A Study of Braille Contractions

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Grade 2 Standard English Braille utilises 190 abbreviations and contractions. This code is used in the U.K. and in a large number of foreign countries (not only the English-speaking countries).

The American Grade 2 braille code has the same abbreviations and contractions, but the rules governing the use of the contractions differ slightly from the English code. For instance the word 'dear' uses the EA contraction in English and the AR contraction in American. Another difference is that the American code has both upper and lower case letters by the use of a capital letter sign; the English code does not normally differentiate between upper and lower case.

Many developing countries use braille in the English language; the braille books come from both the U.K. and the U.S.A. Therefore it is essential to the braille readers in these countries that the two codes do not differ to any greater extent than at present. The English code is monitored by the National Uniform Type Committee (NUTC), and the American code by the Braille Authority of North America (BANA).

The aim of this study of the braille contraction system is to identify the aspects which affect ease of learning, reading speed, writing speed, space saving and ease of production. This is the first step in determining whether any alternative system would be a significant improvement. There is no desire for any change unless it can be clearly demonstrated that there are some very considerable advantages to be gained by modifying the system.

To scientifically compare an experimental code with the existing Grade 2 code, it is necessary to specify the relative weighting given to the five factors. This can be expressed in mathematical notation as:

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

where P is the performance index
l is the ease of learning
r is the reading speed
w is the writing speed
s is the space saving
p is the ease of production.

Assuming a simple linear function to a first approximation, and P for Grade 2 is unity, then:

$$P_e = k_l \frac{l_e}{l_2} + k_r \frac{r_e}{r_2} + k_w \frac{w_e}{w_2} + k_s \frac{s_e}{s_2} + k_p \frac{p_e}{p_2}$$

$$k_l + k_r + k_w + k_s + k_p = 1$$

where l_e is ease of learning for the experimental code
l_2 is ease of learning for Grade 2
k_l is the weighting factor for ease of learning.

However there are no established suitable measures for either l, r, w, s or p; a part of this study was to develop such measures. The determination of the weighting factors cannot be done by a purely scientific approach. Studies on ease of learning, reading speed and writing speed can be done by both macro and micro analyses. The macro approach permits experiments close to normal usage of braille but cannot provide precise data on the effects of individual contractions. Therefore it seems desirable to first study the contractions using the micro approach, and then study the overall effect of any proposed changes using macro techniques.

This article describes the technologically-related aspects of the project; the educational aspects were undertaken by the Research Centre for the Education of the Visually Handicapped.

The initial steps were a survey of the literature (see BRN No. 7, pp 25-35), and a questionnaire survey of braille users to obtain their impressions of the aspects of the contraction system which caused them most problems. The results are sumamrised in Appendix 1. The questionnaire demonstrated that the users did not want the code changed unless there were very considerable advantages by modifying the system.

A detailed analysis was done on the frequency of use of braille contractions and abbreviations for a large sample of text which had been produced in braille in the UK (a summary of results is contained in Appendix 2). For comparison, analyses were done on the Brown corpus which contains about one million words of American text (see Appendix 3).

The text was stored on computer magnetic tape so that a precise comparison of space saving for Grade 2 and any experimental code could be undertaken. In the past, studies on the braille contraction system have often concentrated exclusively on the space saving aspects. This may be attributable to the fact that space saving is the easiest factor to measure precisely. However it is important to emphasise that ease of learning, reading and writing are important factors and are not direct functions of space saving.

Another part of the project involved developing a system for accurately measuring the time taken to read individual braille cells; the timing was required to be accurate to the nearest millisecond. Based on research at Uppsala University, an on-line system was built and tested (see Appendix 4).

The measure for ease of production was proposed as the number of table entries in a specific table-controlled braille translation program needed to give a predetermined approximation to the contracted braille code. A new algorithm was developed for implementation on a microprocessor (see Appendix 5). This system has now been duplicated for use in the routine production of documents in braille.

This project has developed some of the techniques needed for a scientific study of the braille contraction system. Further studies are required involving psycho-linguists and psychologists before any recommendations can be made on possible changes to the braille contraction system.