Complexity in grammar

Komplexität und Wortstellung: Culicover (2014)

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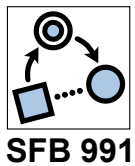
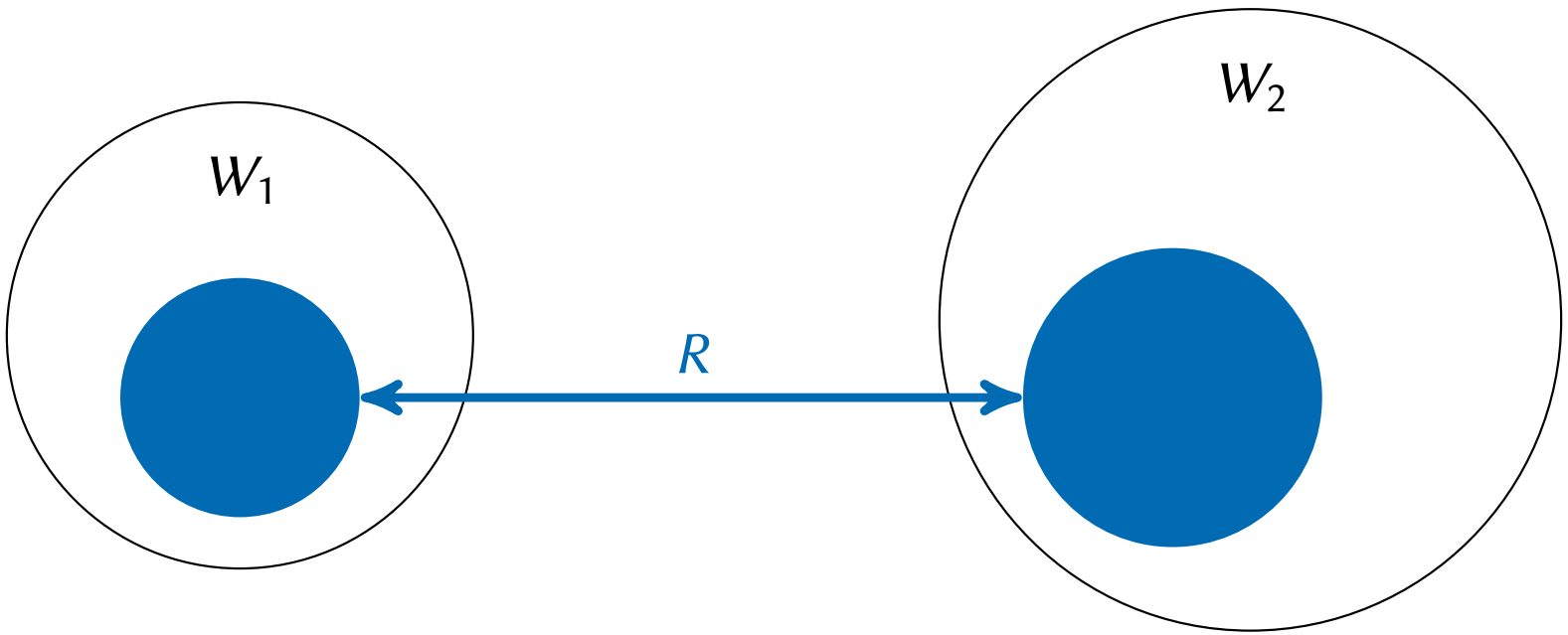


Letzte Sitzung

Jackendoff, Ray. 1975. Morphological and Semantic Regularities in the Lexicon. Language 51(3). 639–671.

- Erfassung von (Un-)Regelmäßikeiten im Lexikon
- Full-entry theory mit Redundanzregeln
- neues Informationsmaß (als Evaluationsmaß für Erklärungsadequatheit)
  - ⇒ Beschreibungskomplexität



Diese Sitzung

Culicover, Peter W. 2014. Constructions, complexity and word order variation. In Frederick J. Newmeyer & Laurel B. Preston (eds.), *Measuring grammatical complexity*, 148–178. Oxford: Oxford University Press.

(Quelle: Culicovers Homepage)

Intro

This chapter is concerned with the possibility of accounting for word order and word order variation in terms of complexity. I propose that it is useful to consider **word order variation in terms of competing constructions**, where other things being equal, the less complex construction is preferred by speakers. This view of variation presupposes that we have a way of measuring complexity. I suggest that both **formal complexity** and **processing complexity** play a role in driving change and variation. [...] Focusing on **English infinitival relative clauses** and **Continental West Germanic verb clusters**, I suggest several ways in which complexity may be measured and how such complexity may contribute to language change and variation. I consider how complexity may actually arise in the course of change, and why it may persist even in the face of pressures to reduce it. (S. 148–149)

Überblick

1. Introduction
   - *do*-support versus V2
2. Measuring syntactic complexity
   - formal complexity, processing complexity
3. CWG verb clusters
   - Empirie
4. Constructions
   - Theorie
5. The role of complexity biases in accounting for change and variation
   - processing complexity
6. A computational simulation
7. Summary and conclusions

Introduction

***do*-support:**

(1) Did any of the students [pass the exam]?

Funktion: “preserve the adjacency of the main verb and its complements”

Puzzle

Why don’t all languages have do-support and eliminate the V2 alternative? That is, why are there languages like German and Dutch? (s. 149)

Introduction

V2:

(2) ða wendon hi me heora bec to. (Old English)

(2) ða wendon hi me heora bec to. (Old English)
then turned they me their back to
'Then they turned their backs to me'

Funktion: "the thematic structure governed by the verb is more readily identified when the main verb is inverted than when a dummy modal such as *do* is inverted"

⇒ "multiple dimensions of grammatical complexity"

On this scenario, pressure to reduce complexity on one dimension may **conflict** directly with pressure to reduce complexity on another dimension. (S. 150)

Measuring grammatical complexity

Formal complexity:

- "degree of generality of grammatical description"
- "can be measured in terms of the number of terms, statements and length of statements in a description"

English infinitival relatives:

(4) a. *the man who to talk to __
    b. the man to whom to talk __

English infinitival questions:

(5) a. I wonder who to talk to __.
    b. I wonder to whom to talk __.

Measuring grammatical complexity

English infinitival relatives offer an intriguing insight into how complexity as exemplified by (4a) may actually arise as a language changes in the direction of **greater generality**.(S. 152)

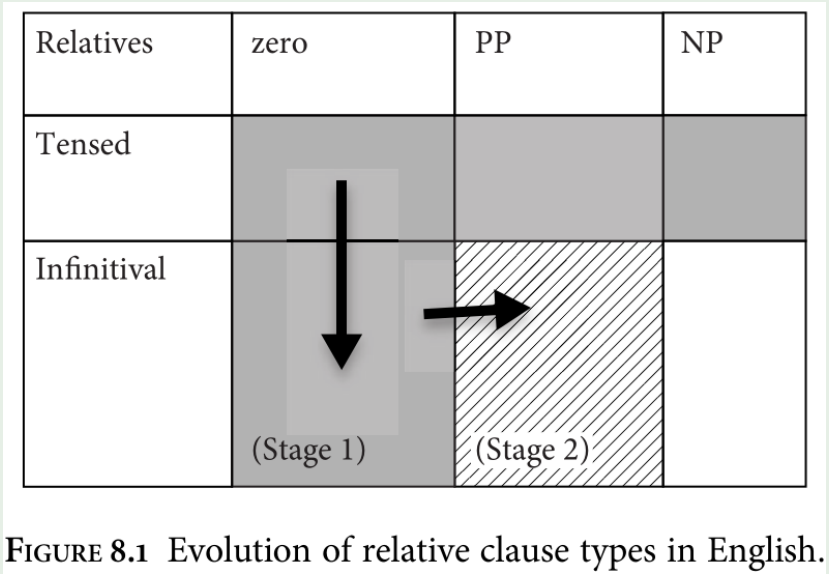


FIGURE 8.1 Evolution of relative clause types in English.

Korpusbeleg für die NP-Zelle:

(7a) Where do I find the person who to talk to about the quest?

Measuring grammatical complexity

Procesing complexity

- "the computational resources that are required by language users to map between a string of words and an interpretation"
- can be measured in terms of "eye-tracking, self-paced reading, and reaction times"

Subjekt-Relativsätze leichter als Objekt-Relativsätze:

- *the doctor that consulted the nurse*
- *the doctor that the nurse consulted*

Selbsteinbettungen:

(3) a. The doctor visited the patient.
b. The doctor that the nurse consulted visited the patient.
c. The doctor that the nurse that the hospital hired consulted visited the patient.

Measuring grammatical complexity

Komplexität für den Sprecher:

- "maintenance of representations in memory"
- "the maintenance of reference and the cost of the operations that build structure"
- "the cost of backtracking and repair"

$\rightsquigarrow$ geringere Frequenz

Garden-Path-Sätze:

- *The horse raced past the barn fell.*

lower frequency $\rightsquigarrow$ 'surprisal' beim Hörer

It is assumed in syntactic theory that processing complexity is not represented in the grammar per se (cf. e.g. Chomsky and Miller 1963). (S. 151)

Continental West Germanic (CWG) verb clusters

(9) Maria glaubt, daß
   a. sie die Arie singen kann. (2-1)
   b. sie die Arie kann singen. (1-2)

Dialect	MOD V	AUX V
Standard German	2–1	2–1
German & Austrian dialects (Wurmbrand)	2–1	2–1
S and W Austria	1–2 (2–1)	1–2 2–1
N Austria	2–1	2–1
E Austria	2–1	1–2 2–1
Bavarian	2–1	2–1 (1–2)
Swabian	2–1	2–1 (1–2)
Alsatian	2–1 (1–2)	2–1
Swiss	1–2 (2–1)	2–1 (1–2)

FIGURE 8.2 Word order in two-verb clusters (Sapp 2011: 108). Reprinted by permission of John Benjamins.

Continental West Germanic (CWG) verb clusters

(9) Maria glaubt, daß
   a. sie die Arie singen kann. (2-1)
   b. sie die Arie kann singen. (1-2)

Syntagm (group)	2–1	1–2	Total tokens
V AUX (perfect, subjunctive, passive)	887 (92.4%)	73 (7.6%)	960 (72.4%)
V MOD	227 (74.9%)	76 (25.1%)	303 (22.9%)
V *tun* 'do'	27 (96.4%)	1 (3.6%)	28 (2.1%)
V_2V_1	13 (59.1%)	9 (40.9%)	22 (1.7%)
V *kriegen* 'get'	8 (100%)	0 (0%)	8 (0.6%)
V *lassen* 'let/make'	4 (100%)	0 (0%)	4 (0.3%)
MOD AUX	1 (100%)	0 (0%)	1 (0.1%)
Totals	1,167 (88%)	159 (12%)	1,326 (100%)

FIGURE 8.3 Two-verb clusters in spoken West Central German subordinate clauses (Dubenion-Smith 2010: 112). Reprinted by permission of Cambridge University Press.

Continental West Germanic (CWG) verb clusters

(10) Maria glaubt, daß
  a. sie Peter die Arie singen hören wird. (3–2–1)
  b. sie Peter die Arie hören singen wird (2–3–1) [rare]
  c. sie Peter die Arie wird hören singen (1–2–3)
  d. sie Peter die Arie wird singen hören (1–3–2)
  e. sie Peter die Arie singen wird hören (3–1–2)
  f. sie Peter die Arie hören wird singen (2–1–3) [rare]

Correlations between two-verb and three-verb clusters

That is, certain three-verb clusters occur only in varieties with 1–2 in two-verb clusters, while others occur only in varieties with 2–1.

Continental West Germanic (CWG) verb clusters

(10) Maria glaubt, daß

a. sie Peter die Arie singen hören wird. (3–2–1)
b. sie Peter die Arie hören singen wird (2–3–1) [rare]
c. sie Peter die Arie wird hören singen (1–2–3)
d. sie Peter die Arie wird singen hören (1–3–2)
e. sie Peter die Arie singen wird hören (3–1–2)
f. sie Peter die Arie hören wird singen (2–1–3) [rare]

Overview of verb order patterns in Zürich German (Fig. 8)

V_2	AUX_1 V_2[PAST.PRT] V_3	AUX_1 V_2[INF] V_3 (IPP)	FUT_1 V_2 V_3
Causative	*	3–2–1, 1–2–3, 1–3–2	3–2–1, 1–2–3, 1–3–2
Modal	*	?3–2–1, 1–2–3, 1–3–2	?3–2–1, 1–2–3, 1–3–2
Perception verb	3–2–1, ?1–2–3, 2–1–3	?2–3–1, 1–2–3	3–2–1, 1–2–3, 1–3–2
Benefactive	3–2–1, 2–3–1, 1–2–3, 1–3–2, 2–1–3	2–3–1, 1–2–3, 2–1–3	3–2–1, 2–3–1, 1–2–3, 1–3–2
Durative	3–2–1	*	3–2–1, 1–3–2
Inchoative	2–3–1, 2–1–3	*	2–3–1, 1–2–3, 2–1–3
Control verb	3–2–1, 1–2–3, 2–1–3	*	3–2–1, 1–2–3, 1–3–2, 2–1–3

Continental West Germanic (CWG) verb clusters

Fragen:

- How do we account for the possible orderings in each variety? Specifically, is there a derivational account that explains the observed orderings in terms of an underlying 'canonical' order? Or must the various orderings be treated as distinct, but related, constructions?
- Why are some orderings more frequent than others? Does either formal or processing complexity have anything to do with these phenomena?
- If the rare orderings are more complex in some sense than the more common ones, then why have they not been completely supplanted by the less complex orderings?
- How are clusters properly integrated into grammatical descriptions in terms of syntax and semantics? That is, what is the relationship between the structure of a verb cluster and its interpretation?

Constructions

- How do we account for the possible orderings in each variety? Specifically, is there a **derivational account** that explains the observed orderings in terms of an underlying 'canonical' order? Or must the various orderings be treated as distinct, but related, **constructions**?

Eigenschaften von Verbalkomplexen:

- unterschiedliche Stellungen und trotzdem gleiche Bedeutung
- alle Stellungsmöglichkeiten möglich (typologisch)
- 1-2-3 und 3-2-1 am häufigsten

Constructions

Traditional derivational approach:

(11) a. $[_{VP}\ [_{VP}\ [_{NP}\ \text{das Buch}]\ \text{lesen}_2\ ]\ \text{kann}_1\ ]$

b. $[_{VP}\ [_{VP}\ [_{NP}\ \text{das Buch}]\ t_2\ ]\ \text{kann}_1\ +\text{lesen}_2\ ]$

c. **ABLE**(**READ**(AGENT:X,THEME:BOOK))

(12) a. $[_{VP}\ [_{VP}\ [_{VP}\ \ldots V_3\ ]\ V_2\ ]\ V_1\ ] \Rightarrow$
$[_{VP}\ [_{VP}\ [_{VP}\ \ldots t_3\ ]\ V_2\ +V_3\ ]\ V_1\ ]$ (2–3–1)

b. $[_{VP}\ [_{VP}\ [_{VP}\ \ldots V_3\ ]\ V_2\ ]\ V_1\ ] \Rightarrow$
$[_{VP}\ [_{VP}\ [_{VP}\ \ldots t_3\ ]\ V_2\ +V_3\ ]\ V_1\ ] \Rightarrow$
$[_{VP}\ [_{VP}\ [_{VP}\ \ldots t_3\ ]\ t_{2+3}\ ]\ V_1\ +V_2\ +V_3\ ]$ (1–2–3)

c. $[_{VP}\ [_{VP}\ [_{VP}\ \ldots V_3\ ]\ V_2\ ]\ V_1\ ] \Rightarrow$
$[_{VP}\ [_{VP}\ [_{VP}\ \ldots V_3\ ]\ t_2\ ]\ V_1\ +V_2\ ]$ (3–1–2)

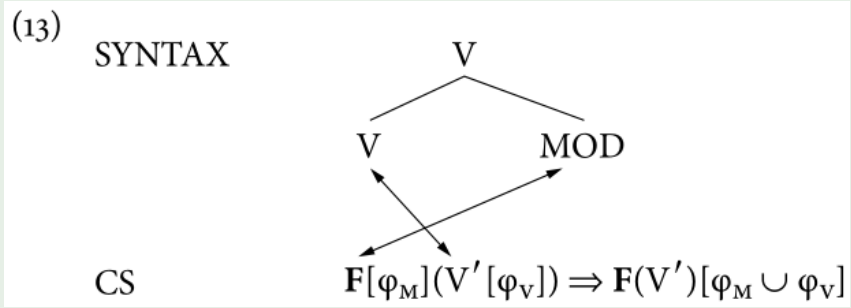
As far as I know there is no natural mechanism intrinsic to the grammar in such an account to explain why some orders are very frequent and others are not. (S. 159)

Constructions

Constructional approach:

- unifikationsbasiert
- eine Konstruktion pro Stellungsmöglichkeit

(13)



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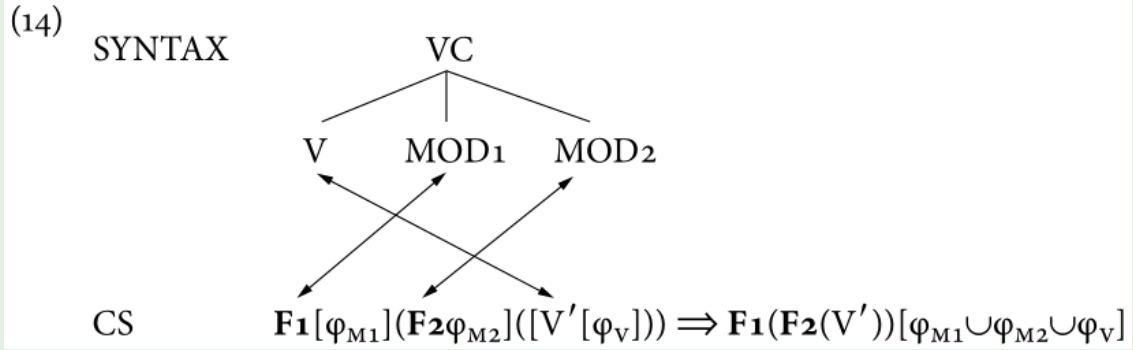


- Stellung V_1 V_2 impliziert die Verfügbarkeit von V_1 V_2!
- Tatsächlicher Gebrauch hängt von Frequenz und Komplexität ab.

The role of complexity biases in accounting for change and variation

V_1 V_2 weil …

(17) Scope-order principle: (Haider, Kroch)
The prefered scope ordering of operators correspond to the left-to-right ordering of the phrases.

(18) Scope bias:
Alignment of scope with linear order facilitates one aspect of the computation of scope in the CS representation.

Beispiel:

- *sie das Buch lesen*$_2$: READ(PRO, BOOK)
- *sie das Buch will*$_1$: WANT(PRO[3.FEMALE]$^{\alpha}$, F(α,BOOK))

$\Rightarrow$ besser: *dass sie das Buch will*$_2$ *lesen*$_1$

The role of complexity biases in accounting for change and variation

V_2 V_1 weil …

(23) Dependency bias: (Hawkins, Gibson)
The preferred ordering of a head and its dependents is the order that permits the minimal syntactic domain that contains them.

Beispiel:

- *daß sie das Buch lesen*$_2$ *will*$_1$: READ(α,BOOK)) ✓
- *daß sie das Buch* | *will*$_1$ *lesen*$_2$: F(α,BOOK))

The role of complexity biases in accounting for change and variation

Vorhersagen:

- 1-2 ⇔ 1-2-3
- 2-1 ⇔ 3-2-1

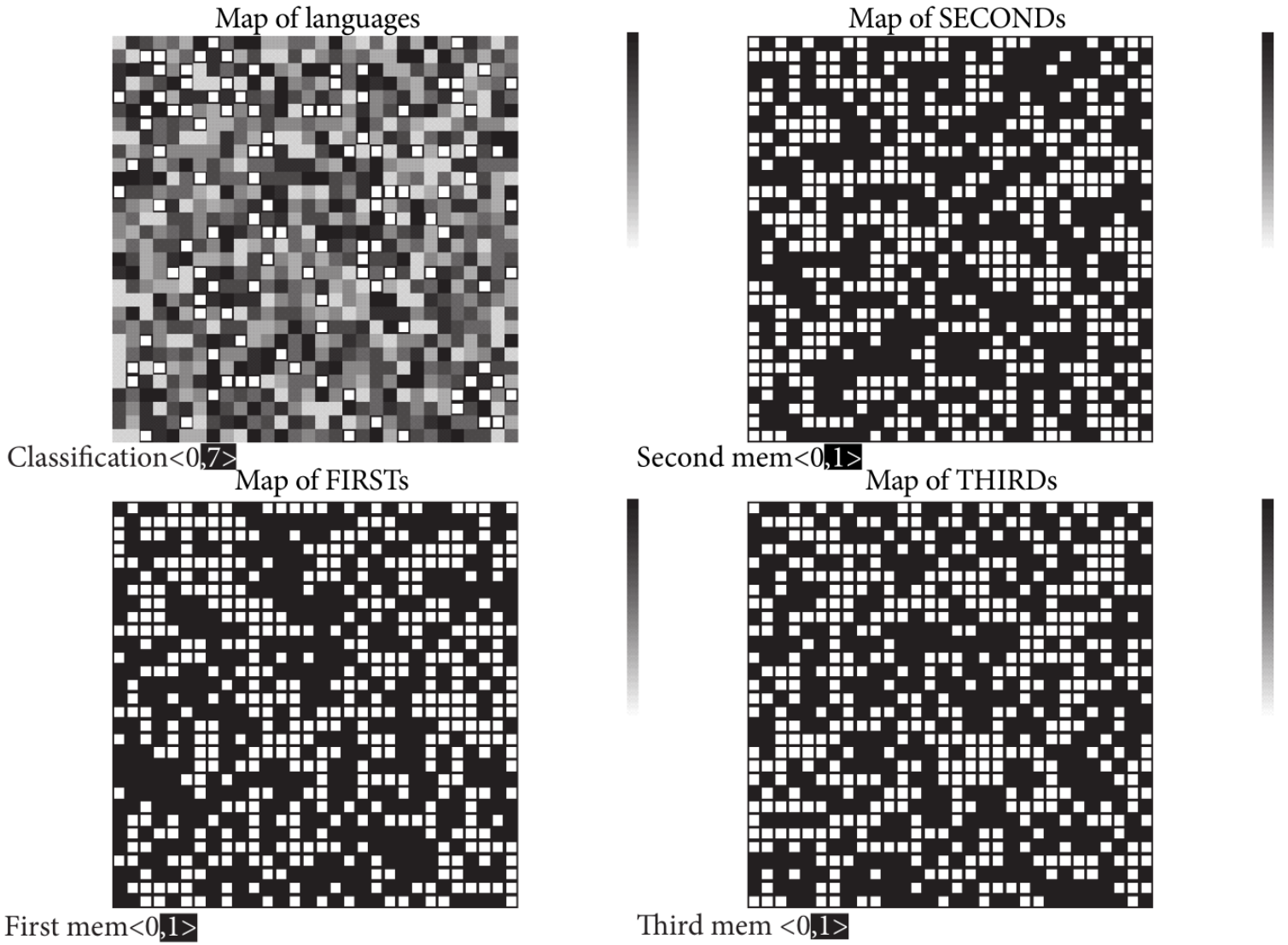
Verbalkomplexe mit drei Verben:

(25) X 3–2–1 ⇒ X 1–3–2 [scope bias]
X 1–2–3 ⇒ X 2–1–3 [dependency bias]
X 1–2–3 ⇒ X 2–3–1 [weak dependency bias [...]]
X 1–2–3 ⇒ X 3–1–2 [dependency bias]

Die Verfügbarkeit ist abhängig von der Varietät und den involvierten Kategorien (AUX, MOD).

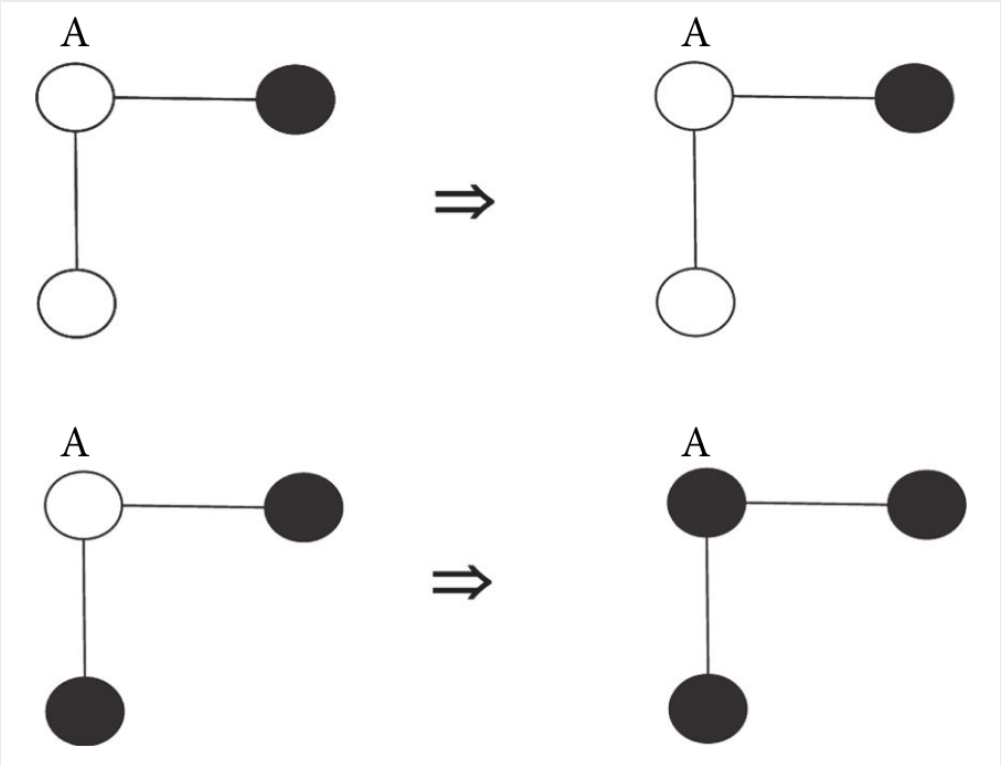
A computational simulation

Figure 8.5: Feature values at initial state



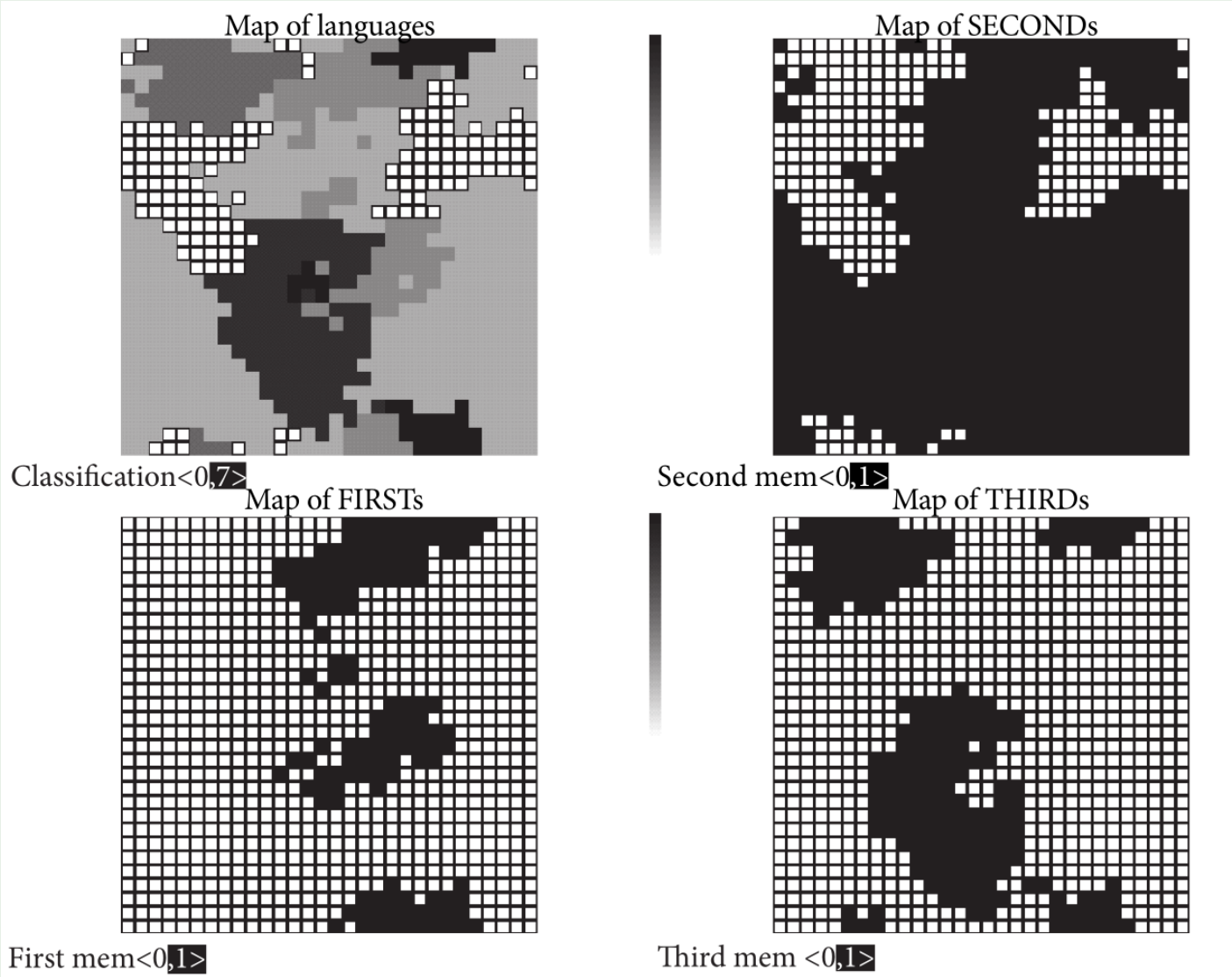
A computational simulation

Figure 8.6: Interaction of neighboring agents



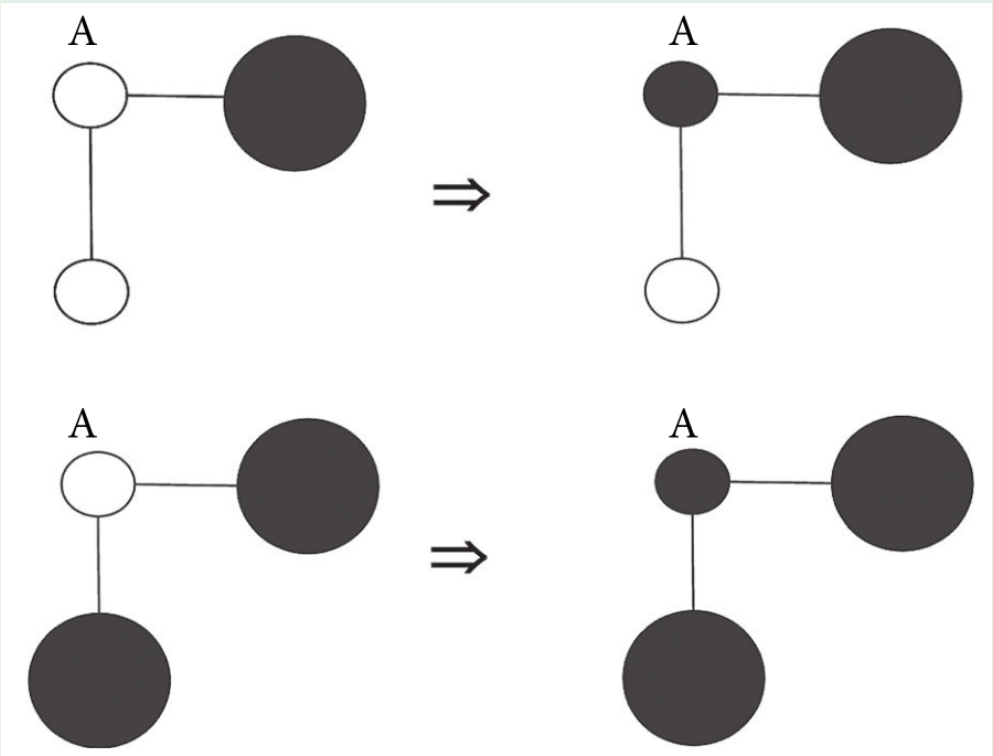
A computational simulation

Figure 8.7: Feature values after step 69



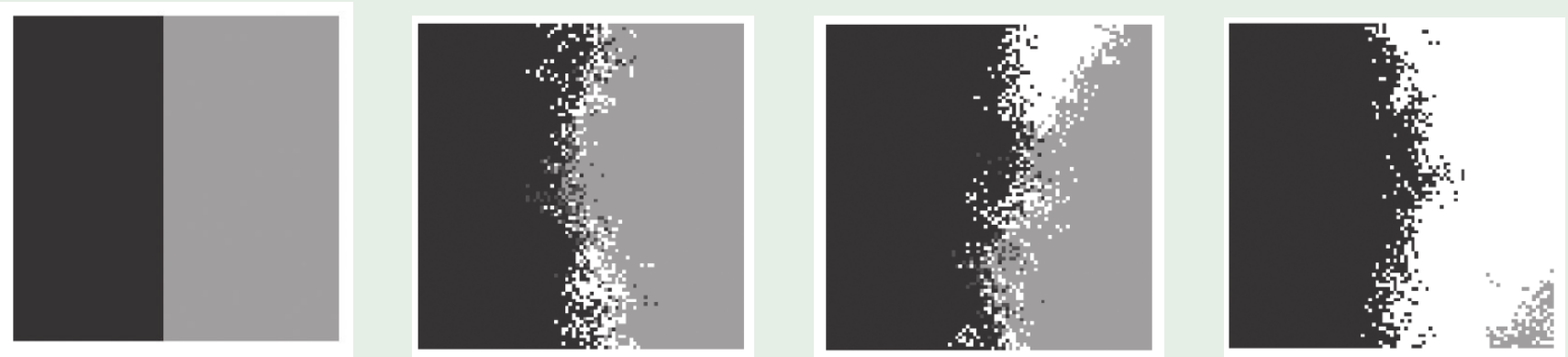
A computational simulation

Figure 8.9: Interactions of neighbors in a network, bias on Black



A computational simulation

Figure 8.10–8.13: Feature values with -1% bias



initial state | step 453 | step 2209 | step 3751

This simulation **illustrates** that it is possible for a less preferred option, in this case a particular construction, to remain in the population for a substantial amount of time, and in principle forever, as long as there are conditions that continue to support it. (S. 176)

- lack of contact
- strong and compact clusters

Aber: Viele weitere Faktoren, z.B. Frequenz, fehlen hier.

Zusammenfassung

- formal complexity — *do*-Support
- processing complexity — Wortstellungsvaration im Verbalkomplex
  - scope bias versus dependency bias
  - prinzipielle Verfügbarkeit aller Wortstellungen
    $\Rightarrow$ Konstruktionen
- Simulation der Verbreitung von Konstruktionen aufgrund von Komplexität

Kritik:

- Das Performanzmodell ist unklar.
- Daher ist auch der Zusammenhang zwischen Konstruktionen/Grammatik und "processing complexity" unklar.
- Generalisierungen in Konstruktionen bleiben unklar.

[1] Culicover, Peter W. 2014. Constructions, complexity and word order variation. In Frederick J. Newmeyer & Laurel B. Preston (eds.), *Measuring grammatical complexity*, 148–178. Oxford: Oxford University Press.