



Dual-Route Connectionist Model of Greek Spelling

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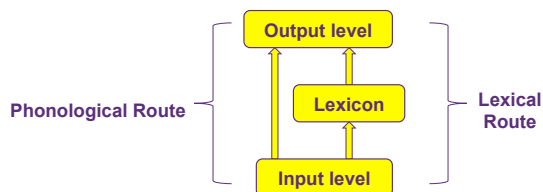


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MODEL

1. INTRODUCTION

We created a model that maps sequences of phonemes to corresponding sequences of graphemes using a sub-lexical and a lexical route. It is based on the models of Houghton & Zorzi (2003) and Simpson (2011). Its architecture is as follows:



3. TRAINING

To simulate children's spelling we used:

- 30,391 words from a child database
- 30 epochs of training
- no weight pruning

EMPIRICAL VALIDATION

5. THEORETICAL BACKGROUND

- In Greek, possible graphemes of ambiguous phonemes have different frequencies
i.e. /o/ is "o" 74% and "ω" 26% of the time
- The model spells using only frequencies created during training

7. METHOD

CHILD SPELLING SESSION 2: 177 students (Grades 5-6)

Item group A: 39 nonwords spelled by the model with the low-frequency grapheme

Item group B: 39 nonwords spelled by the model with the high-frequency grapheme

5 pairs of low and high frequency graphemes were used:

/o/ ("ω" or "o")	/e/ ("αι" or "ε")	/i/ ("oi" or "ι")
/i/ ("υ" or "ι")	/g/ ("γκ" or "γγ")	

2. INPUT/OUTPUT REPRESENTATION

The representation is syllabic and nucleus centred, with 4 consonant slots before and after the vowel.

Input (Phonological form)

s _ _ i _ _ _	b _ _ 'e _ _ _	kt _ _ e s _ _	_____	_____
ccccvcccc	c ccc vcccc	cccc vcccc	cccc v ccc c	cccc vcccc
1 st syllable	2 nd syllable	3 rd syllable	4 th syllable	5 th syllable

Output (Orthographic form)

σ _ _ υ _ _ _	μκ _ _ αί _ _	κτ _ _ ες _ _	_____	_____
ccccvcccc	c ccc vcccc	cccc vcccc	cccc v ccc c	cccc vcccc
1 st syllable	2 nd syllable	3 rd syllable	4 th syllable	5 th syllable

4. RESULTS (Part 1)

SPELLING OF THE TRAINING SET BY THE MODEL:

- **Dual-route:** 100% correct spelling.
- **Phonological route:** 65,2% correct spelling, almost all mistakes were phonologically plausible.

CHILD SPELLING SESSION 1

48 words given to 37 students (Grades 3-4):

- 13 of 14 mistakes made by the model were also made by children
- 11 of 14 mistakes made by model were the most common mistakes made by the children

6. GOAL

1. To create nonwords that the model would write with a low-frequency grapheme. We used the model's weights in order to chose consonants that promoted low-frequency graphemes
2. To test if children are also more likely to chose the less frequent graphemes in the same contexts.

8. RESULTS (Part 2) & DISCUSSION

For each of the 5 grapheme pairs, the relative proportion of low frequency graphemes compared with high frequency graphemes used by children was significantly higher in Item group A compared to Item group B. (all $p_s < .001$)

These results demonstrate that:

- Children's spelling of ambiguous phonemes is influenced by context
- Spelling is affected by the frequency of phoneme-grapheme co-occurrence
- The model can be used successfully for further research