

An Analysis of Braille Contractions

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Introduction

Grade 2 English braille uses 190 contractions in order to save space and reduce the time taken in reading and writing. From time to time studies have been proposed which investigate whether the contraction system is optimal for space saving, speed of reading and writing, and for ease of learning by both children and adults. The first step, in any such study, is an analysis of the frequency of the present use of contractions.

A survey was undertaken by Lockhead and Lorimer (1954) which analysed half a million words. This study was extremely time-consuming since the whole text was manually analysed and the occurrence of each contraction noted by a group of skilled braille transcribers. However computers offer a fast method of statistically analysing data which is already in digital form.

Kederis, Siems and Haynes (1965) used a computer to analyse 291,000 words for American grade 2 braille. The sample was taken from books (mainly fiction) of which over 60% were for children; numbers accounted for less than 0.1% of the input characters. They found that contracted braille used 26.5% fewer characters than the ink print for their sample text.

Method

A computer program was modified to automatically analyse the frequency of use of braille contractions. The analysis program used 13k words of store and processed text at 7468 words per minute. The data used in this study was documents requested by blind individuals as part of

an evaluation of a computer-based braille production system (Gill and Humphreys, 1976). The data consisted of 1,073,339 words which can be considered typical of those used in short documents but not of literature in general.

The computer program has been designed to be capable of analysing the effects of any proposed changes to the rules of contracted braille. This facility will be essential to assist those studying the revision of the braille code.

Results

Table 1 shows the frequency of use of contractions in order of space saved over uncontracted braille. The total number of spaces saved over uncontracted braille is the product of the total number of occurrences and the number of cells saved. The cumulative percentage of space saved is the running total of the number of spaces saved divided by the total number of spaces saved expressed as a percentage.

The entry in the table marked SPACE refers to the space omitted between certain contractions (AND THE); this entry is not present in previous studies of the braille contraction system.

The use of a system of contractions saved 1,257,640 braille cells for the test data of 1,073,339 words. The first 13 contractions account for over 50% of the space saving, and the first 36 contractions for over 75%. The last 11 contractions occur, in total, only 38 times in over one million words.

The contractions AND, FOR, OF, THE, WITH account for 23% of the space saving but all the 23 simple upper word-signs together only account for 8.2%.

Table 1 The frequency of contractions in order of space saved over uncontracted braille. An asterisk indicates a single cell contraction.

Contraction	Total number of occurrences	Total number of spaces saved over uncontracted braille	Cumulative percentage of space saved
1 * THE	69028	138056	10.98
2 * AND	31810	63620	16.04
3 * ING	28452	56904	20.56
4 * ER	52968	52968	24.77
5 * IN	50238	50238	28.77
6 * TO	23833	47666	32.56
7 * OF	36767	36767	35.48
8 * EN	36232	36232	38.36
9 * ED	35857	35857	41.21
10 ATION	11760	35280	44.02
11 * ST	33134	33134	46.65
12 * FOR	15556	31112	49.13
13 * AR	29164	29164	51.45
14 * THAT	6644	19932	53.03
15 * WITH	6624	19872	54.61
16 * EA	17628	17628	56.01
17 * CH	17189	17189	57.38
18 TION	8584	17168	58.74
19 * CON	8378	16756	60.08
20 MENT	8081	16162	61.36
21 * OU	13829	13829	62.46
22 * WHICH	3395	13580	63.54
23 * COM	6693	13386	64.61
24 * THIS	4363	13089	65.65
25 (SPACE)	13067	13067	66.68
26 * FROM	4131	12393	67.67
27 * TH	12064	12064	68.63
28 * BLE	5738	11476	69.54
29 * BY	5589	11178	70.43
30 * OW	10361	10361	71.25
31 * SH	9187	9187	71.99

32	*	BE	9078	9078	72.71
33	*	HAVE	2965	8895	73.41
34	*	WILL	2880	8640	74.10
35		SHOULD	1994	7976	74.74
36	*	WAS	3768	7536	75.33
37	*	YOU	3672	7344	75.92
38	*	NOT	3555	7110	76.48
39		PART	3424	6848	77.03
40		THERE	2243	6729	77.56
41		SION	3348	6696	78.10
42		WORK	3331	6662	78.63
43	*	WH	6600	6600	79.15
44	*	DIS	3248	6496	79.67
45		ANCE	3243	6486	80.18
46		BLIND	2086	6258	80.68
47	*	SHALL	1518	6072	81.16
48		THEIR	1901	5703	81.62
49		WOULD	1817	5451	82.05
50		ENCE	2725	5450	82.48
51	*	PEOPLE	1062	5310	82.91
52	*	IT	5274	5274	83.33
53	*	AS	5215	5215	83.74
54		ALLY	2411	4822	84.12
55	*	WERE	1535	4605	84.49
56		UNDER	1516	4548	84.85
57		CHILDREN	752	4512	85.21
58		TIME	2196	4392	85.56
59	*	HIS	2124	4248	85.90
60		THESE	1409	4227	86.23
61		ONE	4080	4080	86.56
62		ITY	4062	4062	86.88
63	*	BUT	2029	4058	87.20
64	*	MORE	1268	3804	87.51
65		INTO	1249	3747	87.80
66	*	GH	3693	3693	88.10
67		YOUR	1832	3664	88.39
68		QUESTION	595	3570	88.67
69		ABOUT	1145	3435	88.95
70		BETWEEN	686	3430	89.22

71	THROUGH	671	3355	89.48
72	OUND	1653	3306	89.75
73	* CAN	1618	3236	90.00
74	BEFORE	800	3200	90.26
75	SOME	1598	3196	90.51
76	OUNT	1570	3140	90.76
77	SUCH	1502	3004	91.00
78	WHERE	992	2976	91.24
79	FIRST	945	2835	91.46
80	RIGHT	924	2772	91.68
81	EVER	1378	2756	91.90
82	COULD	837	2511	92.10
83	BRAILLE	619	2476	92.30
84	AFTER	824	2472	92.50
85	NECESSARY	412	2472	92.69
86	* VERY	819	2457	92.89
87	* CC	2456	2456	93.08
88	DAY	2339	2339	93.27
89	* OUT	1150	2300	93.45
90	* FF	2252	2252	93.63
91	BECAUSE	446	2230	93.81
92	NESS	1102	2204	93.98
93	RECEIVE	551	2204	94.16
94	LETTER	512	2048	94.32
95	HAD	2040	2040	94.48
96	CHARACTER	285	1995	94.64
97	ALSO	996	1992	94.80
98	THOSE	610	1830	94.95
99	LITTLE	456	1824	95.09
100	* EVERY	449	1796	95.24
101	ONG	1716	1716	95.37
102	MUST	835	1670	95.50
103	* LIKE	556	1668	95.64
104	MANY	801	1602	95.76
105	GOOD	792	1584	95.89
106	AGAINST	369	1476	96.01
107	TOGETHER	279	1395	96.12
108	OUGHT	454	1362	96.23
109	* STILL	339	1356	96.33
110	* DO	1301	1301	96.44
111	EITHER	316	1264	96.54

112	*	SO	1243	1243	96.64
113		KNOW	614	1228	96.74
114		IMMEDIATE	201	1206	96.83
115	*	DO	1187	1187	96.93
116	*	KNOWLEDGE	146	1168	97.02
117		FRIEND	270	1080	97.10
118	*	RATHER	213	1065	97.19
119		ACCORDING	150	1050	97.27
120		GREAT	522	1044	97.36
121		NAME	521	1042	97.44
122		MUCH	512	1024	97.52
123		WORD	510	1020	97.60
124		ALTHOUGH	203	1015	97.68
125	*	JUST	335	1005	97.76
126		FUL	1004	1004	97.84
127		THEMSELVES	166	996	97.92
128		WORLD	328	984	98.00
129		SAID	491	982	98.08
130		ITS	963	963	98.15
131		YOUNG	321	963	98.23
132		AGAIN	314	942	98.30
133		CANNOT	228	912	98.38
134		LESS	441	882	98.45
135		ALWAYS	290	870	98.52
136		HERE	421	842	98.58
137		ALREADY	210	840	98.65
138	*	CHILD	203	812	98.71
139		PAID	387	774	98.78
140		UPON	382	764	98.84
141	*	GG	760	760	98.90
142		HIM	753	753	98.96
143		MOTHER	188	752	99.02
144		ABOVE	369	738	99.08
145		HIMSELF	180	720	99.13
146	*	QUITE	160	640	99.18
147		PERHAPS	152	608	99.23
148		FATHER	149	596	99.28
149		LORD	282	564	99.32
150	*	ENOUGH	110	550	99.37
151		BELOW	164	492	99.41

152	ITSELF	121	484	99.45
153	BEHIND	117	468	99.48
154	QUICK	152	456	99.52
155	TODAY	135	405	99.55
156	WHOSE	132	396	99.58
157	ACROSS	129	387	99.61
158	* GO	387	387	99.64
159	* BB	352	352	99.67
160	* US	352	352	99.70
161	ALMOST	117	351	99.73
162	AFTERNOON	55	330	99.75
163	RECEIVING	62	310	99.78
164	SPIRIT	77	308	99.80
165	YOURSELF	61	305	99.83
166	TOMORROW	39	234	99.85
167	BEYOND	57	228	99.86
168	DECLARE	53	212	99.88
169	NEITHER	48	192	99.90
170	O 'CLOCK	46	184	99.91
171	AFTERWARD	25	150	99.92
172	MYSELF	50	150	99.94
173	HERSELF	36	144	99.95
174	ALTOGETHER	20	140	99.96
175	BESIDE	25	100	99.97
176	BENEATH	17	85	99.97
177	OURSELVES	14	70	99.98
178	CONCEIVE	11	55	99.98
179	TONIGHT	10	50	99.99
180	DECLARING	7	35	99.99
181	DECEIVE	8	32	99.99
182	REJOICE	7	28	99.99
183	PERCEIVE	6	24	100.00
184	YOURSELVES	3	18	100.00
185	ONESELF	4	16	100.00
186	THYSELF	2	8	100.00
187	PERCEIVING	1	5	100.00
188	CONCEIVING	0	0	100.00
189	DECEIVING	0	0	100.00
190	REJOICING	0	0	100.00

Conclusions

This study did not include speed of reading or ease of learning contracted braille so the data should not be used as the sole basis for modifying the braille system. However from this data it is clear that the present system is not optimum for space saving. This study has clearly demonstrated the viability of using a computer to assist in analysis, and indicates the potential of such a program for assisting in studies of the braille code.

References

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