Entrenchment vs. Transparency

Modelling the Dutch strong-weak past tense competition in an agent-based simulation

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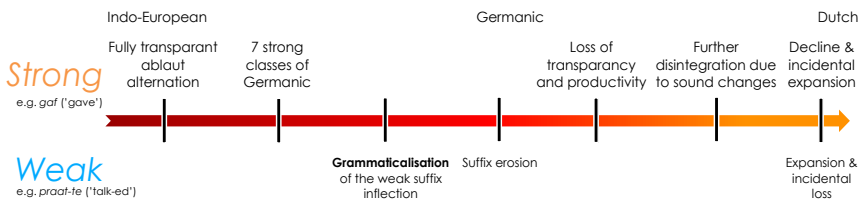
Historical Competition



Is the Dutch strong verb inflection bound to disappear?

Model Design

Set-up

- Population: 10 agents
- World: 200 events which occur with a frequency taken from the **Corpus of Spoken Dutch**
- Game: After each event, a hearer and speaker agent are randomly selected to play a language game!

Language game

- Task: communicate the event taken place
- How: use the strong or weak past tense
- Lexicon with strong form, weak form and score
- Score indicates chance of strong form being chosen

Entrenchment vs. Transparency

Alignment: hearer increases/decreases score of used verb greatly (+/- 0.01)

Strong entrenchment
all verbs start with a bias pro strong inflection
(initial score 0.7)

Weak transparency
if a weak form in used, the scores of all verbs are decreased slightly
(- 0.0005)

World

Event	Chance of occurence
gaan	0.105168148
…	
kijken	0.027508912
krijgen	0.020419438
…	
schijten	0.000028571

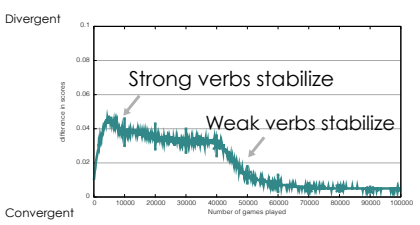
Initial lexicon

Event	Strong	Weak	Score
gaan	"ging"	"gade"	0.7
…			
kijken	"keek"	"kijkte"	0.7
krijgen	"kreeg"	"krijgde"	0.7
…			
schijten	"scheet"	"schijtte"	0.7

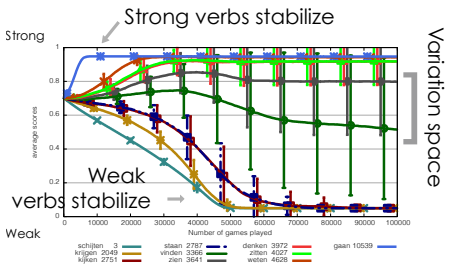
Basic model

40 series of 100.000 interactions

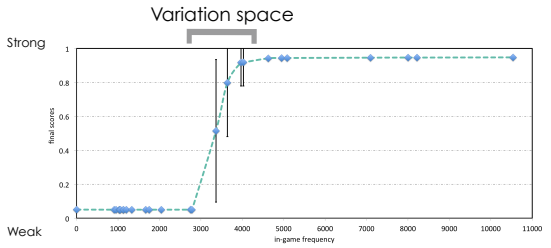
Hearer-speaker convergence



Preference development



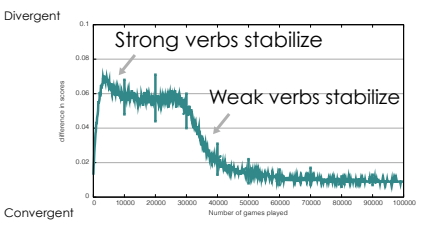
Influence of frequency on final preference

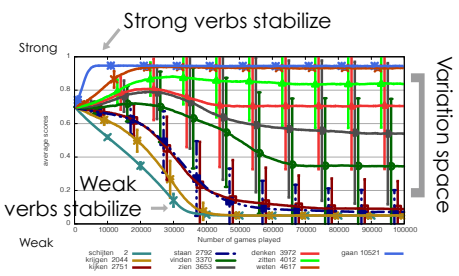


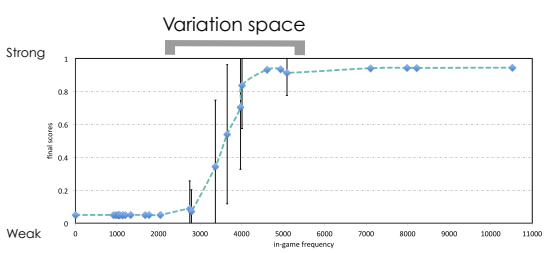
Sociolectal Extension

When speaking, a prestigious agent has 5x the normal verb-specific and general effect on the hearer

+ 1 prestigious agent / 10 agents







Conclusions

- **Strong and weak inflection systems may coexist** with each its own habitat in the lexicon
- Between the strong inflection's habitat, i.e. the high frequency verbs, and weak inflection's habitat, there is room for variation
- High frequent strong verbs may resist regularization pressure indefinitely
- **Prestigious agents**
  - speed up convergence
  - **enlarge the variation space**
  - may turn more frequent verbs weak and less frequent verbs strong according to 'personal taste'

Future goals

- From **lexicon-based to construction-based**
  - Competition between constructions instead of lexical forms using **Fluid Construction Grammar**
  - Making the weak inflection truly productive: new events
  - Internally competing strong verb classes
- Comparing different theories about **the emergence of the weak suffix inflection**
  - Verb + past tense of *to do*
  - Verb + past participle ending
  - Verb + second person singular ending
  - …

References

Bailey, C.G. 1997. *The Etymology of the Old High German Weak Verb*. Dissertation, University of Newcastle upon Tyne.

Hempen, U. 1988. *Die starken Verben im Deutschen und Niederländischen: Diachrone Morphologie*. Tübingen: Niemeyer.

Mailhammer R. 2007. 'Islands of resilience: the history of the German strong verbs from a systemic point of view'. *Morphology* 17(1): 77-108.

Salverda, R. 2006. 'Over de sterke werkwoorden in het Nederlands, Engels en Duits'. In: M. Hüning et al. (eds.), *Nederlands tussen Duits en Engels*. Leiden: Stichting Neerlandistiek Leiden, 163-181.

Steels, L. 2012. *Experiments in Cultural Language Evolution*. Amsterdam: John Benjamins Publishing.

Van Eerten, L. 2007. 'Over het Corpus Gesproken Nederlands'. *Nederlandse Taalkunde* 12(3): 194-215.

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