An Annotation of Semantic Change based on Usage Relatedness

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Introduction

- aim: build a computational model detecting semantic change in corpora
- benefits: test theories empirically on a large scale, inspire research by detecting new changes
- problem: models should be evaluated on a sufficient number of semantic developments, there is no reliable test set of semantic change for any language
- solution: collect a set of words displaying semantic change in a specific corpus in an annotation study
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  the emergence of polysemy

  **reductive meaning change**
  loss of a fully-established meaning
Innovative Meaning Change

'I wanted to talk, but he grabbed me with a strong fist and kicked me out of the door...'

'Only then I was hit by desperation and with the desperation also by undescribable rage.'

'The old Schäferle grabbed his arm and shouted:'

▶ change: to grab > grab; to hit figuratively
Innovative Meaning Change

earlier: Ich wollte reden, er packte mich aber mit starker Faust und warf mich zur Thüre hinaus...
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- in the following we adopt Blank (1997)’s view (cf. p. 406–419)

- relies on prototype theory

- distinguishes four degrees of semantic proximity for pairs of uses:

  (i) identity: both uses have same meaning

  (ii) context variance: semantically very near, referents belong to same category

  (iii) polysemy: semantically more distant, referents belong to different category but have semantic relation (similarity, contiguity...)

  (iv) homonymy: semantically very distant, referents belong to different category and have no semantic relation

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→ leads to up or down movement on proximity scale
Identity

My arm hurts.
Identity

My *arm* hurts.

vs.
Identity

My arm hurts.

vs.

She grabbed my arm.
Context Variance

My arm hurts.
Context Variance

My arm hurts.

vs.

Look at the arm of the statue.
Context Variance

My arm hurts.

vs.

Look at the arm of the statue.
Polysemy

My arm hurts.
Polysemy

My *arm* hurts.

vs.
Polysemy

My *arm* hurts.

vs.

An *arm* of the sea.
Homonymy

My arm hurts.
Homonymy

*My arm hurts.*

vs.
Homonymy

My arm hurts.

vs.

The number of men under arms is no longer the decisive factor in warfare.
Semantic Proximity in Practice

→ semantic proximity is a *continuum* with homonymy on one end, meaning identity on the other and polysemy in between
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▶ various polysemy annotation studies of use pairs on proximity scales:

- Brown (2008): semantic relatedness (‘1’ = unrelated, ‘4’ = same sense)
- Erk et al. (2009, 2013): semantic similarity (‘1’ = completely different, ‘5’ = identical)
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Semantic Proximity and Meaning Change

- **basic idea**: we measure the mean semantic proximity of uses of a word over time
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  - **increase** suggests innovative meaning change (polysemy)
Semantic Proximity and Meaning Change

- **basic idea**: we measure the mean semantic proximity of uses of a word over time
  - increase suggests innovative meaning change (polysemization)
  - decrease suggests reductive meaning change
Example – Polysemization

Figure 1: 2-dimensional use spaces in two time periods of a target word \( w \) undergoing polysemization. Dots represent uses of \( w \) and lines represent the \textit{semantic proximity} of two such uses (measured by the number written next to it).
Advantages?

- use pairs:
Advantages?

- use pairs:
  - **propagation**: distinction of different levels of prevalence
Advantages?

- use pairs:
  - propagation: distinction of different levels of prevalence
- scale:
Advantages?

- use pairs:
  - *propagation*: distinction of different levels of prevalence
- scale:
  - *graduality*: distinction of different strengths of change
Advantages?

▶ use pairs:
  ▶ propagation: distinction of different levels of prevalence
▶ scale:
  ▶ graduality: distinction of different strengths of change
▶ relatedness:
Advantages?

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  - **intersubjectivity**: previous studies high annotators’ agreement on semantic relatedness
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  - **graduality**: distinction of different strengths of change
- relatedness:
  - **intersubjectivity**: previous studies high annotators’ agreement on semantic relatedness
  - **feasibility**: non-experts can annotate semantic change
Problems?

- sample size
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- hardly distinguishable semantic constellations:
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  - homonymy vs. polysemy with 3 meanings
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- annotators’ tendency to interpret language with modern meaning
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- ...

Annotation Scale

4: Identical
3: Closely Related
2: Distantly Related
1: Unrelated
0: Cannot decide

Table 1: Four-point Scale of Relatedness derived from Brown (2008, p. 250).
Table 2: rating 4 (Identical).
Table 3: rating 3 (Closely Related).
### Table 4: rating 2 (Distantly Related).

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>target sentence 1</strong></td>
<td>judgment</td>
<td>comment</td>
<td><strong>target sentence 2</strong></td>
</tr>
<tr>
<td>Die Fraw aber / gleichsamb ob sie nichts von der Fabel wiste / fragte fleissig nach allem / wer das Kind were / warumb man es verstossen / vnd den jungen Knaben / von solcher Schönheit daß die Natur nichts an ihm vergessen / also weggeworffen hette. Er gab für / jhm were weiter nichts wissendt / als dass er jhn auf einem Scheidewege am Wald / da niemand als Hirten vnd Jäger hin kämen / gefunden; dahin er entweder vnbaarfweziger weise / oder auß höchstdringender Noth müßte gelegt worden seyn. Also nam Sicambre das weinende Kindt / vnd schweigte es / in dem sie jhm zu trinken gab.</td>
<td>2</td>
<td></td>
<td>Auf der Erde werden Kinder Gottes geboren, die von den Menschen Genies genannt werden. Ein jedes von ihnen wird in früher Jugend an einen Scheideweg gestellt und muß seine Wahl treffen. Seine Gabe ist ihm verliehen für andere sowohl wie für sich selbst.</td>
</tr>
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<td>Ferner: solange der einzelne Geschäftsmann alle Zahlungen unmittelbar aus seiner Kasse leistet, bezw. in dieselbe einnimmt, muss er zu den Zeiten, wo regelmässig grössere Summen fällig werden, einen erheblichen Barbestand beschaffen und andererseits in den Zeiten überwiegender Eingänge dieselben sogleich zweckmässig unterzubringen wissen. Die Konzentrierung des Geldverkehrs in den grossen Banken enthebt ihn dieses periodischen Zwanges zur Aufhäufung und Drainierung; Endlich ein letztes Beispiel.</td>
<td>1</td>
<td></td>
<td>Ich fand lat. 43° 14', long. wahrscheinlich 51°¼. Auf der Bank haben wir keinen Seetang gesehen, auch nicht westlich seit dem 8ten Juli. Wenige Tage, ehe wir die Bank von Neufundland berührten, waren, was in dieser Jahreszeit (Mitte Juli’s) sehr ungewöhnlich ist, grosse Eismassen gesehen worden, die sich nach Südwest bewegten, während der gewöhnliche Strom auf dem südlichen Theil der Bank nach Norden gerichtet ist.</td>
</tr>
</tbody>
</table>

**Table 5: rating 1 (Unrelated).**


