A comparison of some Dutch spelling reform proposals affecting verb inflection

Heuven, V.J.J.P. van

A COMPARISON OF SOME DUTCH SPELLING REFORM PROPOSALS AFFECTING VERB INFLECTION

VINCENT J. J. P. VAN HEUVEN

Abstract

An information theoretical model of some spelling reform proposals, enabling comparison of their consequences, is put forward.
   Results indicate that the relative efficiency of the Dutch verb affix system is disproportionately affected by the proposals in comparison to the loss of information in conventional spelling relative to what is theoretically possible.

Introduction

Efficient information processing in reading is highly benefitted by a certain amount of redundancy in the visual material. One of the higher level redundancies that apply in Dutch orthography are the mutual dependencies that exist between verbs and other parts of the sentence, as expressed by inflections. Within the limited framework of our investigation, a spelling system is more optimal as a more predictable correspondence exists between inflection (*form*) and the grammatical dependency expressed by it (*function*). In information theoretical terms, such predictability can be conceived of as the amount of transmitted information (Attneave, [1]). Mathematically, optimality is a problem of determining a conditional extreme value.

   Our research is based on a total inventory of 25 inflectional forms (13 regular, 11 ambiguous and one rest category) and 20 grammatical functions (cf. [3], [5]. In this paper the effects of certain spelling proposals in terms of form-function predictability will be determined and applied to two serious reforms in the orthography as proposed in 1969/1970. They affected, among other things, the verb inflection system. In terms of inflections the effects of the two proposals are the same, both resulting in collapsing a number of form classes. I expect on the basis of Cohen and Kraak [2] that one of the general consequences of the proposals will be a reduction of the type of predictability mentioned above. In order to be able to lend a certain meaningfulness to the extent of this reduction, should it be found at all, it is also necessary to calculate the amount of predictability that would be contained in an inflection system

that would be optimal from the point of view of information transmission.

1. The spelling proposals

Two officially published proposals will be discussed: the proposal of the governmental committee [7] and the one advocated by a number of organisations of people who are, mostly professionally, concerned with spelling matters [6].

The latter proposal dictates the following changes, which should be applied to the conventional orthography in conjunctive linear order:
1. word final *t* is dropped after *d* (*wordt* → *word*);
2. underlying word final voiced plosives are written as their unvoiced counterparts (*b* → *p*; *d* → *t*; e.g. *word* → *wort*, *heb* → *hep*, *geloofd* → *gelooft*); and
3. geminate *t* or *d* are simplified except when immediately after a single vowel symbol (*tt* → *t*, *dd* → *d*; *leidde* → *leide*, *tastte* → *taste*). Pee, Wesselings, et al. [7] differ from this only with respect to rule 2, adding the condition that the change is to take place only if the word final plosive is not part of the stem.

As my investigation is not concerned with stem morphemes, I have reason to consider the two proposals identical. In order to arrive at the optimally informative spelling system indicated above, I propose that any deep level suffix be written, on condition that the result remains compatible with the pronunciation. The use of word final geminate *tt* and *dd* is permitted. (e.g. *verbrand* → *verbrandd*, *gedut* → *gedutt*, *hij schiet* → *hij schiett*, *de vergrote foto* → *de vergrootte foto*).

2. Counting the alterations

When the frequencies of form-function correlates of the verbs occurring in the 600,000 word corpus of Dutch verbs were counted (cf. [8]) on the CDC–6500 computer of Utrecht University, the number of verb stems ending in *t*, *d*, or *b* were also specified for each of the 25 form classes.[1] With this information the magnitude of the changes under section 1 could be determined. In Table 1 (at the end of this paper) the resulting form-function correspondences are given, both for the official spelling reforms and for my own 'optimal' system. These data should also be compared with those obtained for the conventional orthography.

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3. Calculating the amount of transmitted information

The general formula for the amount of transmitted information is:

$$T_{(x, y)} = H_{(x)} + H_{(y)} - H_{(x, y)} \tag{3.1}$$

In this formula $H_{(x)}$ represents the entropy per form class, and is defined as

$$H_{(x)} = - \sum_{i=1}^{n=25} (p_i \, ^2\log p_i), \tag{3.2}$$

where i is a variable ranging over the ordinal numbers of the form classes $(1 \leqslant i \leqslant 25)$ and p_i the relative frequency of the particular form class i. By the same token, $H_{(y)}$ stands for the entropy per function class and is defined as

$$H_{(y)} = - \sum_{j=1}^{m=20} (p_j \, ^2\log p_j), \tag{3.}$$

where j ranges over the ordinal numbers of the function classes with $1 \leqslant j \leqslant 20$, and p_j is the relative frequency associated with the particular function class j. $H_{(x, y)}$ is the entropy of the joint occurrence of a particular form with a particular function, and is equal to the negative sum of all the individual $p \, ^2\log p$ values of form-function combinations

$$H_{(x, y)} = - \sum_{i=1, j=1}^{n=25, \, m=20} (p_{i, j} \, ^2\log p_{i, j}) \tag{3.4}$$

In table 2 the amount of transmitted information is given for each of the three spelling systems.

4. Conclusion

Taking the results for the 'optimal' system as our basis, it is possible to specify the loss of transmitted information in the conventional and reformed systems as percentages relative to this basis. It appears from the data that a relatively small part of the transmitted information is lost when going from 'optimal' to conventional spelling, and that the major part is lost in the transition from the latter to the reformed system.

   It should be pointed out, however, that even the 'optimal' spelling system exploits only a moderate part of the theoretical possibilities: the maximum amount of transmitted information would be 4.3219 bits, of which only 1.3964

bits are transmitted in the 'optimal' system. On the other hand, one could argue that precisely because only a small amount of information is transmitted through the form-function system, any loss, however small, would have serious consequences.

Let us finally consider how these changes in form-function predictability should be interpreted within the context of the reading process. Starting from the obviously false assumption that verb inflections provide the only cues by which the reader extracts functional meaning from a sentence, his relative certainty in determining grammatical meaning solely on the basis of verb inflections decreases with about 7 percent when the spelling reform is introduced.

In actual practice, however, this type of structural predictability is not the only source of redundancy the reader may draw on. Thus the information measures calculated in this paper set the upper limit to the relative importance of the cue values of verb inflections in the reading process. Psycholinguistic experiments are necessary in order to put this and other types of information in their proper perspective [4].

References

1 Attneave, F , *Application of information theory to psychology, a summary of basic concepts, methods and results*, New york, (1959)
2 Cohen, A and A Kraak, *Spellen is spellen is spellen*, (Dutch), The Hague, (1972)
3 van Heuven, V J J P , Frequencies of form-function correlates in the Dutch verb inflection system, *PRIPU*, 1(2), (1976), 45–55
4 van Heuven, V J J P and A Cohen, Verb endings as structural cues in the reading process, submitted to *Cognitive Psychology*
5 van Heuven, V J J P and S Krauwer, Description of a computer program for the analysis of Dutch verbs in terms of morphological structure and grammatical meaning, *PRIPU* 1(2), (1976), 56–61
6 Hollaar, H J , Spellingspleidooi, (Dutch), *Moer*, 1 (1970), 97–102
7 Pee, W , J H Wesselings, et al , *Eindvoorstellen van de Nederlands-belgische commissie voor de spelling van de bastaardwoorden*, (Dutch), The Hague, 1969
8 Uit den Boogaard, P C , *Woordfrequenties in geschreven en gesproken Nederlands*, (Dutch), Utrecht, (1975)

Table 1. Absolute and relative frequences of form-function correlates in Dutch verb affixes.

(0): – ∅

function	conv. spelling used:	Abs. fr.	Rel. fr.	reformed spelling used:	Abs. fr.	Rel fr.	optimal spelling used:	Abs. fr.	Rel. fr.
1 pres. sing.	x	2327	2.23	x	2327	2.23	x	2327	2.23
2 pres. sing.	x	812	.78	x	862	.82	x	582	.56
3 pres. sing.	x	1583	1.51	x	3737	3.58			
2 pres. plus	x	0	.00	x	0	.00	x	0	.00
imp. sing.	x	693	.66	x	693	.66	x	694	.66
imp. plur.	x	0	.00	x	2	.00			
partc. verb.	x	366	.35	x	366	.35			
partc. adj.	x	27	.03	x	27	.03			
partc. adv.	x	10	.01	x	10	.01			
	9	5818	5.57	9	8025	7.68	4	3603	3.45

(1): –e

function	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel fr.	Optimal spelling used:	Abs. fr.	Rel fr.
1 past sing.				x	31	.03			
2 past sing.				x	3	.00	*Disappears*		
3 past sing.				x	391	.37			
2 past plur.				x	0	.00			
partc. adj.	x	65	.06	x	65	.06			
partc. nom.	x	6	.01	x	6	.01			
	2	71	.07	6	496	.47	0	0	0

(2): – n

Function	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
1 pres. plur.	x	330	.32						
2 pres. plur.	x	16	.02	*as conventional*			*as conventional*		
3 pres. plur.	x	2420	2.32	*orthography*			*orthography*		
imp. plur.	x	0	.00						
inf. verb	x	3064	2.93						
inf. nom.	x	119	.11						
	6	5949	5.69	6	5949	5.69	6	5949	5.69

(table 1. continued)

(3): – en

function	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling Rel. fr.	used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.	Abs. fr.	Rel. fr.
1 pres. plur.	x	1382	1.32		x	1382	1.32					
2 pres. plur.	x	58	.06		x	58	.06	*as conventional*				
3 pres. plur.	x	5550	5.33		x	5560	5.32	*orthography*				
1 past plur.					x	11	.01					
2 past plur.					x	0	.00					
3 past plur.					x	77	.07					
imp. plur.	x	3	.00		x	3	.00					
inf. verb	x	16885	16.15		x	16885	16.15					
inf. nom.	x	1195	1.14		x	1195	1.14					
	6	25083	24.00		9	25171	24.08		6		25083	24.00

(4): – t

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
2 pres. sing.	x	995	.95	x	945	.90	x	1262	1.21
3 pres. sing.	x	10987	10.51	x	8833	8.45	x	12808	12.26
2 pres. plur.	x	0	.00	x	0	.00	x	0	.00
imp. plur.	x	101	.10	x	99	.09	x	103	.10
partc. verb	x	445	.43	x	1877	1.80	x	654	.63
partc. adj.	x	27	.03	x	150	.14	x	40	.04
partc. adv.	x	66	.06	x	185	.18	x	70	.07
	7	12621	12.07	7	12089	11.57	7	14937	14.30

(5): – d

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
partc. verb	x	1432	1.37				x	1632	1.56
partc. adj.	x	123	.12	*disappears*			x	139	.13
partc. adv.	x	119	.11				x	128	.12
	3	21674	1.60	0	0	0	3	1899	1.82

(table 1. continued)

(6): – te

Functions	Conv. spelling used:	Abs. fr.	Ref. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
a past. sing.	x	95	.09	x	74	.07	x	95	.09
2 past. sing.	x	12	.01	x	9	.01	x	12	.01
3 past. sing.	x	1047	1.00	x	816	.78	x	1047	1.00
2 past. plur.	x	0	.00	x	0	.00	x	0	.00
partc. adj.	x	78	.07	x	78	.07	x	108	.10
partc. nom.	x	4	.00	x	4	.00	x	9	.01
	6	1236	1.18	6	981	.94	6	1271	1.22

(7): – de

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
1 past. sing.	x	299	.29	x	289	.28	x	299	.29
2 past. sing.	x	50	.05	x	50	.05	x	50	.05
3 past. sing.	x	2583	2.47	x	2423	2.32	x	2583	2.47
2 past. plur.	x	0	.00	x	0	.00	x	0	.00
partc. adj.	x	341	.33	x	341	.33	x	376	.36
partc. nom.	x	30	.03	x	30	.03	x	31	.03
	6	3303	3.16	6	3133	3.00	6	3339	3.19

(8): – ten

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
1 past. plur.	x	48	.05	x	40	.04	*as conventional*		
2 past. plur.	x	0	.00	x	0	.00	*orthography*		
3 past. plur.	x	284	.27	x	241	.23			
	3	332	.32	3	281	.27	3	332	.32

(9): – den

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
1 past plur.	x	66	.06	x	63	.06	*as conventional*		
2 past plur.	x	0	.00	x	0	.00	*orthography*		
3 past plur.	x	609	.58	x	575	.55			
	3	675	.65	3	638	.61	3	675	.65

(table 1. continued)

(10): ge – ∅

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
partc. verb	x	716	.68	*as conventional*			*disappears*		
partc. adj.	x	55	.05	*orthography*					
partc. adv.	x	18	.02						
	3	789	.75	3	789	.75	0	0	0

(11): ge –t

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel fr.
partc. verb	x	936	.90	x	4289	4.10	x	1182	1.13
partc. adj.	x	46	.04	x	243	.23	x	70	.07
partc. adv.	x	8	.01	x	73	.07	x	18	.02
	3	990	.95	3	4605	4.41	3	1270	1.21

(12): ge – de

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel fr.
partc. verb	x	3353	3.21	*disappears*			x	3925	3.75
partc. adj.	x	197	.19				x	240	.23
partc. adv.	x	65	.06				x	73	.07
	3	3615	3.46	0	0	0	3	4238	4.05

(13): – e/ – te

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
1 past sing.	x	5	.00	*as conventional*			*as conventional*		
2 past sing.	x	2	.00	*orthography*			*orthography*		
3 past sing.	x	71	.07						
2 past plur.	x	0	.00						
partc. adj.	x	13	.01						
partc. nom.	x	1	.00						
	6	92	.09	6	92	.09	6	92	.09

(table 1. continued)

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(14): –e/– de

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel fr.
1 past sing.	x	0	.00						
2 past sing.	x	0	.00	*as conventional*			*as conventional*		
3 past sing.	x	22	.02	*orthography*			*orthography*		
2 past plur.	x	0	.00						
partc. adj.	x	12	.01						
partc. nom.	x	0	.00						
	6	34	.03	6	34	.03	6	34	.03

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(15): – en/ – ten

Functions	Conv. spelling used:	Abs fr.	Rel fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
1 pres. plur.	x	22	.02						
2 pres. plur.	x	2	.00	*as conventional*			*as conventional*		
3 pres. plur.	x	124	.12	*orthography*			*orthography*		
1 past plur.	x	2	.00						
2 past plur.	x	0	.00						
3 past plur.	x	12	.01						
inf. verb	x	344	.33						
inf. nom.	x	16	.02						
	8	522	.50	8	522	.50	8	522	.50

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(16): – en / – den

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
1 pres. plur.	x	2	.00						
2 press. plur.	x	0	.00	*as conventional*			*as conventional*		
3 pres. plur.	x	3	.00	*orthography*			*orthography*		
1 past plur.	x	0	.00						
2 past plur.	x	0	.00						
3 past plur.	x	1	.00						
inf. verb	x	49	.05						
inf. nom.	x	1	.00						
	8	56	.05	8	56	.05	8	56	.05

(table 1 continued)

(17) – ∅ / – t

Functions	Conv spelling			Reformed spelling			Optimal spelling		
	used	Abs fr	Rel fr	used	Abs fr	Rel fr	used	Abs fr	Rel fr
1 pres sing	x	0	00	x	0	00			
2 pres sing	x	37	04	x	37	04	*disappears*		
3 pres sing	x	238	23	x	238	23			
2 pres plur	x	0	00	x	0	00			
imp sing	x	0	00	x	0	00			
imp plur	x	2	00	x	2	00			
partc verb	x	6	01	x	43	04			
partc adj	x	0	00	x	2	00			
partc adv	x	0	00	x	3	00			
	9	283	27	9	325	31	0	0	0

(18) – ∅/– d

Functions	Conv spelling			Reformed spelling			Optimal spelling		
	used	Abs fr	Rel fr	used	Abs fr	Rel fr	used	Abs fr	Rel fr
1 pres sing	x	0	00						
2 pres sing	x	0	00	*disappears*			*disappears*		
partc verb	x	37	04						
partc adj	x	2	00						
partc adv	x	3	00						
	5	42	04	0	0	0	0	0	0

(19' – ∅/ge – ∅

Functions	Conv spelling			Reformed spelling			Optimal spelling		
	used	Abs fr	Rel fr	used	Abs fr	Rel fr	used	Abs fr	Rel fr
1 pres sing	x	1	00						
2 pres sing	x	0	00	*as conventional*			*disappears*		
3 pres sing	x	6	01	*orthography*					
2 pres plur	x	0	00						
imp sing	x	1	00						
imp plur	x	0	00						
partc verb	x	4	00						
partc adj	x	0	00						
partc adv	x	1	00						
	9	13	01	9	13	01	0	0	0

(table 1. continued)

(20): − t/ge − t

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
2 pres. sing.	x	0	.00	x	0	.00	x	0	.00
3 pres. sing.	x	2	.00	x	2	.00	x	8	.01
2 pres. plur.	x	0	.00	x	0	.00	x	0	.00
imp. plur.	x	0	.00	x	0	.00	x	0	.00
partc. verb	x	35	.03	x	126	.12	x	39	.04
partc. adj.	x	0	.00	x	1	.00	x	0	.00
partc. adv.	x	0	.00	x	0	.00	x	1	.00
	7	37	.04	7	129	.12	7	48	.04

(21): − d/ge − d

Functions	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel fr.
partc. verb	x	91	.09				*as conventional*		
partc. adj.	x	1	.00	*disappears*			*orthography; change*		
part. adv.	x	0	.00				*possible*		
	3	92	.09	0	0	0	3	92	.09

(22): ge– ∅/ge–t

Function	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
partc. verb	x	26	.02	x	102	.10			
partc. adj.	x	2	.00	x	12	.01	*disappears*		
partc. adv.	x	0	.00	x	0	.00			
	3	28	.03	3	114	.11	0	0	0

(23): ge– ∅/ge–d

Function	Conv. spelling used:	Abs. fr.	Rel. fr.	Reformed spelling used:	Abs. fr.	Rel. fr.	Optimal spelling used:	Abs. fr.	Rel. fr.
partc. verb	x	76	.07						
partc. adj.	x	10	.01	*disappears*			*disappears*		
partc. adv.	x	0	.00						
	3	86	.08	0	0	0	0	0	0