have some examples of this kind of product generated at an experimental facility in the United Kingdom (Warwick Research Unit for the Blind). The symbols used on these examples are the result of over 25,000 experimental observations made by Graham James of the University of Nottingham and John Gill of the University of Warwick, observations designed to yield a reasonably small set of
symbols that are maximally discriminable one from another. The tactual maps can be produced for pennies each; and the epoxy master has been shown capable of making over 15,000 copies at very low cost.

We intend to pursue the creation also of other pictorial representation - other than maps, that is. Although there has been some controversy over whether pictorial diagrams can be presented tactualy, there has been no suitable means of producing them in high quality so that their usefulness can really be assessed. We will explore the definition of useful information in such a tactual form, and evaluate the product in conjunction with actual users.

But it is important to point out that we will have the capability of producing maps of school, university, travel, and work environments easily and cheaply. Furthermore, since reading maps is a learned skill, we will develop instructional modules that will enable naive map readers to use these products.

The second area of immediate application of computer technology is that of providing direct access to information that is normally considered private or privileged, but which is not normally so accessed by blind persons. I mean, of course, information contained in bank statements, charge accounts, and the like. There is now in operation in England with most of the major banks a service which gives blind persons the option of receiving bank statements in braille. We thought originally that it would be possible to import that system and install it in the American banking system. Nothing is ever quite that easy in so elaborated a society as our own: the complexities of automatic deposit and withdrawal, electronic funds transfer, and the multitude of other banking services in the American system require a rather more complicated solution. We have been intensively involved in discussions with major banks in the New York, and midwest area, and we are currently negotiating a
contractual arrangement to develop program modules for computer processing that take account of these complexities of American banking service practice. These modules will be operated experimentally at the Center until thoroughly debugged. They can then be transferred out into the working environments of the banks themselves. This development will preserve the advantages of privacy that informed our effort from the start.

The third area of immediate application of computer techniques is the provision in braille of information which is profiled to the specific interests of professionals. In our beginning effort we look again to our British colleagues at Warwick University. There, a service has been operating for some time that provides a selection from the American Psychological Association's *Psychological Abstracts* to about a dozen blind psychologists. Each month, subscribers to this service receive a listing, with abstracts, of up to 75 references matched to a specific set of interest terms drawn from the *Psychological Abstracts Thesaurus*. What has been faintly scandalous about the enterprise is that American data tapes have been sent to England, processed on an American computer, using an American translation program from ink print analogue to braille analogue, embossing the translated output on a high-speed American embosser, and sending the bulk of the output to American psychologists! Except for experimental purposes, this arrangement is patently absurd, and we are working to redress the situation. We intend to do even better - namely, to extend our capability to provision of abstract services of this kind to other blind professional groups, such as engineers, computer specialists, biologists, physicists, and others.

So much for some of our immediate projects. What of future research undertakings? Here there are two classes of activities: those for which we can see that there is almost enough information available to us to allow the creation of new products from the Center; and those for which we know sufficient information will not be
immediately available to allow us to act, but which we monitor carefully for their potential applicability.

One could give many examples of such research based on what Robert K. Merton called "hypotheses of the middle range", but from that set I shall mention five that span a fair domain of diversity.

Thus, building upon what I have already mentioned for map reading and the need for an instructional module teaching the reading of maps, we shall be looking into the construction of instructional modules that will ease the entry of visually impaired persons into the professions and occupations. It is at present very difficult for such a person to obtain an M.B.A. or, indeed, any other professional degree. In part that is a result of a lack of information sources, which the technologies we have already demonstrated here redress in part; but in part it is a matter of altering the way in which instruction is given, assisted let us say with computer techniques. Such an approach is taken in one project at the Center which is tailoring instruction in advanced data processing techniques to a blind individual in a major corporation; he will then instruct other visually impaired persons in his own organisation. One interesting result is that the sighted student of whatever age may well benefit by the increased clarity and logic of instruction and teaching - a serendipity that has bestowed benefits on the sighted population in the past, by way of the invention of the phonograph, typewriter, ball point pen, and long playing record for blind persons.

In a parallel way, we shall be investigating the design and conduct of the work-place for that mix of system and social technologies that will open new jobs to the visually impaired. This is more than an effort to find new applications for computers; rather, it is a comprehensive undertaking requiring task analysis, job integration, microprogramming of information flow in the workplace, and enrichment of tactual and auditory interfaces with the workers. There is an increasing
number of jobs, particularly in the technical occupations, that because they depend on machine read-out of various kinds lend themselves conceptually very readily to adaptation to visually impaired persons. Consider the modern automated office: there are few machines, if any, that cannot be used by the visually impaired with appropriate adaptation, perhaps a simple aid of two, and minor alterations in the organisation of work flow. This area has received some attention - not much - in the USA, particularly by the Sensory Aids Foundation in California. We intend to carry this out further with the help of the rehabilitation counsellor community, and to design machine-assisted information inventories on our experience so that they may have the widest possible applicability. In this we are collaborators with the American Foundation for the Blind and with the Conservatoire National des Arts et Metiers in Paris. The specification of new kinds of sensory aids may well be one important product of this work.

Another activity will be the examination of the implications in the new generation of compact, if not in every case portable, devices from France, West Germany, and the United States that encode and display braille information. Such devices use digitally coded braille; they are thus transparent to computer input and output (or can be made so with interface equipment that is equally compact). Such devices may have a revolutionary impact on the local and remote input and output of information - including computation and programming tasks - in braille displays. Systems of this sort may alter radically the conduct of work and study for braille readers, and we will remain sensitive to the implications.

Finally, in this set of proximate research goals, we shall be reporting out fairly soon on the routinisation of the use of photocomposition tapes to produce braille, large print, and synthetic ink print books and journals. Although the feasibility of using photocomposition tapes to produce braille has been demonstrated on an experimental basis, we shall be reducing to a practice art the
complexities in the creation of software that make a wide variety of photocomposition tapes available as input to a computer programmed for the automatic transcription into braille, for creating large print output, and for creating a synthetic speech equivalent of the ink print page. The day draws closer when textbooks for blind students will arrive at the same time as textbooks for their sighted colleagues - and not up to two years later!

Parenthetically, I should mention that experimentation with alteration of the braille code - to reduce the difficulties in learning it, to increase the speed of writing it, and to increase the speed of reading it - are now under way in a few centres in the world. We intend to assist in this experimental programme by providing materials for such experiments, and by consulting in the conduct of experiments to test the usability of such material.

Beyond these immediate tasks, let me now mention rather rapidly more remote goals for the Center's research activities for which we hold considerable expectation. I shall mention but four examples drawn from a larger set.

First, we shall be examining the implications of recent advances in voice data entry systems, systems which by-pass the use of keyboards. I think it not merely a human conceit that we need to have our machines speak to us and understand our speech: small scale and very expensive data entry systems using the human voice are already showing significant gains in speed and efficiency where they have been applied to inventory and order service functions that can be clearly specified. Undoubtedly, advances in microprocessors and in speech technology will make possible large reductions in the cost of such equipments. If so - and the American Foundation for the Blind is investigating this technology intensively - we are prepared to move quite early on in applying it to the data processing needs of the visually impaired.
Second, the possibility of providing a full page of braille in a transient, transitory, or "refreshable" display, is under active prototype development in a few places in the world. At least one of these designs, and perhaps two, give evidence of the possibility of eventual serial production at a cost of $1000 or less. Here, the advantages of tabular display and simultaneous voice read-out for relevant information — in look-up of reference information such as timetables, tax tables, and the like — are quite obvious.

Third, the eventual deployment of relatively sophisticated microprocessor-based small voice-and-digital-braille data entry and output systems allows us to think in terms of a networking operation, in which some functions not supplied by the small local user unit can be supplied by a central computer processing unit over telelinks, i.e., by telephone line or radio. Not only would this supplement small digital braille equipment with capabilities for voice synthesis, greater computational ability, and larger storage of information; such a system could also be adapted relatively easily to the deaf-blind, whose communication needs are difficult to satisfy.

Finally, we remain alert to the possibilities that will ensue from a forthcoming National Science Foundation meeting focussing on the interrelations among the communicative senses. Sensory research and advanced technologies allow us to consider for the first time, in any serious way, the possibilities of creating enriched sensory environments by cross-transfer of information from one sense to another. In this way, it may be possible to match and coordinate the capabilities of the tactual sense for spatial resolution, for example, and the capabilities of the auditory sense for temporal resolution. For the blind, that would mean the creation of the "hearing-feeling" transformation or imitation of the visual environment — that is, a bi-modal display. For the hearing impaired, one might opt for the creation of a "seeing-feeling" transformation of the auditory environment. I have already referred to a crude
approximation of this approach in discussing the simultaneous presentation of braille and auditory information; the proposed scheme simply carries this approach to its logical conclusion. The implications for rehabilitation are enormous, and we shall try to interpret these advances for the counsellor and the impact they will make on him and on his client.

In summary, I would say that the Baruch Computer Research Center for the Visually Impaired will concentrate ab initio on one application area all of those technologies, both system and social, that enhance the ability of the visually impaired to function optimally in study, work, and leisure. As we gain experience in transferring this knowledge to the everyday practice domain, we shall extend our purview in logical steps, building upon the expertise we gain in fulfilling our purposes. Our overall aim is no less that the creation of, or restoration of, a lifestyle and a competence among the visually impaired that will allow such persons to function indistinguishably from their sighted neighbours. I do not regard this as a noble goal, but rather merely our obligation in human terms to the population we intend to help.

(This article is a transcript of remarks made at the formal opening of the Baruch Computer Center for the Visually Impaired, 29 March 1978, at Baruch College, City University of New York).
It is nigh impossible to estimate the braille-reading population in the United States. Louis Goldish has made a couple of stabs\(^1\) and so have others including the Library of Congress, Division for the Blind and Physically Handicapped. Neither Mr. Goldish nor we have done much more than scratch the surface: the sources for his figures were secondary sources, and DBPH's most recent effort in assessing braille readership arose from a loosely constructed survey with limited objectives.

If one attempts an honest estimate or projection of this readership by looking at a variety of national sources, one can see, I believe, that the braille readership appears to be at a plateau in terms of numbers. There have been many efforts, however, to provide improved reading services to braille readers, some coming from the United States and some from other countries.\(^2\) It is these

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\(^{2}\)A recent statement about the Library of Congress braille readership and DBPH's production of braille, as well as some optimistic speculations about the fruitfulness of recent technological developments, mostly from countries other than the United States, were set forth in an address by Frank Kurt Cylke to the Helen Keller World Conference on Services to Deaf-Blind Youths and Adults, held in New York City, September 11-16, 1977. Copies of the address entitled "Braille Resources for the Deaf-Blind Person: What They Are and What They Could Become", are available by writing to F.K. Cylke, Division for the Blind and Physically Handicapped, Library of Congress, Washington D.C. 20542.
efforts to meet braille readers' needs that have taken up a good deal of my time in these past four years, and for that reason I am pleased to be here to give you our view of "what's up with braille".

Who are the Braille Readers?

Even with this disclaimer about numbers, though, one should attempt to establish a magnitude or level or range; for without this, none of us, either organisations or individuals, will know what services we should be providing or seeking. Let me make a stab at it, using available sources and, frankly, a conservative judgement. Working from Goldish's estimates, as shown in his written material and as a result of a recent conversation with him, we can speak of a population today of about 60,000 persons who use braille fairly regularly. This is a 33 percent increase over the 45,000 estimated a decade ago. By looking at some figures collected over the past five years, we find not only a less clear picture - certainly not a straight-line increase - but even contradictory figures. The number of readers registered with the American Printing House for the Blind increases each year, from 25,800 for 1974 to 29,000 for 1976 (probably 30,000 for the most recent reporting period); but the numbers who read just braille or both braille and large print have decreased steadily in this same period, from 7,850 to 7,300.

It is not too helpful for present purposes to look at figures available from the Library of Congress - for the simple reason that we count only those who register with one or another of our cooperating libraries for braille service - it is user-initiated. A user survey

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3 Telephone communication between the writer and L.H. Goldish, October 3, 1977.

4 Figures on visually handicapped persons eligible to receive educational materials from the American Printing House for the Blind under the so-called quota system, and in particular figures on braille readership were supplied to the writer by Ralph McCracken, Braille Editor at APH in a telephone communication on August 15, 1977.
conducted in 1968 for the Library of Congress sampled from a braille reader population of 10,000; the same population was sampled in a 1974 survey of braille readers only, this time about 12,000 (the subscribers to the Braille Book Review). Actually, DBPH reader statistics show a larger population, because not everyone who uses a braille lending library subscribes to this bimonthly periodical. For the most recent five years for which we have statistics, the increase has been about 17 percent, from 18,300 in 1972 to 21,600 in 1976. In this same period the legally blind population, as reported by the National Society for Prevention of Blindness, grew only three percent, from 475,000 to 490,000. If we accept, however, the prevalence indicated by the 15-year-old household survey by the National Center for Health Statistics, the blind population is more like 865,000. I think you will agree all this is confusing, misleading, and perhaps useless. About the only clear conclusion is, I believe, that a thorough, truly scientific study must be made.

Some inferences can be and have been made from one or another of the above figures – and I will tread among them and a few others. In the period of five years when braille readership in the Library of Congress network grew 17 percent, the total number of readers (95 percent or more using audio materials only) grew about this

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7 Reader and circulation statistics, for braille and talking book formats, are reported annually by the cooperating regional libraries to the Division for the Blind and Physically Handicapped, Reference Section; the Section's statistician supplied the writer with the necessary reader statistics, with comparable figures on legally blind persons as reported annually by the National Society for Prevention of Blindness, and with extrapolations from the 1968 report of the National Center for Health Statistics, U.S. Public Health Service.
percentage each year. It seems safe enough to say, then, that there are fewer new braille readers added to the population each year. This seems to be confirmed by the decrease in braille registrants at APH - and we usually look to the young for the preponderance of growth in braille readership. The best that one can say, after balancing a slight increase against a decrease, is that we are probably at a plateau with respect to the number of braille readers. Like most plateaus, this is negative, for almost everyone who looks at general statistics expects that the number of legally blind, or more broadly visually handicapped persons will grow at a relatively high rate since this handicap occurs most frequently at older ages, beyond 50 or 60.

Who are Serving the Braille Readership and with What Services?

Over about the same five-year period I have been using for other purposes, we have figures that indicate a still high production level and a high demand level. Clovernook Printing House for the Blind reports an increase in the number of plates produced annually, from 46,000 in 1972 to 50,000 in 1976, but a decrease in the number of pages - from 66 million to 50 million in the same period. Similarly, APH in this period saw a drop and a rise in the number of plates but a steady drop in the number of pages produced; thus between 1972 and 1976 the first figure looks the same - 176,000 plates - but the second decreased from 57 million to 48 million pages. Both Martin Droege and Ralph McCracken, in my conversations with them, see some of the same things already mentioned here - fewer new readers - but they also point out that more individual needs are being met (educational as well as recreational

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8Supplied to the writer by Martin Droege, Plant Manager, Clovernook Printing House for the Blind, Cincinnati, Ohio, in a telephone communication on August 9, 1977.

9Telephone communication between the writer and Ralph McCracken, APH, August 19, 1977.
with APH, mostly recreational with Clovernook). This speaks well for their sense of service, their responsiveness, and for users' demands.

Other organisations are responding just as positively: the growth of instructional materials centres in several states serving students with all media; and the success in meeting educational needs in braille by the still increasing number of volunteer braille transcribers; recreational and professional as well as educational needs are being met by other braille presses such as Volunteer Services for the Blind - and, of course, right here in Boston the Howe Press and National Braille Press.

There are strong assists to braille production from systems analysts, programmers, and manufacturers - and again there is a strong centre in Boston: the DOTSYS translation programs begun some years ago at MIT and Mitre Corporation, the efforts by American Systems, Inc., ARTS Service Center, Duxbury Systems, and Kurzweil Computer Products. Let us not forget the great boom to braille, brailling and braillists made possible by the quiet genius of David Abraham, the Perkins Brailler, successfully brought into production by him and Dr. Edward Waterhouse, and maintained at high production levels and according to high standards by Harry Friedman and his staff at the Howe Press.

I am not at all modest in pointing to the strong efforts at the Library of Congress, Division for the Blind and Physically Handicapped, where there have been significant increases: from a $1.3 million braille budget two years ago to a current one of close to $3 million; from a total of 300 new press braille titles to 375 in the same period.  

10 There are other advances too: we have embarked on a program of making available four copies of braille titles produced for DBPH by volunteer braille transcribers; and the braille magazine program has grown both in the number of magazines and of

10Cylke, F.K. op. cit.
subscribers, despite the heavy increases in braille pro-
duction costs. DBPH has strengthened production standards
and inspection, and is receiving fine cooperation by both
paid and volunteer producers, both types considered
professional braillists, in our opinion.

These many examples show the revitalised concern in
many places to do a better job in braille - the very
holding of this workshop proves, I believe, such concern
and dedication: the leadership of the National Braille
Press chose this as a fitting, meaningful celebration of
its fifty years of service, and the response to this
stimulus was nationwide - those who are here today.

What Must Still be Done?

Of great concern to us at DBPH and to many who work
with us in braille production and distribution is the high
cost of braille. What can be done about it? We have
asked a question beyond this: what help can be had from
the fruits of technology? Technology has always been
significant in the Library of Congress reading program.
Consider all the advances in the talking book program from
that first long-playing record in 1934. For about two
decades, the question about braille has been addressed in
terms of computer assistance: the translation programs,
automatic card-driven stereograph machines, and more
recent efforts to provide flexible computer programs. A
still knotty problem in this area is the continued search
for, development of and agreement on computer-compatible
braille codes and/or braille code-compatible computer
systems.

We must follow other directions also, many of which
still depend on the computer but perhaps in different
ways. I am here speaking of developments in which DBPH
has had a very direct role. We are continuing our efforts
to assure high standards of braille production. We are
eager partners in the reorganised Braille Authority of
North America, and look to its being strengthened in terms
of financing, expertise, and especially program outlook. And we are very active in supporting, where possible, promising technological advances. We sat with other organisation representatives on an advisory committee during the planning of the preliminary testing of the Argonne Braille Machine. We are presently devising a draft evaluation plan for the ELINFA Digicassette Portable Braille Recorder, which is a good example of a revolutionary idea - storing braille magnetically on cassettes (what a saving in space). We have a contract with Triformation Systems, of Stuart, Florida, for modification of its embosser which, if successful, will speed up embossing of zinc and iron plates by as much as six times the rate for stereotyping by an operator. We have a contract with Ray Kurzweil's company whereby, again if successful, his already ingenious reading machine will produce braille output as well as the present voice output. We are following other ventures in the concept, design or prototype stage, but frankly our still-limited funds force us to back truly promising devices and systems, which means beyond the breadboard and prototype stages.

Conclusion

It is up to all of us to keep open our eyes, our ears, and our minds to the possibilities of technology for braille - even such possibilities as high-speed transmission of braille, possibly by satellite. We must strive and strive together to do a better job, whether we be educators, rehabilitation workers, librarians, producers or providers, inventors or developers, publicists, leaders - all of use interested in advancing braille, perhaps even in saving braille, certainly improving the production and distribution of braille by exploring practical alternatives to achieve such improvements. But never, never must we go far in any direction of improvement without complete and total attention to the needs and demands of the ultimate consumer, the braille reader.
Role of Talking Books and Their Influence on the Demand of Braille Literature

E. Agueev
All-Russia Association of the Blind, 14 Novaya Plochad, Moscow 103672, USSR

Scientific and technical progress is correctly referred to as one of the most important social phenomena of the present time. It has been instrumental in the introduction of unprecedented changes in all fields of human endeavour. Its action is increasingly being extended to the solution of a whole series of matters which concern blind people all over the world.

However, and this is true in any field of activity, the scientific and technical progress becomes a powerful creative force only if social conditions are favourable. Its achievements depend to a large extent on the economic power of society as well as on political and other institutions.

The problems of the blind are deeply social and this is why the role of scientific and technical progress depends entirely on the social policy of a given community.

It is very well known that in the USSR, in the countries of socialist cooperation and in the developed countries of Europe and Asia great achievements have been made in the field of compensation of blindness and in the rehabilitation of the visually handicapped. The energetic action of society, the development of culture and the education of people with scientific progress acting as a thriving factor have banished forever the eternal myth of blindness as a fatal phenomenon characteristic of mankind. In the USSR, the satisfactory solution of some very vital problems of the blind, such

This paper was presented at the European Conference of Directors of Braille Printing Houses and Braille Libraries in Madrid in April, 1978.
as the prevention and treatment of eye diseases, employ-
ment, the constant improvement of their cultural and
educational standard has traditionally been made with
the assistance of a close cooperation between scientific
knowledge and practical action. An organic connection
with scientific organisations for the solution of a wide
range of problems relating to the improvement of working
and living conditions of blind people and to their
vocational training is a distinct feature of the activity
of the All Russia Society of the Blind (VOS).

Thus, we can say that scientific and technical
progress is a sort of catalyst of the main processes
which occur in a given society. This will necessarily
influence the nature and methods of the solutions to
specific problems of education and integration of the
blind.

The problems of the situation of the blind in
the age of Science, a difficult and contradictory matter
in many aspects, is one of the concerns of the national
associations as well as of the World Council for the
Welfare of the Blind. And this has not happened by chance.
Under the current conditions, the question has been posed
as follows: Can the collective participation of the blind
in the process of social production be in accordance
with rapidly changing demands?

So is the dialectic of life. Although all that has
been said above has a universal character, it imposes on
the social organisations and above all on the organised
movement of the blind, the special responsibility of
safeguarding the positions already attained, of consolidating
and developing them.

The practical results of our work, especially the
model of solution of the most vital problem, i.e., the
rational employment of the blind, reply positively to
this question. Reality shows not only that there is a true
correspondence between the possibilities of the blind and
the demands of the present time but also that these
possibilities have new perspectives. To achieve this end, a decisive factor is the constant understanding and the increasing support of the state and scientific institutions with regard to the solutions to the development task of the material, technical and professional bases of the All Russia Society of the Blind.

The objective analyses of the development trends of blindness and of the demographic composition of seriously visually impaired people, have permitted this institution to work out new methods for the solution of the tasks relating to the training of blind and partially sighted people bearing in mind current demands. This results in the increasing importance of subjective factors, such as the mobilising role of social organisations - in our case, the All Russia Society of the Blind - and the increasing social activity of blind people themselves. Our association is not only an independent organisation which gives a certain contribution to the national economy but also an important leading centre which has the responsibility of studying, organising coordinating, consulting and assimilating the work carried out in practically every field of the social and vocational rehabilitation as well as of placement in employment.

Social activity, implies for every expert in any branch of production, science and culture, a sense of responsibility of the task he has been assigned and an understanding of the need to improve constantly the standard of professional knowledge and knowhow.

The availability of books is a great benefit for contemporary mankind. Society acts in a humanitarian way by giving blind people access to the treasures of human genius. There is a growing need of acquiring concise information. This general phenomenon deriving from the information explosion and the increase of the cost of the time necessary to obtain new data demands from the national organisations, the application of better methods in the vocational training and the improvement
of social and cultural services for the blind.

Scientific and technical progress has presented the blind with the tape recorder and talking books. The availability of talking books meant that for the first time after the creation of the marvellous system of Louis Braille, blind people had received a second means offering them the possibility of working independently with a book. This has given birth to a whole series of new and rather complex tasks. In this paper we will deal with the mutual dependence of two types of books.

All the discussions on the supposed opposition between braille and talking books should be considered as mere sophistics.

Both types of books exist and develop in a parallel way.

The book in braille or in talking book form is one of the most important means of getting information about reality, of obtaining and exchanging vocational skills as well as scientific and cultural values. Books, besides being a mass medium of information, offer to society an immense possibility considering their variety and power to influence both the individual and the community as a whole.

We are going to study some development trends of the two types of books for the blind. Each kind has its own specific features. Both are defined above all by the nature of the perception involved and by their efficiency and comfort of manipulation.

The application to vocational and study purposes becomes one of the most important trends in the development of embossed books. Today it is undeniable that not all books can be perceived by listening. In order to carry out a serious scientific study, it is necessary to know how to work independently with a book. Blind people can acquire this skill thanks to the braille book. There
has been an increasing availability of books for blind people engaged in different fields of intellectual work. There is a growing number of publications relating to Sociology and Politics and scientific books designed for the general public as well as reference books and dictionaries. The publication of periodicals is braille does not decrease either.

Libraries for the blind have an excellent stock of Russian and world classics as well as of contemporary foreign and Soviet authors. In 1977 the stock of books in the libraries for the blind, in the Russian Federal Socialist Soviet Republic only, amounted to 1,350,000, including records. (All the figures mentioned in this report refer exclusively to the above-mentioned republic.) More than half of this stock consists, as above, of books in braille. However, the proportion of braille books in the total stock is decreasing considerably. The proportion of talking books is increasing.

In the following table we show a comparison of the distribution of book stocks according to the type of book and the proportion of each type in relation to the total stock of 1974-1977.

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<th>Type of book</th>
<th>1974</th>
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<tr>
<td></td>
<td>number of copies (thousands)</td>
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<tr>
<td>Books in braille</td>
<td>1643.5</td>
<td>54.1</td>
</tr>
<tr>
<td>Talking books</td>
<td>810.5</td>
<td>26.6</td>
</tr>
<tr>
<td>Ink print books</td>
<td>582.6</td>
<td>19.2</td>
</tr>
</tbody>
</table>
We can make the following remarks concerning these figures: in two years the number of books in braille has increased 6.5% and that of talking books 7.5%. The increase in the number of books in ordinary print of 21% is due not only to the presence of a certain number of sighted readers but also to the increasing demand from the blind themselves.

This same pattern can be observed in the analysis of the data concerning the loaning of books in libraries.

In spite of the increase of the absolute indexes relating to stocks and loaning of braille books, it is possible to see a clear trend towards a decrease in the demand of such books. This undoubtedly influences the number of copies printed in each edition. If we take the 1971 editions of braille books as a basis for comparison, in 1977 they represented 90% and this year they do not exceed 78%.

Our experience shows that the period of initial accumulation is rather quick. The basic stock of talking books has been completed for almost all the branches of knowledge. Its development has started a stage of regular increase of book stocks on the basis of more specific topics within the general subjects. We must point out that the subject trends will be constantly corrected as methods and quality of recording are improved and with further development of duplication techniques.

In 1977 the total stock of talking book libraries amounted to 2,200 titles, of which 80% corresponded to fiction, and approximately 20% to literature on Sociology and Politics, text books and scientific books designed for the general public.

If the recording of talking books amounted to 3,200 hours in 1970, in 1977 it equalled 3,650. These figures show that there is an increase in the production of recorded literature. In terms of edition sheets, the
figures just mentioned amount to 4,000 and 4,562.2.

Talking books according to the demand from readers are produced in two quantities of copies. The small quantity is equal to 150-170 copies of each title and the large one 250-270. All the books are distributed to libraries for the blind.

The tape-recorder, despite its degree of perfection, enslaves man and transforms him into a "dumb" worshipper. Technical whims do not disturb man but rather annoy him when there is a forced interruption of reading. All the same, the demand of talking books is rapidly increasing. Their mean circulation is eight times larger than that of braille books.

The recording of books on tape undoubtedly has some advantages. The broadcasting of talking books in special factories for the blind, and the listening of talking books at home which generally becomes a collective reading session of all members of the family, are factors which have an enormous educative value. The advantage of the talking books is that they are read by great artists, and qualified radio announcers. This produces a great moral and esthetic satisfaction, and increases the emotional and educative effects on man.

Moreover, recorded books have some advantages in comparison to braille with regard to their weight and size. Talking books can be easily carried and stored.

The facts are clear. The talking book has had for a long time a leading position. What are the prospects of these two types of books in the world of literature for the blind? Does this imply that a progressive abandonment of braille is taking place?

In the Soviet Union the talking book has had a great impulse for the last twenty years. Blind people receive tape-recorders at reduced prices or free of charge. The
talking book does not require any of the physical or intellectual efforts necessary for the assimilation of braille.

The talking book has rapidly attracted a great number of visually handicapped persons to reading. The overwhelming majority of these people are invalids of the second group (partially sighted), who do not know braille.

Statistics show that the increase in the number of blind people is only due to the inclusion of adults who have lost their sight as a consequence of disease or injury, and whose sense of touch is very poor because of their age.

In the Russian Federal Soviet Socialist Republic out of the 205,000 registered blind people, 43,000 know braille, i.e., 1,900 people less than in 1974.

Blindness among children has reached in our country its lowest record. From 0 to 7 years, it represents 0.2% and from 7 to 16, 2.1%. On the other hand, the number of blind people sixty years and older represents a 46.5% of the total population of registered blind people.

Most of the schools for the blind have practically become schools for partially sighted.

All this has directly influenced the readers' demands as far as libraries for the blind are concerned. In 1977, out of the 143,000 readers (of these 21,000 were sighted), 28,300 people read books in braille, i.e., 65% of those who know the system. 80,000 people have listened to talking books. In relation to 1974 the number of listeners of talking books has increased almost by 12,000.

That is the evolution of braille and talking books with the background of the social processes that influence it.
As far as the abandonment of braille is concerned, it is a problem that lies beyond the limits of this paper and which needs an urgent and thorough analysis. In any case, we are not at all convinced that the system of Louis Braille is completing its historic mission. No, this should not be taken as a narrow conservatism. A sense of deep conviction compels us to say: the possibilities of this system are far from being fully exploited. It will only become history when blindness has disappeared.

We think that the practical solution of the tasks of the rehabilitation and education of the blind, bearing in mind the specific demands of present time, should be supported by a deep knowledge of the peculiarities of each category of blind people, peculiarities which are even more varied than the ones one can observe among sighted people.

Considering the specific character of this work due to differences resulting from the onset of blindness, the nature and degree of visual impairment, the compensation task for the various categories of blind people has to be conducted in different ways utilising the most appropriate means for each category.

This is why the success of the work will increasingly depend on the improvement of all the systems and methods used in the training of blind people for a useful and remunerative life based on the achievements of scientific and technical progress and of social development.

The maximum utilisation of educational guidance and of the compensation potentials of the braille system as well as of tape recorders and other technical means, are some of the challenges derived from the present state of development.

From a practical viewpoint the main feature of the development prospects of both types of literature for the blind is a stronger specialisation of publications in accordance with the reader demands and with psychological
and educational recommendations made by the scientists. The methodical, technical and typographical improvement of each type of book production is very important. We also are aware of the objective need to conduct further research to find new methods which could make possible a combination of both types of literature, offering the blind the chance to have at their disposal a book using the two systems, i.e., braille and recorded, taking into account the perceptive potentials of both braille and talking books as well as their information possibilities. The creation of such books, for instance for handbooks and textbooks, for those who learn a foreign language is entirely feasible and does not require any additional expenses.

In many countries, including the Soviet Union, studies are being conducted along these lines. The international exchange in this field will contribute in our opinion to the promotion of our common cause.

All that has been said so far confirms the view that braille and talking books are natural allies, which are destined to develop and complement each other. Since the tape-recorder is a remarkable achievement of scientific and technical progress, it has become a device liable to be humanised, as they said in England. Now we are witnessing the birth of new discoveries and inventions for the blind. The optacon and other reading machines still have a long way to go before they become media as efficient, reliable and easily accessible as their brother the tape-recorder.

For more than a century, braille has been the only instrument available to the blind to get to know life in an independent manner, to penetrate in the world of human treasures and to prepare them to lead a useful life. Nowadays scientific and technical progress is broadening the possibilities of the blind to become independent, and it contributes to the process of their adjustment and integration in society. The community is becoming more and more aware not only of its responsibility but also of
the interest in solving the current problems of the blind.

In conclusion, I wish to make the following proposal for the final resolution: to consider that the combination and development of traditional and new methods for an independent access to information are important prerequisites for the successful integration of the blind in present society. To achieve this end, it is essential to obtain an increasing moral and material support in order to solve the present problems of the blind taking into account the demands of scientific and technical progress.
Effective Forms and Methods of Lending
Literature in Braille and on Sound Carriers

V. Omasta
Svaz Invalidu, Karlinske nam. 12,
Praha 8, Czechoslovakia

Scientific and technical development has notably increased in the last few decades. There is talk of the penetration of the scientific-technical revolution in all countries of the world and in all spheres of human life, including the new devices and aids for the blind and visually impaired. We, the directors of printing houses and libraries for the blind, have the responsibility of taking immediate and full advantage, in our work, of the results of the rapid growth of this modernisation and technical development.

The organisation of braille libraries, of recorded literature, and of books, magazines and manuals in large print for the partially sighted need not be isolated from the general development. Also in this same aspect it is necessary to search for new ways, new work methods, inasmuch as both the blind and visually impaired represent at the present time a significant factor, which must be integrated, as an important part of society and state in normal life.

The historical development of libraries for the blind has not been, of course, identical in all countries of the world. It has suffered the influence of a great number of factors, among which we might mention as most important the constitution and the system of distribution of state wealth, secondly, social conditions, and finally, the manner of providing financial means, whether from charity organisations or from state allotments, as is the case in the more progressive societies.

This paper was presented at the European Conference of Directors of Braille Printing Houses and Braille Libraries in Madrid in April, 1978.
There are, in essence, three types of libraries:

1. The library united with the printing house for the blind on the same premises.

2. The library as an isolated unit, independent in its organisation and financial matters.

3. The library included in the system of public libraries.

The most frequent of these three types is the first: the functioning of the library is directly linked with that of the printing house for the blind. This system has its advantages and its disadvantages. The advantages have to do with the common objectives of the two services, the possibility of immediate collaboration between the two and the close contact which is established with the production system. The disadvantages arise from the insufficiency of available space, which offers few possibilities for expansion of the services, and from the dependence of the library's administration, whose development is subordinate to that of the production techniques of the printing house.

The independent library, in this sense, is in a much more advantageous situation. It is free from the problems of the production of literature for the blind and from the worries arising from them. It has its own financial base and must take care of only its own development goals. It is a system which is in accordance with the modern conception and which is likely to become in the near future the most common system.

The lending libraries integrated within the system of normal public libraries should be considered only as a complement to the above-mentioned systems, and will need to be converted preferably into branches of the libraries in regional capitals. These branches are more easily
accessible to readers and relieve the postal services of an enormous burden as regards the sending of braille books and talking books. This type of library constitutes as well a new form of development which sooner or later will become a supplement to the services of a central library. It is also to be expected that these branches plant the seeds for future social centres for the visually impaired. These centres will be able to establish small recording studios, communication and technical assistance services, services for aid to students from all kinds of education centres, and when the time comes they will be converted into centres for the use of computers in the system of data processing.

The equipment of the libraries is, save for a few exceptions, out-dated. In them we find various types of simple shelves in total or almost complete absence of mechanisation. The reference system of the braille and talking books is carried out in the majority of cases by way of a simple system of cataloguing, inasmuch as the number is not too large and its ordering is rather simple. This is another aspect towards which we should direct our efforts in order to obtain total technification. The type of materials available for lending is well known. These materials are books and magazines in braille, records, books and magazines on tape, radio plays, large print books and magazines for the partially sighted, informative materials of all types, including translations of sister magazines from all over the world, brief reports on research, musical scores in ink print and braille, text books on tape for secondary schools and universities, and a small collection of ink print books.

The volume of production increases continually. Printing houses for the blind will be supplied with modern systems of computerised transcription, rotary presses, automatic presses and sophisticated techniques of book binding. At the present time the recording studios increase the production of books on tape, the number of
copies on open reel tape and cassettes is multiplied, and the number of blind and visually impaired students in upper level education centres increases. The growth of activity in a specific area, in production for example, implies the appearance of a greater need for improvement in the reference and cataloguing systems and in the lending systems. One of the aspects in which it is possible to imagine modernisation is in the possibilities of mobility of the book shelves. It is necessary to eliminate the complicated search for desired books and materials as well as the useless movement from one shelf to another. The equipment in braille libraries differs undoubtedly from that of talking book libraries. Braille books take up considerably more space and are rather heavy, which causes the lending process to be much slower. How can we resolve these problems? The shelves will be placed one after another in modular form without intermediate passageways. Each one will have its own transportation system and will be electrically movable, controlled from a central control board. This control board will be located as close as possible to where direct contact with the readers takes place. The numbers on the control board for the shelves will correspond to the catalogue reference numbers.

In the case of the talking book library, including records and radio plays, the problem will be resolved in a different way. In the majority of cases there will be an area exclusively set aside for this purpose. Here also there will be a control board, but the shelves will adopt the form of a continuous ellipsoidal moving band. In the first place the desired title will be sought, and then by way of a button the movement of the band will be ordered to carry the shelves until the corresponding point is found, in which position the movable wall will stop. At this point it will be extremely simple to find the book. It is possible also to incorporate the reference system of the books in a computer, which will also be used for the automatic printing of braille and ink print.
The storing of information of all kinds, the translations made from specialised journals for the blind in braille or in ink print, as well as other translations that the research service may have been able to obtain, are carried out much better with the help of the computer and its very extensive memory. Musical scores in braille should also be supplemented by the corresponding version in ink print and on tape and the three variants will be filed in one single container.

The existing systems strongly depend on the development which has taken place up to now in the lending services for visually impaired readers and their range of application is of a limited scope. Most of their activity takes place in the central library and consists of two fundamental procedures. First, the readers who live in the town where the library is located go to the library personally or send some family member to pick up the material for them. Those who live in different cities use the postal service and order by mail the literature that they wish to receive. The library makes sure that they receive the requested volumes. This system, which is the one most frequently used, is advantageous for both parties and will continue in effect for many years to come, although in some of the very advanced countries new alternatives have begun to appear. These alternatives are, in the case of large cities, the transportation in vehicles belonging to the institution, of the books to the home of the reader and especially to elderly blind people.

For this purpose in large cities district branches of the libraries are opened. They are very adequate for this type of collaboration with the readers, inasmuch as in addition to developing other activities and practical services, they create the possibility of more efficiently meeting the needs of the readers, because of a better understanding of their desires. The moving of these branches to industrial centres where a great number of blind and visually impaired people are employed is possible only if the workers reside in the surrounding area of the production site. In this case, the corresponding
library actually becomes a branch of the central library while the central library becomes the consultant and provides its branch with the books and materials.

All libraries have, in addition to their primary task of supplying literature in braille and on tape to the inhabitants of the area who are not able to go to the general information centres, another even more appealing mission. They must educate their readers, advise them, widen their horizons through the spoken word, which is as well we know the most effective contact possible. We have in mind conversations which could take place in clubs, lectures, concerts, short plays, literary gatherings and other similar activities, in short, educational and cultural activities. Visually impaired readers show a special interest in this type of social life which also provides them with the possibility of getting to know each other better and of making new friends.

In this way, the meeting hall, club, gymnasium or sports field is not only a place for social life but can also be a place for informal gatherings. In this way the library workers would be able to see the results of their work in a more efficient manner than that which is provided by analyses carried out by way of questionnaires, no matter how detailed they may be. The services which are provided for the reader in the library itself should be supplemented by reading and study rooms, recording studios and listening booths. The available tables in the rooms should be equipped with modern technical devices in order to facilitate maximum concentration for the student. In these rooms there will be tape players with earphones, optaconcs, digicassettes, reading aids for the partially sighted and other similar equipment.

In our work with the readers, we should not forget the need to provide information and reporting in an efficient and regular manner. The most adequate informative medium is the publication of regular supplements to the catalogue, in which the publication of new works should be announced. In reporting it will be most important
to make known the situation of the blind welfare movement on an international level, as well as information about new work methods, aids, new machines, devices, etc. And we should not overlook the efforts which are carried out in order to find creative solutions to our internal problems and difficulties.

Computer technology and its integration in the library system represents a new and very specific field in the coping with our problems. The minicomputer is already opening the way towards the utilisation of automatic production of materials in braille and on tape and can claim to have produced some very positive and economic results. Taking into account that the computer has a very extensive memory it is also possible to use it in the activity of the circulation of books. Computerised files for books and readers do not constitute the only possibility of application. Computers must also take the responsibility for a much more important task in the creation of an "information memory" and it will be possible to make use of that system, after work hours, by way of a direct telephone or a radio network. Once the corresponding number is dialed the equipment will switch on and will fulfill, according to the order which has been transmitted to it, the required services, for example, a mathematical calculation, or the search for specific data in its memory. Automatic computer printing is already operational, and the use of computer services without the necessity of directly handling them is at this time in a stage of development and will not be long in becoming a reality.

A new service, which is acquiring increasing success among the other aids for the visually impaired, is radio broadcasting.

Although it may seem that telephonic connection with the users of this service through a central installation is a matter which corresponds to the telecommunication authorities, we think that a separate organisation for this activity would be more efficient and practical. So,
I recommend that libraries have available their own system for control of the central installation, which could in addition activate a device with a telephone connection in order to rapidly transmit information concerning new additions to library stock as well as the progress of the blind welfare movement.

Dear friends, these brief thoughts which I have dedicated to the ways and methods of the functioning of libraries for the blind are by no means an attempt to give a complete view of our problems. My intention has been to give a short look at the present situation and at the new possibilities which are arising, and to provide some suggestions concerning new work methods with and for the readers. We should take advantage of this conference to express in the forthcoming discussion our opinions concerning these matters. If, from this conference, concrete results must be produced, it would be appropriate to examine the following suggestions:

1. That the European Regional Committee examine the possibility of creating the necessary conditions for the establishment of a centre in charge of the systematic reading of all of the journals for the blind, as well as specialised literature from all over the world for the purpose of sending the most important articles and news items to all countries.

2. That a specialised international journal be published concerning the production of written material for the blind, book binding, computer technology, library sciences, etc.

3. That regular meetings be organised for the directors of libraries and printing houses.

Finally, I would like to express my desire that we dedicate all of our energy to the strengthening and improvement of our humanitarian mission for the welfare of the blind and visually impaired throughout the world.
From the Ink Print Book to the Braille Book

Difficulties of the Process

A. Maso Simon
Imprenta Nacional Braille, Prim 3,
Madrid 4, Spain

One of the most important problems braille printing houses and libraries have to face today is, beyond any doubt, the accurate transfer from the ink print to the braille book, especially with regard to the transcription of textbooks for the different subjects of the various educational levels: primary, secondary, vocational and university education without neglecting, of course, the difficulties which one encounters in other books, which while not belonging to any planned instruction, on account of their specific contents, also present certain difficulties.

The book editing service, or if this does not exist, the transcribers in printing houses and libraries are the ones who first have to cope with the transcription problems the ink print book present, so that the braille book provides the blind student or reader with the same scientific or cultural information which is contained in the normal one. The following two principles have to be borne in mind:

(a) That the blind have to use the sense of touch as the reading and information means and that this sense has a psycho-physiological behaviour different from that of sight, and

(b) That the possibilities of the braille system and of graphic representation with embossed dots are very limited.

It seems obvious that with such premises the transcription problems cannot be completely solved. However, one should always try to find the best possible

This paper was presented at the European Conference of Directors of Braille Printing Houses and Braille Libraries in Madrid in April, 1978.
solution in each case. Clearly aware of the responsibility that we, directors of braille printing houses and libraries, have with regard to the numerous transcription problems, I have chosen this topic for my paper. I do not intend to offer miraculous solutions but to make a detailed analysis of the various problems involved in the transfer into braille of the contents of the ink print book and to propose some basic criteria suggested by my own experience in this field, which could serve as a basis for a recommendation. In my paper I shall adopt the following plan:

(a) **Premise** - Comparative study of the psychophysiological behaviour of the sensory organ for reading and gathering book information in blind and sighted people.

(b) Problems posed in transcribing by the current abundance of visual resources in ink print books: photographs, drawings, graphs, diagrams, synoptic tables, tree-type structures, etc.

(c) Problems derived from the great variety of print resources used in ink print books: different type sizes and forms, use of various colours, marginal or interpolated paragraphs, footnotes, etc.

(d) Problems arising from the use of special signs: mathematical and scientific, linguistic, phonetic and musical.

(e) **Conclusion**: Critical analysis of the positions adopted by those concerned with the problems presented: sightism, blindism and eclectic position.

And after this necessary introduction, let us go on to the problems indicated, in accordance with the outlined plan:

(a) **Premise** - Comparative study of the sensory organs for reading:
It is not my purpose here to carry out a thorough study of sensory sight and touch organs which are used for reading respectively by the sighted and the blind, since it would not be appropriate now, but only to make a comparative analysis of the psycho-physiological behaviour of both senses in respect of reading and book information.

We must emphasise that whereas sight is synthetic and global, touch is analytical and sequential, and, therefore, these senses are opposite in behaviour. These circumstances imply the existence of various features which differ in both senses: sight totalises and integrates. Touch, on the other hand, individualises and disintegrates. Sight has a second analytical stage, in which it concentrates its attention on the different parts, and touch, on the contrary, is not able to synthesise by itself but only with the help of imagination and memory. Sight perceives the whole, and appreciates in it forms, sizes and colours, whereas touch only distinguishes those forms and sizes which are sequentially perceived by the fingertips in movement. Sight has an extensive and varied series of sensibles which produce a very complete sensation, rich in nuances and remote, and touch is more limited, much poorer in nuances and needs direct contact, and lastly, sight has a very wide sensory horizon, apprehends space and perspective, whereas touch has a sensory horizon and spatial perception limited to the environment the hands can reach, is sequential and does not apprehend perspective.

The features we have just mentioned clearly show that, in connection with reading, graphic information and book resources in general, sight gives a quantity and quality of information far superior to that furnished by touch and that there are means and procedures in ink print books which are essentially visual, and which, if they are transcribed into braille with the same form in which they appear there, their purpose is betrayed and, if we adapt them to tactile characteristics, their aim is not
fulfilled either. **Synoptic** and other types of tables are a clear example of this.

In order to illustrate what we have just said it will be sufficient to have a look at a **synoptic table** as elementary as the one appearing on page 37 of the IV volume of the work "Consultor, Ciencias Sociales" for the VIII Grade of the General Basic Education in Spain, published by Editorial Santillana. The purpose of the **table** is to make a comparative study of three factors in Iberoamerican countries: absolute population, relative population and per capita income in each one. And in spite of its obvious simplicity, whereas the sighted visualise the **table** in a global manner, establishing the comparisons immediately between each of the factors in each country, the blind have to read it sequentially, either horizontally - the country and its three factors - or vertically, analysing each factor in each country, and they will therefore need to resort to the help of memory to make the comparison.

The more complex the **synoptic table** is, the greater the difficulties will be for the blind reader to understand it, regardless of the technical problems involved in its transcription. So, for instance, the **table** appearing on page 181 of the first volume of "Los Partidos, Arma de la Democracia", is far more complicated. There a comparative study of the main European political parties is made, covering the following data: electoral system, countries, parties in each of them, date of the last elections held, net percentage of votes and seats obtained in the Lower House. It is easy to imagine the technical difficulties its transcription presents, as it has six columns and fourteen rows. In braille one is compelled to transcribe it with a structure in accordance with the possibilities of the system whereby is shown the inability of touch to **understand globally**, which is precisely what the ink print table tries to do, i.e. to give the sighted reader synthetic and comparative information much clearer than what the blind get by sequential reading.
The differences between sight and touch as reading and information organs are shown more clearly when dealing with graphic information in ink print books. This information will generally have to be left out, as we will see in the next section when talking about visual means. Touch as a reading sensory organ is an imperfect substitute for sight and therefore has obvious disadvantages.

(b) Problems arising from visual means with regard to braille transcription. The enormous abundance of visual elements which ink print books have today is a great hindrance to their transcription, because it is not an adequate solution just to eliminate all the graphic information, as this undoubtedly implies a serious impairment to the book in its informative function.

On the other hand, it is not possible either to carry out an entirely exact transcription, reproducing with embossed dots all that graphic information, because in some cases this is not technically possible and in others, due to the fact that such a reproduction is unintelligible to the blind.

It is therefore, necessary to establish some basic criteria which might serve as general guidelines so as to determine what should be done when each of the visual means is presented, with regard to their transcription into braille, so as to guarantee the appropriateness of the conveyed information. These basic criteria are as follows:

1. All pictures, photographs or drawings of a figurative nature should be eliminated because, even if they are capable of reproduction with dots, they are inaccessible to touch and, however simple they might seem, they are difficult to identify. Touch, on account of its inability to appreciate perspective, cannot discriminate forms in a bi-dimensional representation.
2. When pictures are eliminated one should consider whether their omission significantly affects the contents of the book. If so, they should be substituted by their corresponding caption when it is explicit enough, or by a textual explanation.

3. Geometric drawings, diagrams and graphs, which are usually the basis of a mathematical or scientific demonstration should be made with dots and they should comply with the following conditions:

(a) That braille embossed reproduction should be technically possible.

(b) That such reproduction should be perfectly understandable by touch, and

(c) If the figure is very complex, before its transcription someone with sufficient experience should simplify it to the limit by eliminating irrelevant auxiliary lines or he should adapt it without detriment to the demonstration.

4. Figures should be placed in the braille book as near as possible to the theorem or problem they illustrate or for the demonstration of which they are the basis.

5. With regard to diagrams, organigrams, tables with keys or the like, developed formulae for Organic Chemistry, tree structures, synoptic tables, etc., a similar criterion as indicated for geometric figures or graphs should be followed. Their possibilities for embossed reproduction and their ability to be understood
by touch should be carefully studied and if necessary, they should be adapted by an expert. When tables and diagrams, etc., are too complex and difficult to be transcribed or understood, it is better to reproduce them horizontally and sequentially, as this is more in accordance with tactile possibilities.

In order to apply these criteria we have just specified adequately, it is first necessary to carry out a thorough study of the ink print book so as to eliminate, adapt or transcribe the visual means it contains. This study should be made by suitably qualified people with a good knowledge of the subject of the book, with a mastery of the possibilities of braille transcription and with good teaching experience. This team should consist of both sighted and blind people. The book-editing team has to work in close cooperation with the printing house or better still, it should consist of members of the braille works staff in order to ensure perfect functioning.

(c) **Problems posed by print resources.** At present ink print books, especially textbooks, contain a great variety of print resources: use of different colours and various type sizes and forms, marginal or interpolated paragraphs, formulae layouts and definitions, footnotes, etc. All this, together with the enormous abundance of visual elements render the books extremely pleasant and are a recreation for sight.

But this luxury in the print book, relevant in many occasions since it emphasises what is important and acts as an aid to memory, and which is a true visual rest, poses great difficulties for its transcription into braille, if we intend to show everything.

It is well known that the braille system has a single character type and that its possibilities are limited to the combination of the six dots, with which the sixty three simple signs can be made. It is necessary to use
key signs which, placed before the simple ones, transform them in numbers, capital letters or italics. However, bearing in mind that braille reading is analytical and sequential, these key signs should be reduced to a minimum so that they do not become a serious obstacle for the blind reader.

Although we are not going to give a detailed account of the rules concerning the use of key signs, it is, however, absolutely necessary to suggest some basic criteria so that transcribers know what action to take and how to interpret the ink print resources suitable when having to make the braille version. These criteria are as follows:

1. In braille transcription it is impossible to reproduce the enormous variety of print resources of the ink print book, i.e., use of different colours and different type sizes and forms. Consequently, key signs should only be used in really relevant cases:

   (a) The number sign should precede any numerical expression.

   (b) The capital letter sign will be used in the following instances: before the initial word of any writing, all proper names, the initial word of a paragraph, after full stop and optionally after the colon and in any other cases where the text requires it, such as a literal mathematical expression, some items with literal enumeration, etc. When in the ink print book a word is written entirely with capital letters or when the initial letter of every word in a paragraph is capital or the whole paragraph is written with capital letters,
there are some conventional solutions in braille, but they are not very convincing, and therefore, it is advisable not to apply them.

(c) The italic letter sign will precede those words which, because of their importance, it is necessary to emphasise as well as brief paragraphs applying the existing braille solution for that purpose, which is not very convincing and which should be eliminated in long paragraphs. The italic braille sign stands for the following ink print variants: italic, bold type, letters with a different colour, underlined words, or in general, all forms of emphasising a word. It is also used to emphasise a letter or group of letters - desinential prefixes and suffixes - but this solution is hardly in accordance with braille, and therefore, its appropriateness should be studied in each case.

2. When paragraphs written in small characters, marginal or interpolated paragraphs are indicative of complementary information or a more advanced knowledge corresponding to a higher educational level, they should be transcribed into braille in a distinct manner, isolating them by means of blank lines and using a conventional sign. In Spain for this purpose, we usually write a double asterisk sign preceding the capital letter which initiates the paragraph and a single one after the full stop sign that ends it.

3. If those marginal or interpolated paragraphs are only placed in this way for situational
reasons, as parallel information, an adequate place within the text will be sought to insert them.

4. Formulae, definitions or paragraphs in a box can be transcribed, surrounded by dotted lines, in order to enable their easy location and make them stand out.

5. Notes, both those from the ink print book and the ones belonging to the braille edition, should be placed at the foot of the page and should be separated from the text by a dotted line. However, when books have a great profusion of notes and, therefore, their insertion at the foot of the page would imply a serious nuisance for reading because of the limitation of the written braille space, they can be placed immediately after the end of a chapter or lesson, this being indicated when the first one appears. Bearing in mind that print resources, besides having an informative goal, also aim, as we said, to be an entertainment for sight it would be worthwhile to investigate whether in braille books, within the lack of resources, means could be found to serve as entertainment for touch. I wonder whether some blank spaces and lines, provided that they do not hinder the continuity of reading, could fulfill this end. This is my suggestion, in case it should be of interest it should be further investigated.

(d) Special notations. Braille with its limited resources has to cope with the presentation of signs and symbols for mathematics and science, phonetics, linguistics and music and which often appear in ink print books with a great variety of meanings.
In order to solve this problem, as blind people progressed in the field of culture, in the different countries special codes gradually appeared, based on the elementary ones created by Louis Braille, and thus emerged the special notations, unfortunately differing from one country to another because cultural evolution has not been parallel.

Today there are different notations, for science and mathematics, music and phonetics, and in spite of the efforts made by the World Council for the Welfare of the Blind through its specialised commissions to achieve the desired unification, it has not become a reality yet, although we are all convinced of the considerable advantages that unity would bring.

With regard to mathematical and scientific notation, Spain has adopted the "U" notation, created by Francisco Rodrigo Dominguez, an official of the Spanish National Organisation of the Blind, who has recently been appointed as Chairman of the Subcommittee on Mathematics of the Committee on Cultural Affairs of the W.C.W.B. This notation is now in the experimental stage and is being studied by experts from different countries, and it adequately satisfies the demands for transcription of mathematical and scientific books.

(c) As far as phonetic notation is concerned, in Spain we are using the code published in Marburg in 1938, translated and revised by Byron Eguiguren, and produced by the Editora Nacional Braille de Buenos Aires. This notation, where only consonant signs, semi-consonant and semi-vowel sounds, are included, was supplemented later with the signs for vowel sounds by Mr. Eguiguren and Mr. Pajon, in accordance with the table published by the Imprenta Nacional Braille in Madrid.
For linguistic codes, Spain has followed the work "World Braille Usage" by Sir Klutha Mackenzie, published by UNESCO with some later modifications approved in international meetings of the Iberoamerican countries.

Finally, with regard to music notation, Spain for many years used the eight dot music code of the Spaniard Abreu, but in the early fifties the 1929 Braille Music Notation was adopted in order to contribute to the international use of a unified system. Today we still use it with some modifications introduced by experts.

These notations, which have emerged separately and without communication among the experts who created them, have already posed some problems for lack of coherence among themselves especially if we consider that culture nowadays is mainly interdisciplinary, and mathematical symbols, for example, can be found very frequently not only in physics, chemistry or biology, etc., but also in grammar, sociology, philosophy and in some specific subjects, such as logics. On the other hand, in mathematics use is made of Greek and Hebrew letters together with the Latin ones, and this makes it necessary to render them distinct from the corresponding linguistic signs.

I do not wish to make an eloquence here of the advantages of unified braille notations, but I think that we, directors of printing houses and libraries who are directly concerned with this problem, on account of our responsibility in braille production, should undertake to pressure the experts so that unification soon becomes a reality.

(e) Conclusion. So far we have made an objective study of the problems arising from the transcription of the ink print book into braille from the point of view of the production centres: printing houses and libraries; but now we shall try to analyse critically the opinions of the interested parties: blind students, professionals and readers, those who receive our book.
Three positions have been adopted by those concerned, and they usually coincide with their conception of blindness in general:

1. **Sightism.** Those who maintain this position believe that braille should be an exact copy, a very accurate transcription from the ink print book, containing the graphic information, reflecting the typographic resources and omitting exclusively those prints, tables or typographic resources, which are clearly impossible to be transcribed on technical grounds.

The defenders of this position think the apprehension possibilities of touch are in a way equal to those of sight because the visual sensibles that touch does not perceive can be replaced, so they believe, by imagination and intelligence. They hold the view that touch can even apprehend perspective with a period of training.

2. **Blindism.** The defenders of this position believe that textbooks should be made specially for the blind, taking into consideration the resources of the braille system and the information. The fight against verbalism has led to the opposite extreme, that is, intuitionism, and the enormous abundance of visual means makes textbooks almost intranscribable, above all, those prepared for the first grades of elementary education where there is a minimal amount of written text and graphic information occupies almost the entire book.

3. **Eclectic position.** This is a midway position, belonging to those who consider that many texts cannot be transcribed exactly in the same way as they have been conceived, not only for reasons of technical impossibility
but for the fact that they would prove inadequate and of very little use. However, if we make special textbooks for the blind this would imply a greater isolation from the surrounding world, acting against the necessary socialising nature of culture. Thus, for example, a blind person will never be able to verify that snow is white and blood is red, but he has to know it.

The defenders of this eclectic position believe that ink print books should be previously or simultaneously adapted for transcription into braille, eliminating those drawings unsuitable or impossible for touch, simplifying those which can be simplified for better interpretation, replacing where necessary visual means by adequate written information, giving the synoptic tables, diagrams, tables, etc., the most accessible form for touch and in a word, showing only those typographic resources which are really meaningful.

The three alternatives given serve to some extent as a corollary to the problems presented above, problems which offer us a wide range of subjects for meditation, which we feel if critically contrasted in an open and constructive debate, will no doubt lead us to adopt the appropriate agreements and make the necessary recommendations for reaching valid solutions.
Report on Experiences About Modern Printing Techniques Under Consideration of Traditional Methods

P. Schneider-Maunoury
Association Valentin Hauy, 47 Boulevard Garibaldi, 75015 Paris, France

Introduction

The framework of this report has been defined with precision.

Modern techniques are obviously the utilisation of data processing and electronics, and traditional methods are the embossing of sheets of paper or plastic.

However, we will recall some characteristics of the traditional techniques and, at the end, we will mention briefly the non-traditional methods, such as the elimination of braille paper and the utilisation of the normal method of printing embossed characters for the production of braille.

According to traditional techniques, the cooperation of a non-blind person is used. This person should have, according to his abilities, the knowledge of grade 1 braille, contracted braille, braille music or mathematical notations.

The instruments used are the LOUIS BRAILLE writing frame or slate, the 6 key braille writer and the stereotyping machines. These latter permit the embossing of aluminium plates, indispensable for the press printing of a large number of copies on paper, or occasionally on plastic.

This paper was presented at the European Conference of Directors of Braille Printing Houses and Braille Libraries in Madrid in April, 1978.
This demands a specialisation on the part of the transcriber whose actual production is very small. It is estimated in fact, that a transcriber will not produce more than 600 words per hour and, since this work is tiring and demands great attention, the daily production should approximate 4,000 words.

Consequently, it is necessary to point out that this procedure is not valuable or economic unless the transcriber is a non-paid volunteer.

It becomes very expensive if it is necessary to pay the transcriber, even more so when the transcriber produces only one copy at a time, which explains the enormous amount of time required for a given transcription and the interest of trial experiments in various countries, notably in Denmark, the Federal Republic of Germany and in France, in the utilisation of data processing. The computer program replaces the individual knowledge of the braille transcriber.

The Production Process of Braille using Modern Techniques

In order to fully understand the interest of modern techniques, the development of experiments, and the progress which can still be made, we will study the production process of braille which includes 4 steps: data collection, data processing, stocking and distribution of processed data, and finally the presentation of this data on braille paper.

With the exception of the first step, all of the others can be automatic, the reliability of the equipment used eliminating possible errors.

(a) Data collection or the feeding into the computer of the text to be transcribed into braille.

In general, starting from the document to be fed into the computer, punched cards are made.
The control of the cards should be carried out with care in order to eliminate practically all error.

In the different countries where experiments of this kind have been performed, it is undeniable that the problem of the accuracy of the cards is the most important one so as it is for normal printers.

Will it be necessary to use the method which consists of typing the document on a typewriter, equipped with a given type of characters, verifying and correcting as required the typed text, and then having it read by an electronic eye producing a punched or magnetic tape, which will then be inputted into the computer?

In certain cases, apparently very limited, the collection of the data can be carried out using punched tapes, magnetic tapes of the discs used by normal printers in their composition process.

This solution would be advantageous since a document already transcribed on a data carrier is available and permits its direct input into the computer; however, this last solution poses certain juridical problems because of the use of punched or magnetic tapes, where that which is recorded on the tape belongs to the publisher, while the tape itself belongs to the printer.

(b) Data processing, that is, processing in the computer.

It is necessary to draft a program which processes the data to output, be it grade 1 braille, which is simple since there is a one-to-one relation between the ink print character and the braille character, or braille according to the system of contractions of the language of the country concerned.

It is, in fact, deceptive to think that it is possible to have one day an identical contraction code for all
languages.

In the three countries mentioned above, the programs have been completed.

In France in particular, a team of data processing experts from the SABATIER University in Toulouse has completed a program with total reliability for the contracted code of the French language, despite its complexity.

This program has been checked with the very greatest care and should be considered reliable.

As regards musical transcriptions, the problem is much more complex and experiments are in progress, particularly in France.

With regard to the transcription of mathematics, of detailed mathematical notations, there do not yet exist to our knowledge any complete programs.

If the setting up of a program is expensive, it is done once and for all and the cost of its setting up can be made up for over a very long period of utilisation.

Keeping in mind that this type of program requires a very large computer, it seems desirable to centralise the data processing instead of dispersing it which would be expensive.

(c) The stocking of the processed data and its distribution.

It is no doubt possible to adapt at the output of the computer a braille printer, such as IBM has done and in this way to have directly available a copy on paper, but it seems preferable, at the output of the computer, to stock the data on punched tapes, magnetic tapes or discs.
The copy obtained at the output of the computer can then be reproduced, as many copies as desired, on simple automated machines, and at a relatively low cost.

This would allow in particular the supplying of materials to libraries, schools and associations which would be able to produce the actual braille volumes as needed.

As has been mentioned above there are no doubt advantages to the centralisation of data processing. It seems, on the other hand more interesting to decentralise the embossing on braille paper itself, stocking locally the punched or magnetic tapes which take up much less space than the braille books. The production of the actual braille volumes would be performed on request.

This is the solution that seems to have been adopted in Denmark.

(d) The embossing on paper of the braille text.

In this area, the experiments vary according to whether it is a case of the printing of one copy at a time or of a large number of copies.

We have mentioned above the braille printer developed by IBM.

In France, the SAGEM Company has modified a traditional teletype machine to permit the printing of braille paper instead of typing the text in "black and white".

This machine prints the paper at the speed of 15 characters per second. It can be connected to a computer to form an actual computer terminal or be controlled by a punched tape.

As regards emission, it can be controlled either by the normal teletype keyboard or by 6 specialised keys corresponding to the 6 points of the braille character.
This machine, which is now operational, installed in libraries and schools, would permit either the production of braille copies upon request or the production of a punched tape for the internal needs of a given school or library.

It is also possible to modify the traditional stereotyping machines so that they are controlled by punched tapes and produce in this way the metallic plates, which permit the press printing of large quantities.

The question, which can be raised, is if it is better to modify the controls of the traditional stereotyping machine or to develop a machine similar to the SAGEM teltetype machine, but permitting the printing of aluminium plates.

This quick review of the 4 steps in the braille production process shows that if the second and third steps of the process are, already, completed and operational, research should be pursued in order to reduce the cost of the first step, data collection, and to find the most adequate system for the fourth step: be it greatly decentralised with the use of machines like the SAGEM machine in the various production centres, or centralised in a few important printing houses equipped with stereotyping machines, controlled by punched tapes, magnetic tapes or discs.

Conclusion

We would not like to conclude without saying a few words about the non-traditional methods and, in particular, about the Digicassette machines, which use a braille display by electronic means.

Studied in particular in France by the VALENTIN HAUY Association with the collaboration of the ELINFA Company, this type of machine permits magnetic stocking of more than 150,000 braille characters on one single side of a C.90 cassette tape.
An interface linking the Digicassettes with the computers has already been developed. And thus it is possible to obtain texts recorded on cassette tapes starting from the elements of the second or third step of the above mentioned production process.

We would like to point out that the same display system has permitted the adaptation of calculators, making it possible in this way for the blind to perform complex calculations, which, up to now, have been barred.

Finally, one last word about a technique concerning which research is in progress in order to obtain a method by which the printing of braille might be produced using the traditional method of normal printers, who wish to obtain a slight embossing.

This technique of embossing until now as regards braille, poses difficult problems, because the relief to be obtained is significantly greater than that used in normal printing.

This report has been purposefully limited to the general principles, without mentioning all of the experiments which have been performed in a number of European countries and, I will be pleased to make any further clarifications for the participants of the Conference. I thank you Mr. Chairman, ladies and gentlemen for your attention.
Possibilities for Stimulating Learning and Reading Braille

J. Lorimer
Research Centre for the Education of the Visually Handicapped, University of Birmingham, Selly Wick House, 59 Selly Wick Road, Edgbaston, Birmingham B29 7JF, England

Introduction

In common with sighted people, the blind during the last fifty years have enjoyed a continuously increasing range of benefits which have come from the rapid and often bewildering advances in scientific knowledge that have been made in less than a normal life-time. Not the least of these benefits is the increasing volume and variety of braille literature which is becoming available through the development and increasing use of automated methods of production. But while it is highly desirable that this search for yet more efficient ways or producing books should continue, it is surely no less desirable that thought should be given to devising ways of making braille a more satisfying and a more easily accessible reading medium. Studies already completed or now under way emphasise the need for a critical review of current methods of teaching braille reading and of the rationale for them. The purpose of this short paper is to describe briefly the research that has been done and to outline the implications of the findings. These implications are relevant, not only to the English-speaking countries in which the researches have been conducted, but wherever braille is used.

The Need for Braille Code Revision

Investigators in the United States of America (Ashcroft, 1961; Nolan and Kederis, 1969) have shown...
that much of English-speaking children's difficulty in learning and reading braille stems directly from the complexity of the contracted code and from certain of its features. The assignment of up to eight meanings to a symbol, the opportunities for reversal and inversion and for confusing upper with lower signs, and the use of short-form word signs infrequently occurring are among the structural features which are troublesome to many beginners, children and adults alike. Furthermore, frequency surveys carried out in Britain and the U.S.A. have revealed that many of the contractions contribute very little to space-saving. Their removal from the code would ease learning difficulty and the resulting increase of space would be almost imperceptible. These weaknesses are probably characteristic in varying degrees of contracted codes used by other linguistic groups.

There are those, usually the highly competent braille readers, who call for the addition of yet more contractions. However, research findings appear to indicate that any further revision of the code should be in the direction of reducing rather than increasing the number of contracted forms. There will be a point beyond which the addition of contractions will have no noticeable effect on saving space but will only increase learning difficulty and reading time.

In Britain and elsewhere there is evidence of a growing belief that a simplification of the contracted codes now in use would be of advantage to readers and producers of braille. The desire for change, however, appears to spring from two rather different and possibly conflicting aims. Teachers regard simplification primarily as a means of reducing learning and reading difficulty whereas the printing houses will understandably tend to seek changes which will facilitate computer-controlled production. It is hoped that any change sought by computer programmers will be adopted only if it also has the approval of braille readers.
Objective evidence which will support or refute the case for a simplified code is now being gathered in England. This is part of a research project on the braille code, extending the use of braille, and the improvement of reading skill which was very recently set up under the joint direction of Dr. M. Tobin, (University of Birmingham) and Professor J.L. Douce, (University of Warwick). I am a Research Fellow at Birmingham closely associated with this investigation. Two experiments have been conducted to obtain some indication of the effect on reading time of using fewer contractions.

**Experiment 1.** The 16 volunteer readers involved had all begun using braille while in a junior school for the blind. Their ages ranged from 20 to 65 years and they represented a wide range of occupations. They read silently two different 900-word passages, one in standard contracted code and the other in a modified code which contained only 57 out of the 190 contractions normally used. The modified version of a passage occupied 8% more space than the standard version. Comprehension was not tested. A balanced design was used in allocating passages and braille versions to readers. In order to maximise negative effects, readers had no knowledge beforehand of the modified code being used.

Despite the adverse conditions the difference between mean speeds (94 w.p.m. on the standard version and 77 w.p.m. on the modified version) was found on statistical analysis to be non-significant.

**Experiment 2.** A similar experiment was later conducted with the same group of volunteers but under conditions more favourable to the readers. The code used on this occasion comprised 73 contractions and increased standard braille space by 6%. As before, two versions of two different passages (each about 1,250 words in length) were assigned in a balanced design. But this time readers were able to practice with the modified code during the two weeks immediately before the timed test.
Contrary to the forecasts of some of the readers, mean speed rose from 89 w.p.m. on the standard code passages to 95 w.p.m. on the modified versions. Statistical analysis showed that the difference between the two versions was non-significant. This result was considered to be most satisfactory, indicating that the group read the standard and modified code presentations at approximately the same speed.

Further experiments are being designed in which subjects will read orally as well as silently and be tested for comprehension. The data so far obtained does seem to support the view that the removal of the many weak contractions in the English code would only slightly increase braille space and make no difference to reading speed. At Warwick University, Dr. J.M. Gill is undertaking a large-scale survey of the frequency of occurrence of contractions in English literature. On the basis of this survey it is confidently expected that it will be possible to devise a simplified code that will be less of a burden on the memory and that will be easier perceptually and cognitively to learn and use. Such a code could bring braille reading within the reach of many who have been unable to cope adequately with the complexities of the present code, especially less able children and adults who have lost their sight in later life.

Teaching Methods

In addition to code simplification there is clearly a need for improved teaching programmes, greater teaching expertise and better designed training materials. Indeed, it is in this direction that most surely lies the possibility of raising reading standards and of more widely extending the use of braille. There is a growing realisation among educators that the teaching of reading in schools should continue for a longer time and to a higher level than is generally the case at present, and that the reading courses available to adults are often inadequate. The effectiveness of new teaching approaches
has been demonstrated by experiments recently carried out in the United States and in Britain.

Experiments and Techniques for Increasing Braille Reading Speed

In the United States, Vearl McBride (1972) trained a group of highly-motivated adults to use techniques for rapid reading which had been found to be very effective with print readers. By the end of the two weeks' training, the mean speed for the braille readers had risen from 138 to 710 w.p.m. or twice the rate at which print is generally read. Despite the difficulty of assessing the validity of this dramatic result, there seems no doubt that the kind of training given did produce substantial improvement in reading speed, as was later confirmed by other American investigators who used McBride's methods but under scientifically controlled conditions.

In 1977, I tried out some of the techniques used by McBride and others in a controlled experiment at Lickey Grange School for the Blind, near Birmingham. Unlike the American projects, the children receiving the training were not volunteers and were not even aware that they were taking part in an experiment, for it was a particular aim to conduct it under the conditions in which the teacher would work if the training programme were an established part of the curriculum.

Although not explicitly stated in their published reports, the American training programmes appear to have rested on three assumptions about braille reading:

(a) that scanning techniques used by the sighted are equally effective for the blind;

(b) that braille readers read at a pace which is well within the limits of their perceptual capacity; and
(c) that the sensitivity of fingers can be increased by training and practice.

Although doubtful about their soundness, these assumptions were tentatively accepted. The experimental group received training weekly for twenty weeks.

While the control group made only minimal gains, the experimental group's mean speeds in oral and silent reading increased by 36% and 82% respectively without significant loss of comprehension. The teachers participating in the experiment were agreed that the experimental group would not have made such substantial progress without the stimulation, the challenge and the systematic training provided by the course. Children who had been apathetic and casual about reading became markedly more interested and purposeful. Indeed, the largest individual gain was made by a girl who chanced to meet me just before one of the earlier training sessions and asked, "Do we have to come to do that reading again?"

Braille Courses for Adults who Lose Their Sight After Leaving School

It is probably the experience of most countries that it is recently blinded adults who are particularly in need of much improved facilities for learning braille. In Britain a number of carefully prepared braille courses are available, but I consider most of them to be unsuitable for many adult beginners. None of the courses provides the pre-braille tactile training that is so essential at whatever age braille reading is begun. The learning steps are too short and too many symbols are introduced at each step. The vocabularies used are often too advanced and the material is generally dull and contrived, it being the aim of the authors to use as many as possible of the new signs just learnt rather than to arouse interest in the content of the passage being read. A struggling beginner is hardly likely to be impelled to go on when at the end of the first lesson, he meets a sentence such
as, "A babe can do every bad deed". The perceptual and cognitive burdens imposed by this kind of teaching approach are too great for many beginners, and so it is not surprising that they soon give up the attempt to become readers.

An entirely new approach in Britain which is proving to be very effective has been developed by Dr. Tobin. After several years of research, a programmed course of instruction was designed which enables the learner to progress steadily and confidently without the assistance of a visiting teacher. Simple instructions, guidance and encouragement are given on a pre-recorded tape, and the course is self-pacing and self-correcting. The further development and extended use of audio programmed instruction would seem to be very worthwhile. There is already evidence of the success of adults who otherwise would probably never have learnt to read braille either because no competent teacher was available or because they had found the traditional methods and materials too difficult.

Conclusion

The extent to which teaching methods and reading standards can be improved is dependent on continued research effort in the areas discussed in this paper and also on the investigation of other and highly relevant areas. Important among the latter are the study and evaluation of different teaching approaches, consideration of the use of colour and embossed illustration to enhance the appeal of braille books, and research which would yield more precise information about the braille reading process. Because of the limitations of touch perception, it would seem unrealistic to hope that braille can ever be as efficient a reading medium as print. Nevertheless, the results of work done so far indicate not just the possibility, but the strong probability that braille reading will become easier to master and more widely accessible.
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Use of Modern Equipment for Storing and Reading Braille Script as well as Establishment of National Data Carrier Centres

R. Nicolussi
Centralbibliothek für Blinde und Nordeutsche Blindenhorbucherei, Adolfstr. 44-46, 2000 Hamburg 76, Federal Republic of Germany

The development of devices which would make it possible to store braille print digitally on compact cassettes in order to be recalled for reading, was already one of the topics on the technical conference in London in April, 1977. The advantage of this procedure lies mainly in the possibility to have a large quantity of text on a single cassette. Some of those devices are already in the stage of practical test, so, for instance, the "Digi-Cassette" in France and the "Braillocord (BRS.76)" which was designed by the Heinrich-Hertz-Institut in Berlin and developed by the AID. There is, further on, the "Braillex", designed by Professor Boldt (Dortmund) which is said to come out in a series for testing in the course of this year. Supplied with a fast automatic station-scanner it is specially suited for the storage of dictionaries and files.

I had the opportunity to test the BRS.76 thoroughly. Though its stage of development is remarkable there will be, no doubt, still possibilities of improvement. Two ways of storage are applied with the BRS.76:

1. using the writing-modul which belongs to the Braillocord and

2. using the data-storage media usually used by publishers.

This paper was presented at the European Conference of Directors of Braille Printing Houses and Braille Libraries in Madrid in April, 1978.
These data-storage media are changed into a special computer programme by the "Rechenzentrum" in Munster. This procedure has been very successful but has not yet reached the most possible degree of perfection, a fact, which must be considered also under the aspect of the financial problems arising from the application of more complicated computers.

As for the efficiency of these modern electronic devices on a larger scale no decisive predictions can be made at present. The main difficulty is the price (DM10.000 for the BRS.76) being far too high for the majority. Another problem lies in the complicated handling of these devices. The experiences in other fields of technical development show, however, that prices can be reduced and that devices can be simplified, if there is a genuine request. The most essential point in respect to the present stage of development is, according to my opinion, the demonstration of technical possibilities.

Essential for the practical use of the mentioned devices is, of course, the existence of Braille-cassettes accessible for each aspirant. This problem should be thought over thoroughly already at this moment in order to be able to take the necessary steps in time. The opinions concerning this subject differ more or less from one another because of various interests, for instance, commercial ones, and, last not least, a certain wish for prestige being understandable in a way. It is obvious that especially the associations of the blind pay attention to these quite new perspectives because of their mission concerning the professional and social integration as well as promoting the cultural efforts of their members. It is, therefore, plausible, if the corresponding discussions are not always free from animosity. An intensive engagement of the interested persons can, however, so it seems to me, be very useful in any case. For we stand ladies and gentlemen, at the beginning of a new period in the application of that script having been given by the well known Frenchman Louis Braille to the Blind of the whole world.
Considering the problems connected with the establishment of data-storage media centres it is necessary to remember that, according to the information of experts, copies of Braille-cassettes should be only made from master-cassettes the exact function of the reading-devices being disturbed otherwise. So one has to establish data-storage media centres where Braille master-cassettes are produced and collected. I wish to point out here, that the production of Braille-cassettes with the writing-modul belonging to the reading-device can only be exceptional because this procedure takes a lot of time and needs qualified transcribers knowing Braille and its special scripts. This would mean considerable expenses again. Naturally it is the same case, if one chooses data-storage media usually used by the publishers because of the necessary technical efforts (computers). On the other side one must admit that only thus the advantages of this new technique can be fully used opening a chance for the blind to get hold of the most up-to-date literature in the shortest of time.

We have to ask now, which kind of possibilities show themselves at present concerning the establishment of data-storage media centres.

1. The existing Braille publishers take charge of the production of Braille-cassettes.

At this point the protest of the associations of the blind comes in. They think, that those publishers have already reached the limit of their capacity. So the printing of important and up-to-date books being needed very urgently is often delayed in a very irksome way for those waiting for them. Of course, I do not know the situation in other countries which may be more favourable. Besides, one should not forget the experiences and the qualified staff of the Braille publishers that count very much.

2. The producers of the reading-devices undertake the production of Braille-cassettes too.
Of course, many of the technical presuppositions that are necessary would be available in that case, and a vital interest is likely to be found here, because financial advantages might come out of it. A too intense dependence on the producer would be possible in this case bringing perhaps disadvantages for the user as well in respect to the programme as to the price.

Here I also want to lay stress upon the possible difficulties in case of licences given by the publishers, because those work on economic principles. The privileges which the talking-book libraries have obtained after much effort concerning the licence of the publishers, might be in danger of getting lost.

3. The associations of the blind become responsible for the data-storage media centres, being financed mainly by public authorities and producing, independent of financial interests, a stock of Braille-cassettes exclusively orientated on the many-sided requirements of the users.

In this case the arising problems are the personnel and financial ones. For these data-storage media centres can only be efficient if one disposes of sufficient financial means which cannot be raised by the associations of the blind. Especially with regard to the necessary qualified staff the financial factor is decisive.

Already these short hints make it obvious, that no general solution can be found here, because the starting situation is varying in the different countries.

At best one can lay down a few fundamental demands that ought to be considered in all future discussions of these problems.
(a) There must be a guarantee, that the data-storage media centres being independent of economical ambitions and wishes for prestige will develop to efficient establishments, thus creating the pre-suppositions to utilise the new technical possibilities to the utmost.

(b) Braille-cassettes must be offered as well for an adequate price or as a loan.

(c) The offer must be many-sided taking into consideration the need for knowledge and learning as well as for entertainment.

(d) A possible lending of Braille-cassettes belongs absolutely into the competence of the Braille-lending libraries, if the data-storage media centres do not pursue it themselves.

(e) It is very important to choose the right way already at the present moment to make sure, that the new technical development enabling Braille-text to be stored on a minimum of space brings all possible advantages for the users. To take care of that, is not only our task, but even our duty.

You will understand, that in the course of this meeting I could only treat my subject very insufficiently being just able to hint at some very important aspects or to give a few impulses which might lead you to think matters over. But this was, after all, my intention. Perhaps I have succeeded in contributing something to the following discussion.
Conclusions and Recommendations from the European Conference of Directors of Braille Printing Houses and Braille Libraries

Recommendation No. 1

With regard to the difficulties arising from the transcription of ink print books into braille, the Conference recommends that the braille version should reproduce as accurately as possible the corresponding ink print original, taking maximum advantage of the possibilities of the braille system to identify paragraphs, chapters, etc., through the use of blank or dotted lines and other means.

Although the exchange of views has revealed that there is not unanimity with regard to criteria for representing pictures, graphs and diagrams, the Conference has emphasised the need to carry out an exchange of experiences and practical results among the different institutions concerned, in order to exploit fully the potentialities of embossed reproduction and tactile ability.

The desirability of undertaking the necessary research and experiments so as to make braille books more attractive to touch through imaginative resources was also pointed out.

Differing views were also expressed in connection with the desirability and possibility of the representation of tridimensional figures, and it is consequently recommended that comprehensive studies should be made so as to determine the possibilities of apprehending perspective through adequate training.

Finally, the importance of braille printing houses and other centres interested in the production of embossed literature having a book editing service was made clear.
This service would have the task of analysing the difficulties that braille transcription could pose, as well as of proposing effective solutions to the problem.

Recommendaion No. 2

The Conference made it clear that as in the past braille will continue to be in the future an imperative aid to overcome the lack of information of blind people. In increasing measure the braille book will be supplemented by digital data carriers. Of special importance will be the compact cassette because of its possibility to considerably reduce the volume of braille books.

The Conference asks the braille printing houses and libraries as well as organisations of and for the blind to sponsor the development of this technology as far as possible, and urges the developers to achieve unification of standards and compatibility of comparable media.

The massive application of writing and reading devices using compact cassettes will only be possible if blind people can have easy access to the corresponding data carrier centres. The need to establish efficient centres for this purpose, which should function beyond commercial interests and should have sufficient capacity to cope with the wide range of demands of their potential users is therefore emphasised.

Although it is admitted that the existence of similar devices can bring about positive competition, it is recommended that adequate cooperation and exchange of information be established among the different parties concerned.
Recommendation No. 3

This Conference recommends that there should be greater dissemination of information concerning new developments in braille production including those systems suitable for developing countries.

Recommendation No. 4

The Conference recommends:

1. That a systematic compilation of specialised literature should be carried out and that appropriate measures be taken so as to provide printing houses and libraries for the blind with information of interest to them.

2. That a permanent section should be established in the Review of the European Blind on matters relating to the printing and distribution of literature for the blind and that the possibility of publishing that magazine in braille and/or recorded form should be explored.

3. That a free exchange of catalogues among printing houses and libraries for the blind should be made.

4. That home delivery and collection of talking and braille books for the blind should be guaranteed.

5. That a regular exchange of experience among directors of printing houses and libraries for the blind should be made possible by the organising of conferences and seminars.

Recommendation No. 5

Aware of the fact that the combination and development of new and traditional methods for providing direct and independent access to information is an important prerequisite for the integration of the blind in society, the Conference recommends that increasing moral and material support be given to the solution of current
problems that blind people experience in this regard, bearing in mind the demands of scientific and technical progress.

**Recommendation No. 6**

It is recognised that acquisition of skill in braille reading and writing is indispensable to the blind in their work and in their leisure activities, and that without it their lives would be much impoverished. It is therefore recommended that research effort, nationally and internationally, should be directed towards stimulating interest in braille and finding ways of making it easier to learn, more widely accessible and more satisfying to use.

Towards this end it is recommended that:

1. The systematic teaching of braille reading to school children should continue for a longer time and to a higher level than is generally the case at present.

2. The possibility of designing more effective methods and materials for teaching reading to children and to adults is in urgent need of investigation. The provision of adequate expertise in the teaching of braille to adults is also essential.

3. Any change in braille codes to facilitate computer assisted book production should be adopted only if it also has the approval of the braille authority concerned.

Bearing in mind that unanimous criterion with regard to the appropriateness of contracted codes for the majority of blind people does not exist, reliable research should be effected in order to demonstrate their pros and cons.
Computer Aided Processing for Natural Language - PIAF System

Application to Data Acquisition, Translation and Editing in Contracted Braille

E. Grandjean, B. Mathieu
Equipe Intelligence Artificielle
Laboratoire d'Informatique - IMAG,
BP 53 - 38041 Grenoble cédex, France

Introduction

A set of programs oriented to natural language processing have been designed and implemented. These programs were first applied to French language analysis and led to creation of the PIAF system (Programmes Interactifs d'Analyse du Français).

Some applications are operational mainly in automatic information retrieval where the PIAF system performs two tasks in parallel:

1. Data acquisition and control,
2. Production of simple or compound key words.

Following a request from the Centre National des Arts et Métiers, we have developed the contracted braille translation and editing of French texts with respect to typographic codes from programs and basic algorithms of the PIAF system.

General Principles of the PIAF System

We propose to the average user a set of tools to define and handle textual datas, under the control of an editor:
(i) The definition tools are facilities to create and perform interactive updating of the dictionaries and models of the selected language, in a simple command language.

(ii) The processing tools allow the analysis and the generation of textual datas with respect to the previous linguistic definitions (which are parameters of the running programs).

(iii) The morphological analyser which includes a dictionary and a finite states automaton for the processing sequential data (strings).

(iv) The syntactical analyser built upon a set of dependancy relations and context free rules, to build and control tree structures.

Some research works are going on to implement modules for the transformation and the evaluation of tree structures.

The possibility of changing the linguistic informations allow us:

(i) the choice of source language (French, Spanish, English...)

(ii) the choice of the transduction (grammatical analysis, key words, phonetics, contracted braille, programs translation...).

Application to Data Acquisition Control of Texts in Natural Language

The purpose of this program is the detection of encoding errors (editing, syntactic, morphological error) with respect to a language model, during the input process (real time).
At this moment, the user is automatically advised and he can converse interactively with the computer in order to correct the text, to index the new word in the dictionary or to complete the model of the language.

(a) Morphological analyser

The dictionary contains non-varying forms and expressions, prefixes, radices, suffixes and terminal items. These elements are related to the morphological models (400 models for French) and a finite states automaton controls the application of the concatenation rules (180 rules for French) of the various elements composing a form (radice+suffix(es)+end term) and provide the required transduction, in the form of categories and grammatical variables (verb 1st person, plural, future...).

When no rule leads to a final state, a back-tracking technique is used to look for other solution (e.g. different splitting). Otherwise, an orthographical error is pinpointed.

(b) Syntactical analyser

The dependency relations between the categories induce the construction of one (or several) sentence structure.

On each vertex, a context-free rule can be applied to check the grammatical variable concordances (gender and number concordance between a definite article and a substantive). Therefore, it is possible to exhibit and detail a concordance error.

Application to the Contracted Braille Translation

The purpose of this program is to provide for each basic string its contracted braille representation, according to the rules defined by the braille library edition 64, Association Valentin Hauy. To perform this translation, we only need the morphological analyser.
system described as above together with an appropriate
dictionary and automaton.

The dictionary contains the invariable forms and
expressions, prefixes, radices, suffices and terminal
items, as well as basic strings starting by a consonant
or a vowel. To each of these elements, the braille trans-
lation and a reference to a model (30 models for the French
braille) must be associated. The automaton verifies the
application of rule (about 30 rules). Generally these
rules have two functions:

(i) Concatenation of the different components
of a form,

(ii) Some production constraints (identical
codes, lower codes).

The specific techniques involved in the interactive
language processing previously written for the data
acquisition control made easier the contracted braille
translation to a large extent. In particular, the following
points:

(i) the priority of the identification of the
longest string is possible because of the
organisation of the dictionary.

(ii) these strings may contain blank characters,
this makes possible the identification of specific
expressions in the input text without special mark.

(iii) each element (string) leading to a solution
(a final state of the automaton) cannot be split.
But whenever a final state is not reached, a back-
tracking technique allows a look up for shorter
elements and a solution.
Interactive Editor

A user can run the various modules of the PIAF system in an interactive mode.

(i) At the definitional level - the finite states grammar and the dictionary (or a partition of it) can be created while the coherence of the information is checked automatically.

(ii) At the translation level - the interrogation mode provides the facility of dialog with the computer (IBM 360 CP/CMS) via a terminal (SAGEM type TEM 8BR) (keyboard with stressed vowels) direct login or through the CYCLADES network.

This procedure is particularly well suited to debugging.

Considering an incorrect result (or no result at all), it is possible eventually:

(a) to activate directly the definition programs to update the models and the dictionary.

(b) to correct an error typing,

(c) to restart the current sentence.

The working mode is intended to activate the same functions as the interrogative mode but the user must specify the physical files for input/output and the length of an output lines (up to 31 or 40 characters).

(iii) At the editing level

Two main typographic functions are included:

(a) "COMMENT" prevents contractions
(b) "JUSTIFY" to write at the beginning of a line or a paragraph.

It is possible to invent new typographic functions.

Conclusion

The design of the PIAF system was intended to be interactive, parameterised and modular. In the computer-aided design area for natural language, it requires to work out some software problems before any application.

The translation in contracted braille is a good example of software tool tailorable by non-expert users. For a user, easy debugging is due to the interactive mode designed to reach "transparency" of a set of programs.

An application to other natural languages is made possible without any deep modification.

When there are no contracted braille definite rules for a language, the PIAF system turns out to be a simulator; this leads to formalisation of the processing, hence, of the rules. Besides this effect, the PIAF system can have frequency counters of words to estimate the gain of contracted braille.

Translation speed is about 230 words per second on an IBM 360 under CP/CMS.

Bibliography

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Zoltan Braille Embosser

G. Hellstrom and B. Jacobsson
Trask Datasystem AB, Stockholmsvagen 34,
S-182 74 Stocksund, Sweden.

The ZBE is a computer controlled rotary press, which produces interpoint braille; the press can also print on only one side of the paper.

General principles

With the ZBE the different activities for producing braille print, which previously have been performed as separate subroutines, are now combined in one continuous system. The subroutines are:

1. The processing of text, i.e., translation of text stored on any data carrying medium (paper tape, magnetic tape or floppy disc) into a braille format including automatic generation of braille abbreviations etc.

2. The setting of braille text on the printing drums.

3. The rotary printing, cutting and sorting of interpoint braille.

The core of the system is the press with two printing drums fitted with nearly 13,000 printing pins, each of them can be locked in two positions. The setting of the pins is determined by 144 setting magnets. The setting and the supervision is done by a computer program through a hardware interface. The computer transmits orders about setting of magnets, starting and stopping of motors etc. There are also signals going from the press back to the computer program carrying information of states and positions in the press.
The press is fitted with an extensive protection system to prevent mechanical damage arising from erroneous orders sent from the computer or from any other source.

The press is provided with a panel for manual operation, which permits manoeuvring and positioning of the ZBE when the computer is disconnected from the press. The computer is equipped with facilities for reading the text. There is also a typewriter, which forms the control console for the operator in determining the work of the press.

**Mechanical construction**

The main parts of the press are two printing drums and two textloading devices. Each drum is fitted with 6480 pins corresponding to every point position on one page in the book format of 36 characters in 30 rows.

The details of the printing drums can be divided into two groups - one group belonging to an axle and following the rotation of that axle - and the other group, which can be revolved relative to the former group. This later group of parts forms the outer cylinder and consists of 72 holding rings. The task of these rings is to form a housing for the pointforming pins, dimension being 11.7 mm long, cylindrical with diam. 1.2 mm. The pins are radially movable from a pulled in position, when the pins are completely beneath the surface of the outer cylinder, to a pushed out position .6 mm outside the surface of the outer cylinder.

The holding rings are exposed to an axial pressure coming from press sockets, forming the bearing between the outer cylinder and the axle.

In the lower drum there is a free-wheel clutch inserted between the press socket and the axle. By this arrangement the relative rotation between the outer cylinder and the axle can only occur in one direction thus giving the extra advantage of protection against
wrong direction of motor revolution.

The axles and the details attached to them are connected via gear wheels. The torque is supplied to the lower drum by the aid of a gear belt wheel and a gear belt from the printing motor. The other movable system (outer cylinder with pins and pin-locking arrangements) are also linked together by the aid of gear wheels, attached to the ends of the outer cylinders. An auxiliary driving axle with gear wheels and an incremental decoder also are part of this system. The torque for moving the outer cylinder contra the axles comes from the loading motor by the aid of a ratchet-and-pawl mechanism.

Sequence of operation

The production of braille is performed in two phases. During the first phase (loading phase) the text, which has been read into the computer, will be transferred to the printing drums by the aid of the loading mechanisms. The axles, with inner parts attached, are standing still while the loading motor steps the outer cylinders at low speed. The pins are forced out to printing position erasing the old text. The new text is then loaded into the drums by the loading mechanisms so that only those pins, which are not forming parts of the characters are pushed in. By further revolution of the outer cylinder the pins will be locked in their new positions.

The manoeuvering of the pins can be looked upon as divided between actions inside the drums by the so-called inner mechanism and activities by an outer apparatus - the loading mechanism. Forcing the pins out to the printing position and locking them is performed by the inner mechanisms while the loading mechanisms determine the pushing in of the pins.

The loading phase is completed after one revolution of the outer cylinder which takes about 30 seconds. There is no printing occuring during this phase because the upper drum is lifted thus disengaging the hold of the
Following this phase the printing phase begins. After the upper drum has been lowered on the lower one the printing motor is started and its torque is transferred to the axle of the lower drum and further to the outer cylinder via the free-wheel clutches, which now are exposed to a rotation in their holding direction. The upper drum follows the rotation of the lower by the aid of the gear wheels on the axles and on the outer cylinders. The number of pages printed is determined by the operator. The printing speed is 4-5 interpoint pages per second. It should be noted that the only parts, which are actually moving during the printing procedure are the drums and the driving motor.

The printing phase is automatically followed by a new loading phase for the next sheets of the printed matter etc.

Devices for manoeuvering and electronic control

Besides the above mentioned motors there are three other motors and a set of pushing or pulling magnets for the operation of catches, clutches and brakes.

A large group of magnets are to be found in the loading mechanisms. There are 72 of them in each unit corresponding to 72 pin positions along the horizontal direction of the drum. Every one of these devices are connected with registers in the electronic control unit (the hardware interface), the registers in turn receiving information from the computer.

Besides these active devices there are some passive transmitters delivering signals through the interface about the actual status of the press.

The press is fitted with a manual panel, which enables activation of motors and magnets. The panel is
used when to locate faults, running in of the press and inserting paper in the machine.

**Internal protection aids**

Computer control as well as manual operations from the above mentioned panel could result in erroneous orders to the press, eventually causing damage. In order to protect the press against such situations it has been equipped with internal logic circuits based on fast relays. The main task of this logic is to separate the operations of the loading phase from those of the printing phase. Operations belonging to one of these phases can not appear during the other.

**Main data**

Dimensions: length x width x height
180 x 90 x 170 centimetres

Weight: about 300 kilograms

Environment temperature: 20° ± 5°C

Power consumption: 3 x 389 V Ac., 3 kVA

**Capacity of production**

<table>
<thead>
<tr>
<th>Number of sheets</th>
<th>time for text loading secs.</th>
<th>intermediate time between phases secs.</th>
<th>time for printing secs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>10</td>
<td>.5</td>
</tr>
<tr>
<td>10</td>
<td>30</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>100</td>
<td>30</td>
<td>10</td>
<td>20-25</td>
</tr>
<tr>
<td>1000</td>
<td>30</td>
<td>10</td>
<td>200-250</td>
</tr>
</tbody>
</table>

**Current status of the press**

The press has been built as an experimental model with 36 x 29 characters/drum. The machine is completed
and test printing has been accomplished. The whole system has been tested when all parts for manoeuvring were under the control of the computer program. Test prints of book-format or of format A4 will be available within a short time and will then be distributed for feedback on the acceptability of the end product.

Manufacturing

The ZBE has been developed at Trask Datasystem AB and has been economically sponsored by the Swedish Board for Technical Development (STU). Provided that interest will accumulate for this printing apparatus and that the result of test-runnings are positive, a series of 10 copies of the ZBE is planned. The price for a complete press including interface, computer and software is estimated to 600,000 Sw kronor (circa $125,000). Further details are available from Trask Datasystem Ab, Stockholmsvagen 34, S-182 74 Stocksund, Sweden.
Computer Assisted Book-Lending System for the Blind

R.v. Vliet

Nederlandsche Blindenbibliotheek,
Zichtenburglaan 260, 2544 EB 's-Gravenhage,
The Netherlands

1. Introduction

The Nederlandsche Blindenbibliotheek (Dutch Library for the Blind) has been lending books to the blind since 1895. We started off with braille books only. In 1958 talking books on open-reel tapes were introduced and the number of readers increased rapidly. Nowadays we mainly lend talking books on compact cassettes. The talking book on compact cassette is by far the easiest to use and especially many elderly people benefitted from it. Since we introduced the compact cassette in 1972 the lending figures raised from 0.6 million to 2.2 million in 1978. Evidently this rapid growth imposed great changes on our library. In the early days a team of a few people registered the books in the catalogue, lent them to the blind and put them back on the shelves when they were returned. At the moment three departments are in charge of all this:

The catalogue department registers books in the catalogue and selects books to be added to our collection.

The lending department selects the books to be lent to a given reader on a given day; this department is also responsible for all the lending administration.

The expedition department sends the books selected by the lending department to the readers, registers the books returned, checks these books for damage and put them back in the store.
These departments of course closely work together. Large piles of cards and long lists with numbers are passed from one department to the other. However cards may get in disorder and sometimes lists are lost. In view of this and in view of the shortage of personnel we decided to extend computer services to the process of book registration and book lending.

Since 1970 our library has been active in the field of computerised braille. In 1975 a lending administration system was designed that made use of our mini computer (PDP-8 of Digital Equipment Corporation). It was installed in 1976 and hitherto operates rather successfully. Encouraged by the experience with the small lending administration system and urged by the rapid growth of lending figures (over 30% a year), the decision was taken to set up a much larger computer-assisted book lending and book registration system.

The computer will get involved in many relevant domains:

It will hold the complete catalogue, it will do all lending administration and it will log the books sent out or returned.

This new system is developed on a somewhat larger mini computer (PDP11/34 of Digital Equipment Corporation). We will start using parts of it in summer 1978. The system is planned to be completed before summer 1979.

This paper discussed the above mentioned book lending and book registration system. It will not contain many technical details. Its aim is to point out the over-all system design and the interaction between different parts of the system. Moreover attention will be paid to questions like: How will users communicate to the system, how can they force it to do what they want, and what kind of information is available for the users.
Section 2 discusses the current course of affairs. In section 3 the basic structure of the system is pointed out. The next 3 sections deal with the use of the system on the separate departments. In the last section some general conclusions are discussed and some words are spent on the future.

2. Current book lending activities

As soon as new readers subscribe to the library they receive a couple of books. They also can buy a catalogue of books, so that readers can make up their minds about the books they wish to read. A complete catalogue is brought out once every five years, supplement lists are submitted to all readers every 3 months.

New readers have to answer a questionnaire, which asks them a number of personal data and the genera of books they are interested in.

Libraries for the blind differ from ordinary public libraries in that the readers do not normally visit the library to exchange their books. On the contrary, our readers live all over the country and as they are visually impaired travelling is difficult for most of them. They receive and return their books by post. This fact heavily bears upon the work in our library. As a rule readers want to receive new books when they return the books they finished. As they are unable to come to the library and make their choice from the books currently in stack, the selection of books for readers must be performed by personnel of the library. This is the main task of the lending department.

How do we select books for our readers? As pointed out above, catalogue and supplement lists are at the disposal of our readers. The catalogue is available in ink print only, supplement lists are edited in braille, in ink print and recorded on compact cassette. From this material the reader may decide which books he wishes to
read. Readers may write down the number of these books and send them - either in braille or in ink print - to our lending department. From these lists the so-called preferent wishroll is computed for each reader. Some readers have several hundreds of numbers on their preferent wishrolls; most readers (about 70%) never ask for any special book and hence have an empty preferent wishroll.

When selecting books for a reader, we first look if books on his preferent wishroll are currently in stock. If they are, such books are sent. If the readers' preferent wishroll is empty, or if none of the books on it is in stock, the lender has to make a choice for the reader. This is quite a job. First a book must be found that hopefully suits the taste of the reader and could be of his desire. Here the genera of interest indicated on the subscription form can be used as a guide-line. Also criteria such as age, sex and education are taken into account, as is any other knowledge the lender might have on the reading behaviour of this particular reader. Once such a book is found, it must be checked whether the reader has received this book before. To achieve this we keep track of the so-called reader history. The history of a reader is a list of all books the reader ever lent from our library. Any book lent to the reader is added to this list. Before selecting a book for a reader the lender checks if it does not occur in the readers' history yet. Such a check is of course superfluous when lending books from a preferent wishroll. Finally it must be checked if the book chosen is actually in stock at this moment. If not, everything must be repeated.

The number of the book selected is put on the mailing list together with the name and address of the reader to whom it must be sent.

Before discussing the work of the expedition department in some detail we have to spend some words on the package of our books. We have developed a special box for our books on compact cassettes. This so-called Hulshof box
measures 26 x 24 x 2 centimetres and can hold up to six cassettes. If a book consists of more than six cassettes two or more boxes are required. Bottom and lid of a Hulshof box are tied together with elastic bands. The title and author of the book are written on the lid. The box number is denoted at the side, where it can be seen when the box is stored in the warehouse. The box number is composed of a 5-digit book number, a copy letter (of some books we use over twenty copies), and a 1-digit sequence number (1, 2,... if this box is the first, second, ... box of the book). At the lid of the box there is a window in which an address card can be shifted. One side of the card contains the readers' address, on the other side the address of the library is denoted. The reader may take the address card out and put it back in, the other side upward, in order to return the box.

Books are mailed and stored in these boxes; the box belongs to the book.

Each day the books returned arrive at the expedition department. First all books are registered on the return list. This is the list of readers (name and address) together with all the books they returned on a given day. After registration the address cards are removed and stored in the address stack. The books are checked for damage and completeness. If cassettes are missing, the books are set aside in the case for incomplete books, where they may easily be found should a missing cassette be returned later on. If cassettes are to be mended, these are passed to our department for repair. The remainder of such a book is held apart. Books that are in order are stored in the warehouse again.

Mailing is straightforward. The books indicated on the mailing list are fetched from the shelves, the address cards are inserted, whereafter the books are ready to be sent by post.

There are of course many exceptions to this general order. Such as: readers who do visit the library and
want to take books with them, or readers who temporarily do not want to receive books. For clarity we left out such details.

3. Files

Before going into the operation of the lending and registration system, we shall introduce some of the files stored in the computer memory. Though we feel that the discussion of these files, before telling what they are used for, is a bit tough, we think that an early presentation of this chapter will facilitate referring to its contents later on.

One may think of the files we talk about as large piles of cards. The contents of these cards are stored in the computer memory and there they may be retrieved in some tenths of a second. Data written on the cards in a file are available to programs wishing to use them. Of course the contents of individual cards can be shown on a computer terminal. Like ordinary cards, the cards in these files can be deleted, replaced, modified or extended. The only different is, that modifying is possible as much as required. The previous text does not leave any dirt on the card.


Reader-description file

This file contains a card for each reader subscribed to the library. On the cards in this file information specific to each reader is written. For instance: name, address, sex, education, general of interest, accounting information. Furthermore on these cards some room is preserved for special information for the lending soft-ware. Last but not least, there is room for a message. This room will be used by the lenders to denote remarks of the reader. In the good old days they used to write such
remarks on small notes clipped on the carton cards.

**Book-description file**

This file contains a card for each title available in the library. The cards hold information specific to each title. This is first of all the kind of information librarians want to see in a catalogue. One thing we added is room for accounting information. This may for instance be used to perform popularity measurements.

**Reader/book relation file**

This is the crucial file in the lending system. It contains a card for each reader subscribed to the library. On these cards the numbers of all books the reader is somehow in relation with are denoted. Four types of relation are distinguished.

(a) The books the reader has ever borrowed from the library; they constitute the readers' history.

(b) The books currently lent to the reader.

(c) The books the reader himself has selected and indicated on his preferent wishroll.

(d) Books the lender has selected for the reader in advance. They constitute the nonpreferent wishroll. It seems efficient that a lender selects books for a reader in advance (see chapter 4). If on a given day no books of the preferent wishroll can be lent to the reader, nonpreferent wishes may be used instead.

**Book-copy file**

In this file a card for each copy (not for each title!) is present. This card tells where a copy is, and sometimes
where it was before. A copy is either available in the stack, or in repair, or incomplete, or lent to a reader, or lost. In either case the reader that last had (still has) the copy in loan is denoted.

4. Book lending

On the new system several lenders may be active simultaneously. Each lender is equipped with a computer terminal, preferably a visual display (a television screen and keyboard). The computer holds in its memory a list of readers to be treated (refer to the next chapter to see how it got there).

Three types of readers are distinguished:

- those who require hand-service;
- those who can do with semi-automatic service;
- those who can automatically be served.

At each instant of time the lender may switch a reader from either of these three states into another. So if automatic service no longer seems appropriate for a given reader, the lender resets its state to hand- or semi-automatic service. But if hand-service amounts to nodding "yes" to the computers' proposals, the lender may desire to switch the state to (semi-)automatic. But don't go too fast, let us explain.

Hand-service

When the lender types the "who next" signal to the computer, the computer presents the next reader from the list. It types the readers' number, name and address, his genera of interest, the number of books the reader still has in loan. Moreover, the computer indicates whether wishes are selectable. If no wishes are selectable this does not necessarily imply that no wishes are present on the readers' wishroll; it merely indicates that none of
them is in stock at this moment. Finally, if a message is "clipped" to the reader card it is printed.

The lender may now **ask for book descriptions** in order to choose books for the reader. He may either ask for books from the readers' **wishroll** (presumed lendable wishes are available), or he may **ask for books belonging to the readers' genera of interest**, or he may himself indicate the numbers of the books he wants to see the description of. The computer will **now start proposing books**. It types title and author on the terminal. If the lender wants to see more, the annotation and if required any other catalogue information is added. Once a book description has been presented, the lender must type "yes" or "no" to indicate whether or not the book will be sent to the reader.

This continues until the lender decides that enough books have been selected for this reader. At that time he types the "who next" signal and the subsequent reader will be treated.

It is the systems' responsibility to update the implied changes in the reader/book relation file and the book-copy file. Moreover, all books selected are together with the readers' address etc., added to the mailing queue in the computer memory. They will eventually be found there by someone of the expedition department, who then is in charge of actually sending the book to the reader.

**Semi-automatic service**

If a reader has so many wishes (preferent or non-preferent) on his wishroll, that, as a rule selectable wishes are available for him, the lender may desire to switch his state to semi-automatic. Semi-automatic service is much the same as hand-service. It only requires less lender intervention.
On the "who next" signal from the lender the system responds by listing general information on the reader, just as it does in the case of hand-service. This time the computer does not wait after listing the general information. It immediately continues by presenting book descriptions of lendable wishes. Preferent wishes are presented first. The only activity required from the lender is typing "yes" or "no" to the proposed books. If on a given day the number of selectable wishes would be insufficient the computer will automatically turn over to the hand-lending procedure.

Automatic service

Once we are accustomed to semi-automatic lending, we might go even a step further and introduce automatic lending. If enough selectable wishes are available, there seems to be no reason why the computer could not itself select the books to be sent to the reader. This will certainly turn out to be the fastest and most efficient lending technique.

It is important to stress that automatic book lending is restricted to the selection of wishes from the wishroll. We do not expect a machine to be able to select books on the basis of such general criteria like "genera of interest". If on a given day not enough wishes are in stock, the computer will turn over to the hand-lending procedure and request the lender to do the job.

Preferent/nonpreferent books

In the reader/book relation we distinguish between preferent and nonpreferent books. Preferent books are those that once were ordered for by the reader himself. Preferent books are opposed to nonpreferent books, i.e., books selected by the lender.

This distinction plays an important role in the selection of wishes to be sent to the reader. When the
computer checks the in-stack availability of wishes in order to propose them for lending, it will check and propose preferent wishes first. Of course, if ever possible, we like to lend preferent wishes to our readers.

The lender may list the preferent books of a reader (even those from his history) to catch an idea of the readers' interests and taste.

An overview of all preferent books bares information on the popularity of certain (genera of) books. This is important library information.

Gains

There are a number of obvious small advantages in the new system. The lender no longer needs to write or type lists, he no longer uses lists and cards and is rid of shuffling sheets of paper and piles of cards all over his table. Alas, these advantages will probably be compensated for by small inconveniences, e.g., the inaccessibility of information in computer-down time.

A large gain in hand- and semiautomatic lending is the computer check for the in-stack availability of books. Currently the lender spoils much time by studying cards of books that afterwards turn out not to be in stack at this moment. Checking the in-stack availability of books (especially wishes) will be done by the computer before the lender has spent any time studying the book card, and does no longer require any of the lenders' time.

We feel that the largest gains lie in the application of automatic lending techniques. Moreover, not only the efficiency but also the quality of the service to our readers will be improved, especially for those who do not choose the book themselves (no preferent wishes). To arrive at these gains the lender must lend books to the reader in advance. These books will be stored in the
reader/book relation file as nonpreferent wishes. A special program will be developed to aid the lender with this in-advance lending. It will highly resemble the hand-lending program.

First the lender specifies the reader to whom he wants to lend books in advance. The program responds by presenting the general information on the reader. Next the lender may ask for book descriptions. He may either ask for books of a genus the reader is interested in, or he may himself indicate the numbers of books to be described. The computer checks if the selected books are present in the readers' history. If so; the book is rejected, if not, the lender may type "yes" or "no" to it. If the lender types "yes" the book is added to the reader/book relation file as a nonpreferent wish for this reader.

The advantage of this lending technique is, that books are selected at an instant of time that nobody is waiting for them. It need not be done in a hurry. Moreover, the lender may select quite an amount of books at a time, for instance forty or more. This makes it more worthwhile carefully studying the information on the reader, thereby not only increasing efficiency but also the quality of the service.

At the end of this chapter we again must emphasise that we have only pointed out the general course of affairs. A host of small tools in the system remained untouched, such as, programs for counting all kinds of things, programs for adding reader-indicated wishes to the reader/book relation file, programs for adding and removing books and readers to and from the files, book reservation software.

The system must be able to handle a number of peculiarities:

readers who suddenly call for books without returning books,
readers who want to stop reading for a while, readers who want to receive their books on a temporary address (holidays).

5. The expedition department – electronic book registration

Each day the expedition department registers all books returned on a long list. This list is keyed into the computer in order that the system marks the book copies returned as "in-stack" again. Before writing their numbers onto the list, the books (we should say boxes) are sorted. In this way incomplete books are easily found. An incomplete book is a book, the reader did not return all boxes from. Incompletely returned copies are of course not lendable. They are put on special shelves, waiting there until the reader returns the remaining boxes.

All these registration tasks will be minimised by the introduction of an electronic registration device. This so-called scan-a-bar consists of a lamp, some loops and magic electronics. It is able to "read" specially encoded "bar-code" labels. A bar-code label holds a stretch of vertical bars. By making the bars thinner and thicker information can be encoded.

All our book boxes will be provided with a bar-code label containing their box number, i.e., the book number, the copy letter and the sequence number of the box. Moreover we add a check digit at the bar-code label, so that reading errors may be detected.

The scan-a-bar is mounted in a specially designed table. It is connected to the computer. When the boxes slide over the table, the device registers the box number and sends it to the computer. When the bar-code is not understood, or another reading error is detected, the device notifies the operator by raising a threshold at the end of the table. The operator may then key in the box number on the terminal and take appropriate measures.
Once the computer knows all the boxes returned on a given day, it sorts them in order to find out which copies were returned incompletely and which others possibly became complete again. There is no need any longer to treat incomplete copies separately; the system will prevent lending of incomplete copies.

Before marking the books returned as "in-stack" again, the system waits for the check results of the expedition department. As we told, all books returned are checked for damaged or missing cassettes. If there are, the box is repaired, i.e., new cassettes are played and added to the box. The expedition department announces all boxes in repair to the computer. Books of which boxes are in repair cannot of course be lent.

From the set of boxes returned the system computes a list of readers who need books. This list is fed to the book lending software (see chapter 4).

Output of the lending software is a mailing list for the expedition department. It indicates book copies (book number and copy letter) together with the address of the reader to whom a copy must be sent. The mailing list is, if desired in small parts, printed on a computer terminal located at the expedition department. Printing is started on request, so that people can ask for a list at the moment they are ready to treat it. This reduces the chance of papers getting lost.

6. The catalogue file

In the future the complete catalogue will be brought into the computer memory. It will contain all information normally found in a catalogue system.

The catalogue file will be composed of catalogue cards, one for each book in the library. A number of so-called pointer cards will be added to cope with special desires. The information on the catalogue cards is
subdivided in fields so as to increase retrievability of specific data. Each field is identified by its field identifier and as a rule has a rather rigid structure.

Important fields are:

- author fields (up to three fields holding the names of the authors of the book)
- title field (holding the title of the book and its keyword for sorting);
- contents description;
- genus indication.

The catalogue file may be investigated by the personnel of the library using any of the computer terminals. It may be used to render information about the collection as a whole (possibly important for the selection of new books to be added to the collection), but it may also be used to find certain books, books of certain authors, or books of a certain genus (e.g. all books of certain authors, or books of a certain genus (e.g. all detective stories). The latter may improve the service to the reader, as it may facilitate answering some of his questions.

The pointer cards are added to solve some very peculiar retrieval problems. Let us give an example. Think of a trilogy having some title, of which each of the three component novels has its own other title. For each of these novels a catalogue card exists, whereas a pointer card is added to achieve the possibility of finding the books under the trilogy title. Similar situations occur with omnibus editions.

The most advantageous application of the catalogue system will probably be in the book lending process. There the catalogue information, especially the genus of the book, is combined with the in-stack list of that moment and with the history of the reader under concern. The computer may be used to preselect books, belonging to the genera of interest of the reader, currently in stack
and not yet read by this reader. This optimises the work of the lender. Moreover, author, title and all other catalogue information is immediately available to the lender.

Finally we must mention the possibility of printing out (parts of) the catalogue. A sophisticated system could provide complete catalogues (sorted to title, to author, or to book number), supplement lists, or selections from the catalogue. Last but not least it is worthwhile noting that the print-out can be given in ink print as well as in braille. Multiplication will be no problem.

7. Conclusions

Why did we write this paper? First of all for our own benefit. The best ideas come up when talking about things. On the other hand, we believe that a number of libraries for the blind is about to utilise a computer in their book lending system, or will be forced to do so before long. They might benefit from our design, or at least this paper might stimulate a fruitful discussion.

We have not discussed a system in operation. We started developing it in April 1978. The administration system must be in the air in August 1978. The system is planned to be in full operation, except for the catalogue printing facilities, in January 1979. Catalogue printing must be added before July 1979. We work on the project with two programmers. Programs are developed on the hardware on which the system is to run: a PDP 11/34, a large 63 megabyte disk, a lineprinter, a magnetic tape unit and a number of terminals. The investments were $75,000 for the computer and its peripherals, and $20,000 for the UNIX timesharing system. UNIX is the software package (operating system) on which we based our lending system.

Although this is a paper on future developments we mainly stuck to ideas for which the software was already
designed. Sometimes we mentioned possibilities that, we feel, are just behind the horizon. When writing a paper like this, one is tempted to think about the future. What will be the task of our library over some ten years and what will it look like? Let us make some guesses.

The technical developments most relevant for us probably are the braille display and the public data terminal. A cheap data terminal connected to a braille display will make quite an amount of public information available to those of our readers capable of reading braille. This will help for stuff like newspapers etc., and it will certainly affect the demand for material in braille, albeit on paper or recorded on braille-coded tape cassette. The demand for talking books will probably go upward until it has settled as the alternative reading means, not only for the blind, but for all those who have troubles in reading ink print texts.

Once house to house data traffic has become in common use, great progress in our lending system can be made. At that time we could make our catalogue system and our in-stack list accessible via a datanet. The reader could use his terminal at home to search our catalogue and in-stack list. He could select the book of his choice and order the system to place book such and such on the mailing list for him. This would almost make our library as accessible for our readers as public libraries are for sighted. (Note one tricky point: blind, unable to read braille, would probably need someone to assist with the operation of the data terminal).

Back to our feet again. We are aware of the fact that the system we described will look different once it is in operation. Nevertheless we hope to have pointed out the possibilities that are at hand in the immediate future.
Spelled-Speech Terminals

D.B. Blazie
Maryland Computer Services Inc, 101 Thomas Street, Bel Air, Maryland 21014, USA

A Hewlett-Packard desktop computer has been programmed to output speech with a 64 word vocabulary. The vocabulary consists of the numerals, the alphabet and special symbols for punctuation and upper and lower case letters.

This speech output system has been incorporated into three devices:

(i) a word processing system which permits inputting, editing, printing and formatting. The speech, normally operating only during proofing and correcting, is activated whenever the cursor is positioned over a character. The system prices start at $14,000.

(ii) an automatic data entry system which vocally prompts the blind operator to enter data on a typewriter keyboard. Data entered can be proofed and corrected by speech output which is activated by cursor keys on the keyboard. The system can be programmed to prompt the operator for data to fill out almost any form. The system starts at $14,000.

(iii) a talking computer terminal can communicate with virtually any computer in several modes. The speech portion of the terminal can be selected to monitor either incoming data or outgoing data or both. In addition, data can be stored in the terminal or on the internal tape cartridge and scanned with speech output. The price of the system is $12,000.