

Seminar on Research on Revision of the Braille Code

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Since the announcement of the Douce & Tobin proposal for basic research on the braille code, in 1976, there has been a series of requests for a special meeting of researchers to define and allocate the requisite tasks involved. Scheduling and arrangements difficulties put off such a meeting time and again. Success was achieved in October 1978 when, upon the occasion of J.M. Gill's visit to the USA, an appropriate group was convened under the auspices of the Baruch College Computer Center for the Visually Impaired. The meeting was chaired by Emerson Foulke.

Those who have been following the course of work on revising the braille code will recall that the intention of exploring the matter is to make the code easier to learn and easier to use; to bring together the variants of the code that now exist in the English language community into a single code; and, hopefully, to establish the real capabilities of alterations in the code to effect useful change in reading and writing rates in nonstandard code versions. The focus of the seminar was most definitely not to make the job of automatic braille transcription easier, although it was hoped that proposed changes in the code which rationalised its many exceptions and context-dependent characteristics would also ease the memory and editing requirements for computer transcribed braille.

The meeting could be said to have progressed through three phases. The first reviewed the background events preceding the meeting. The second dealt with a free-ranging discussion of the goals of the meeting. The third outlined a programmatic approach to basic and applied research in revision of the braille codes. Not treated in the meeting was the specific allocation of tasks to be undertaken to individual researchers, thus establishing

on what side of the Atlantic parts of the research work will be done. This was not felt to be a drawback, since the programmatic outline made this allocation an easy decision.

Phase 1 - Background

Since the Douce and Tobin proposal was made, a number of events have occurred that impact on the goal of easing the use of the braille code. First a workshop was held and proceedings issued (in ink print and braille) on the prospects of changes in the braille literary code toward simplification and rationalisation. This meeting was signal in that it brought together for the first time those who were monitoring the use of the braille code, and those who were seeking efficient means of producing output in braille with the use of the computer. Although anecdotal, the incident in which one of the braille specialists declared that one of the preprints (produced by computer) did not appear to be computer transcribed braille, set the tone for some of the meeting.

The second was the funding of, and partial implementation of, the British project for braille code revision. This is based partly at the Research Centre for the Education of the Visually Handicapped, Birmingham and partly at the Warwick Research Unit for the Blind. Educational research design is done largely at the Birmingham facility; engineering and analytical studies are done at the Warwick facility. To date, one paper has appeared describing the work at Birmingham (in Braille Research Newsletter No. 7), and a number of papers have appeared in this same journal describing the work at Warwick. Announced at the seminar was the surprising news that the so-called Brown Corpus (described in Braille Research Newsletter No. 6) has been added to the data base at Warwick. This relatively large and representative sample of words (one million words) drawn from American usage supplements the Gill data base of English text (two and half million words). A preliminary print out of letter combination

occurrences in the Brown Corpus, has been executed at Warwick and shown at the meeting (see Appendix 1).

The third event was the completion of the doctoral dissertation work by Sally Mangold on the tactual strategies used by braille readers. This base of information about behaviour of readers is being used to build our knowledge further, most notably by Professor Moore's Ph.D. student at Pittsburgh.

The fourth event was the completion of the bulk of the studies leading toward a new series of graded readers in braille, undertaken by Hilda Caton and her colleagues at the American Printing House for the Blind. Building upon the early work of Ashcroft, Troxell, Nolan, and others, and informed by the perspective of noted psycholinguist Eric Hamp, the draft manuscript detailing the developments contains much information on reading strategies and pitfalls in the present code; and suggests innovative teaching methodologies. Based on these studies, new readers for braille will be published. Another, and perhaps surprising, conclusion one can draw from the studies is that integration of children in the mainstreaming situation before the age of 8 or so may be contraindicated if one hopes to attain proficiency in these children in reading braille.

Phase 2 - Discussion

It was emphasised in the discussion that there have been no assessments of braille reading ability that could serve as criteria against which new codes could be developed. We obviously must develop measure of behaviour and of performance outcomes of teaching alternative codes. Warwick have already developed a proposed criterion which seemed to many suitable: a performance index which uses ability to read the present braille code as the criterion against which ability to read alternative codes would be judged (see Appendix 2). The Performance Index is a simple mathematical model indicating that performance in

reading any code is a function of ability to learn, ability to read, and space saving. The Index of 100 is set with a particular population by setting their capabilities in all functions by test; this is the criterion against which performance with alternative codes of procedures is judged (note that performance on alternative codes can thus be better than, i.e., numerically over 100, or worse than, i.e., less than, the criterion of 100).

Essentially, the research and development task must ask the following questions:

1. What are appropriate test measures of reading ability, for the third grade through adulthood, in braille?
2. What is the definition of a "rational" braille code?
3. How is reading ability enhanced by a rational code, and to what degree?
4. What is the implication of abandoning space saving and using Grade 1 braille, especially when (as in the case of new and cheap storage media, as with digital braille) space saving is not a cost-effectiveness criterion?
5. What is the definition of superior performance with alternative codes, and what would be the nature of a field study of the new codes that would be convincing regarding its virtues?

These nontrivial questions elicited a fair amount of discussion (as might be imagined). Since, however, responses to them led directly to the statement of a desired strategy for investigation, we shall report it out as a unit of discussion.

Phase 3 - An Outline of Programmatic Research in
the Revision of the Braille Code

A full statement of programmatic research leading toward a revised braille code remains to be done. What follows represents a concensus among participants of the necessary stages to be undertaken, and some of the content of each stage.

Preamble

Any programmatic statement will include the inevitable caveats; among them will be that this first attempt will be confined to possible changes in the braille literary code; that any suggestions for revision, after full research and review, will have to be submitted to the Braille Authority of North America in the USA, the National Uniform Type Committee in the UK, and the appropriate parallel bodies in the other English-speaking communities. Here we emphasise that we wish to encourage parallel revisions, if any, among all the countries using the English language braille code(s), including Australia, New Zealand, Canada, parts of Africa, and elsewhere. We shall also emphasise that as representative a sample of actual texts transcribed into braille as possible has been used - and supplemented by the Brown Corpus. The preamble should also indicate that although no proof is ever complete, that no statement appears suggesting revision that has not been supported by reasonably conclusive research and demonstration. There may well be other matters to be mentioned in the preamble. Having done this, one then proceeds to:

Step I - Gathering the sample and defining the demography of the test population.

What is needed here are data on the general distribution of braille reading ability that is large scale in scope: subjects would have to read a fairly large sample of materials, both children and adults. Among suggested

tests were the Neale (UK) and the Caton (USA), but others should be explored - even a purpose-devised instrument. Considerable thought will have to be given to the demographic variables to be used, so that balances are maintained among several variables: residential/public/rehabilitation centres instructional settings for those 8 years of age and above; regional differences in which sample groups from the East, Middle West, and West, are chosen in places where the average number of dollars spent per child are around the median for the nation; suitably defined groups of adults, in which motivation and "need to know" are significant variables (divisions of age of 20 to 40, 40 to 60, and above 60 years were suggested); and total hours of instruction in braille prior to testing, since there appear to be wide variations among the braille reading public. All these, and more, are examples of criteria for sampling that must be considered.

The national telephone sample survey of braille and large print readers, planned by Baruch College and the American Foundation for the Blind, was described, and it was tentatively agreed that this effort should proceed; and that suitable test subjects could well be identified from this nationwide sample.

Step II - Definition of braille reading ability.

Whatever the instrument used to assess braille reading ability, whether one of the presently available ones or one that is purpose built (so to speak), we shall have to take account of at least the following variables:

- Speed of reading,
- Error rate in reading,
- Comprehension,
- Level of difficulty of text,
- The use of contracted vs. uncontracted samples,
- The nature of layout and format difficulties
in the text samples: the searching
capability of readers.

The use of "silent" vs. "oral" reading,
and so on.

Step III - Identification of difficulties in the
present braille code: testing these identifications.

In this step, the criteria to be met in the design
of a "rational" braille code will have to be carefully
defined. Among other variables, at least the following
will have to be considered:

Ease of reading,
Ease of learning for children and adults,
Writing speed,
Ease of production automatically,
Space saving earned,
Optimal redundancy characteristics.

It is here that the greatest impact of the Performance
Index instrument already described will be felt.

Step IV - Demonstration studies

In this step we shall have to devise optimal strategies
for instruction and evaluation of the revised braille
code.

Step V - Teaching materials

New teaching materials will also have to be developed
for the texts in the new code to be tested.

Step VI - Production

In this step, alternative production methods for
producing quantities of braille in the new code will be
developed.

Summary and Conclusion

In this first US/UK meeting on the project to explore the development of a revised braille literary code, an attempt was made to emphasise that such exploration ought to proceed multilaterally, but with a common focus. That is to say, there is a fairly long series of steps that must be undertaken before one can specify and demonstrate the superiority of a revised braille code. Some can be undertaken in the USA; some can be undertaken in the UK and elsewhere. In all cases, close coupling in research undertaking must be the rule so that the outcome will tend toward a common code for the English speaking community.

A program of research has been outlined in which some of the significant steps to be undertaken have been spelled out. More detail has to be supplied about each of the steps, and the variables treated in each step. It is felt that it will then be fairly easy to allocate specific research and/or demonstration tasks to research groups in the US and the UK.

Finally, some discussion ensued on funding possibilities for the USA. At least one interested federal group has been contacted, and is awaiting word on a program of study suitable for funding.

After some false starts, this first meeting of the primary research interests engaged in revising the present braille code toward easier learnability, readability, and writing ability has taken place. We expect the pace of research and innovation will now increase, and look forward to further reports of work under way.

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Appendix 1

Statistical Analyses of Gill and Brown Corpora

The Gill corpus contains 2,561,308 words of English text from over 1000 sources. The text was chosen to be representative of material transcribed into braille in the UK. The Brown corpus contains 1,014,232 words of American text.

Computer programs have been written at Warwick to analyse:

- (i) frequency of use of braille contractions
- (ii) frequency of words
- (iii) frequency of occurrence of groups of two and three letters when they occur anywhere in a word, not preceded by a letter, and not followed by a letter.
- (iv) frequency of arbitrary character strings

Table 1 shows the frequency of use of contractions in grade 2 braille in the Brown corpus.

Appendix 2

Performance Index

A performance index is needed so that different contraction systems can be compared scientifically. The performance index must:

- (i) reflect the actual performance of a braille reader.
- (ii) be amenable to measurement by a few simple repeatable tests.
- (iii) be acceptable to the Braille Authorities and other relevant bodies.

A simple performance index could be one which is solely a function of space saving, reading speed and ease of learning.

$$P = f(s,r,l)$$

The simplest function for small perturbations, would be:

$$P_e = K_s \frac{S_e}{S_2} + K_r \frac{r_e}{r_2} + K_1 \frac{l_e}{l_2}$$

where $K_s + K_r + K_1 = 100$ ($P_2 = 100$)

and suffix e denotes experimental code
suffix 2 denotes Grade 2 code

The advantage of using a measure relative to Grade 2 braille is that it eliminates many of the problems associated with absolute measures.

Space saving could be defined as the number of cells saved using the contracted code compared with Grade 1 braille for a specified corpus. Given computing time, this is a relatively simple task and is repeatable.

Reading speed can be determined on both macro and micro levels; the former having the major disadvantage that it is a very crude way of measuring the effect of individual contractions. The latter can be carried out under controlled conditions but is subject to the criticism that it may not reflect reading of continuous prose.