Modeling the interaction of affix semantics and base semantics

A frame-based approach

Marios Andreou, Lea Kawaletz, Ingo Plag

*Heinrich-Heine-Universität Düsseldorf*

SFB Kolloquium, November 7, 2015
The problem: Polysemy

1. RESULTS (the outcome of VERB-ing): acceptance, alteration
2. PRODUCTS (the thing that is created by VERB-ing): pavement, growth
3. INSTRUMENTS (the thing that VERB-s): seasoning, advertisement
4. LOCATIONS (the place of VERB-ing): dump, residence
5. AGENTS (people or person who VERB-s): administration, cook
6. MEASURE TERMS (how much is VERB-ed): pinch, deceleration
7. PATHS (the direction of VERB-ing): decline, direction
8. PATIENTS (the thing affected or moved by VERB-ing): catch, acquisition
9. STATES (the state of VERB-ing or being VERB-ed): alienation, disappointment
10. INSTANCES (an instance of VERB-ing): belch, cuddle
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How do we get different readings?

- Certain base verbs evoke certain readings (BLP, 212)
  - Verb requires instrument – Instrument nominalization
    - to wrap – wrap; to refresh – refreshment
- Shift to a syntactic argument of the verb
  - John purchased a car. His wife approves of this purchase.
- Shifts are not restricted to syntactic arguments
  - My granny used to embroider pillowcases. I love the embroidery on this one.
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An interplay of verb and suffix
This paper

- Introduce a new approach to the formalization of the interpretation of derived words
- Apply this approach to the analysis of -ment and un- derivatives
- Discuss the implications of such an approach for other derivational processes
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- Frames are recursive attribute-value structures
- They serve to model mental representations of concepts
- They are applicable to linguistic phenomena
- They can be depicted as graphs or matrices
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\[
\begin{align*}
&\text{walk} \\
&\begin{bmatrix}
0 \\
1 \\
2
\end{bmatrix}
\end{align*}
\]
Frame semantics

psych causation

STIMULUS 1
EXPERIENCER 2

CAUSE

0

EFFECT

3 ≠ 4

activity

ACTOR 1
UNDERGOER 2

change of psych state

INITIAL STATE 3

RESULT STATE 4

psych state

EXPERIENCER 2

psych state

EXPERIENCER 2
Methodology: -ment

- Many (often highly lexicalized) derivatives
  - government 1484
  - development 1756
  - department c. 1450
- Nowadays still somewhat productive (BLP, 199)
- Aim: synchronic analysis of the productive process
- Neologisms (1900-today)
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- Hapax Legomena (Corpus of Contemporary American English)
- 86 -ment derivatives from 24 verb classes (Levin 1993)
- Largest class: psych verbs (N=16)
- Attestations from other corpora (GloWbE, WebCorp, Google)
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Semantic coding of derivatives

Traditional semantic categories, e.g.

- STATE
- EVENT
- EXPERIENCER
- STIMULUS
- RESULT STATE
• EVENT
  Medicine’s and my great problem and great fault consist of what might be called the intellectualization – the enrapturement with science and technology – by which that legion of men and women who are today’s doctors have allowed themselves to become besotted. (Webcorp_BLOG_1998)

• RESULT STATE
  I know a lot of our compatriots also feel the same angst, consternation and confoundment. (GloWbE_ART_2012)

• STIMULUS
  Here comes a confoundment (new word I just made up :) ) for you. (Google COMM 2006)
• EVENT
Medicine’s and my great problem and great fault consist of what might be called the intellectualization – the enrapturement with science and technology – by which that legion of men and women who are today’s doctors have allowed themselves to become besotted. (Webcorp_BLOG_1998)

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**RESULT STATE**

I know a lot of our compatriots also feel the same angst, consternation and *confoundment*. (GloWbE_ART_2012)

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PSYCH verbs (AMUSE verbs): Types in our dataset (N=16)

affrightment  annoyance
bemusement  upliftment
bumfuzzlement  confoundment
dumbfoundment  endullment
enragement  enrapturement
nonplusment  perturbment
soothement  staggerment
upsetment  worriment
• result state is dominant: not surprising
• stimulus or event nominalizations should be impossible
  (Pesetsky 1995, 71):
  "These nominalizations lack causative force"
  "Amusement does not refer to something amusing something,
  but to the state of being amused"
• Not true.
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• Not true.
Formalization: \textsc{PsyCh} verbs

\begin{align*}
\text{psych causation} & \quad \text{STIMULUS } 1 \\
& \quad \text{EXPERIENCER } 2 \\
\text{CAUSE } 3 & \quad \begin{bmatrix}
\text{activity} \\
\text{actor } 1 \\
\text{undergoer } 2
\end{bmatrix} \\
\text{EFFECT } 4 & \quad \begin{bmatrix}
\text{change of psych state} \\
\text{INITIAL STATE } 5 \\
\text{RESULT STATE } 6
\end{bmatrix} \\
5 \neq 6 & \quad \text{REF } = 0
\end{align*}
Formalization: RESULT STATE

confoundment ‘state of being confounded’

psych causation

STIMULUS 1
EXPERIENCER 2

CAUSE 3
actor 1
undergoer 2

0

activity

change of psych state

INITIAL STATE 5
psych state
EXPERIENCER 2

RESULT STATE 6
psych state
EXPERIENCER 2

5 ≠ 6

REF = 6
Formalization: \textit{-ment} on PSYCH verbs

\begin{align*}
\text{lexeme} & \quad \text{PHON} \ x-\text{ment} \\
\text{SEM} & \quad \text{psych causation} \\
\text{STIMULUS} & \quad [1] \\
\text{EXPERIENCER} & \quad [2] \\
\text{CAUSE} & \quad [3] \\
\text{ACTOR} & \quad [1] \\
\text{UNDERGOER} & \quad [2] \\
\text{activity} & \\
\text{EFFECT} & \quad [4] \\
\text{INITIAL STATE} & \quad [5] \\
\text{RESULT STATE} & \quad [6] \\
\text{REF} & \quad \{ y, 1, 3, 4, 6 \} \\
\text{psych state} & \\
\text{psych state} & \\
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\end{align*}
Polysemy triggered by *-ment*

- Possible referential shifts with PSYCH verbs: EVENT, STIMULUS, RESULT STATE
- Impossible shift: EXPERIENCER
- General constraint: inanimate
- What about other verb classes as bases?
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CHANGE-OF-STATE base verbs: Examples

1. EVENT
Markham sets down the rules about park befoulment. (WebCorp BLOG 2012)

2. INSTRUMENT
Minimal bleeding and I didn’t have to have any guaze/tissue in my mouth at all to try and stop it? I’m thinking that they must have used a congealment or something to make it clot while I was under or something? (GloWbE COMM 2010)

3. EVENT or CAUSE (activity)
Click here to watch my progressment of the website (Google COMM 2013)

4. EFFECT (change of state)
For one second she clung to her son, and then, disengaging herself, froze up like the sudden congealment of a spring.

5. RESULT STATE
Sarcasm, Deb ... trying to excuse the bedragglement of the hair, etc? (Google COMM 2013)

6. THEME (in RESULT STATE)
I set down the scrap of doll’s dress, a bedragglement of loose lace hem (COCA FIC 1999)
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5. **Result State**
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\begin{align*}
\text{causation} & \quad \text{ACTOR} [1] \\
& \quad \text{UNDERGOER} [2] \\
& \quad \text{INSTRUMENT} [3] \\
& \quad \text{CAUSE} [4] \\
0 & \\
\text{activity} & \quad \text{ACTOR} [1] \\
& \quad \text{UNDERGOER} [2] \\
& \quad \text{INSTRUMENT} [3] \\
\text{change of psych state} & \quad \text{INITIAL STATE} [6] \\
& \quad \text{RESULT STATE} [7] \\
6 \neq 7 & \\
\text{REF} = 0 & \\
\end{align*}
\]
Formalization: -ment on CHANGE-OF-STATE verbs

- **lexeme**
  - PHON: x-ment

- **change-of-state**
  - ACTOR 1
  - UNDERGOER 2
  - INSTRUMENT 3

- **cause**
  - ACTOR 1
  - UNDERGOER 2
  - INSTRUMENT 3

- **effect**
  - INITIAL STATE 6
  - RESULT STATE 7

- **change of psych state**
  - INITIAL STATE 6
  - RESULT STATE 7

- **REF = \{ y, 3, 4, 5, 7, 2-7 \}**

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Another class of base verbs: ILLUSTRATE verbs, e.g. address

Different meanings:

• 'A addressed B on topic C by saying D in his speech (using E as a medium).'</n
• 'put an address on something'
• 'dedicate one's attention to something'
• 'speak to someone using a name'
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- **EVENT**
  I’d die of embarrassment before making any kind of addressment to a lone female in that way (WebCorp COMM 2014)

- **TOPIC**
  today when i checked ranking, many many keywords have lost rank. Some are not even found! [?] The next thing is this: If i submit my xml sitemap in webmasters central ..., does this make a difference in influencing rankings?? Any advice on these 2 addressments is very much appreciated! (Google COMM 2008)

- **MESSAGE**
  The final addressment was that Shilar or their mage consort did not aid Axfell in obtaining the Silver Golem. (Google COMM 2004)

- **MEDIUM**
  The addressments were still stuck to the wall.
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Formalization: *-ment* on ILLUSTRATE verbs

\[
\begin{bmatrix}
\text{addressment} \\
\text{SPEAKER} \, 1 \\
\text{AUDIENCE} \, 2 \\
\text{TOPIC} \, 3 \\
\text{MESSAGE} \, 4 \\
\text{MEDIUM} \, 5 \\
\text{REF} = \{0, 3, 4, 5\}
\end{bmatrix}
\]
-ment: Interim summary

- Frame-based approach can elegantly model some aspects of the interaction of base and affix.
- Shifts can target argumental and non-argumental components of the semantic representation.
- Shifts cannot target animate elements in the semantic representation.
- Shifts can target ‘core’ elements in the semantic representation.
- Attested readings result from clearly defined shifts in the semantic structure of the respective base verbs.
- The differences between different (sub-)classes of verbs arise naturally from the differences in the verbal frames.
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Derivation = Metonymic shift?

- Derivational semantics: Metonymic shifts in the frame of the base (Löbner 2013, Schulz 2014)


- CONTAINED FOR CONTAINER
  1. The milk tipped over.
  2. saxar-nica ('sugar'-NOM) 'sugar-bowl' (Russian)
  3. květin-áč (lit. 'flower'-AGENT) 'flower-pot' (Czech)

- "Word-formation performs parallel CONTAINED FOR CONTAINER metonymies in the Russian and Czech examples, which are derived from saxar 'sugar' and květina 'flower, flowering plant' respectively". (Janda 2011: 361)
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"a source concept ... provides mental access to the target concept" (Janda 2011:360)

- source = concept of base
- context = affix
- target = concept of derived word
- milk FOR thing containing milk
- CONTAINED FOR CONTAINER METONYMY
- sugar FOR thing containing sugar
- BASE FOR DERIVATIVE

It is rather the affix that provides access to the derived concept.
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Is all derivation metonymic?

• There are instances of derivation that cannot be explained by metonymy.

• Whenever meaning is added, and not shifted

• A case in point: prefixal negation
  • standard negatives ('not X', e.g. dislike)
  • privatives ('without X/remove X from', e.g. decaffeinate)
  • reversatives ('reverse action of X-ing', e.g. unlock)
  • pejoratives ('do X wrongly', e.g. misassemble)
  • scale external (irrelevance of the scale or polar opposition, e.g. amelodic)
  • stereotype negation (a non-stereotypical exemplar of its category, e.g. non-person)
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She calls her new way of eating the 'undiet' because it has no restrictions. (from COCA, Bauer et al. 2013: 373)

- *un-* negates the value of an attribute of the base lexeme.

\[
\text{lexeme} \\
\text{PHON} \quad \frac{\text{x}}{} \\
\text{CAT} \quad \text{N}
\]

\[
\text{SEM} \\
\text{IND} \quad \text{V} \\
\text{RESTR} \quad \text{ATTRIBUTE}/ \alpha
\]

\[
\text{lexeme} \\
\text{PHON} \quad \text{un-} \quad \frac{\text{x}}{} \\
\text{CAT} \quad \text{N}
\]

\[
\text{SEM} \\
\text{IND} \quad \text{V} \\
\text{RESTR} \quad \text{ATTRIBUTE}/ \neg \alpha
\]
She calls her new way of eating the 'undiet' because it has no restrictions (from COCA, Bauer et al. 2013: 373)

* un- negates the value of an attribute of the base lexeme.

\[
\begin{align*}
\text{lexeme} & \quad \text{PHON} \quad \text{CAT N} \\
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She calls her new way of eating the ‘undiet’ because it has no restrictions (from COCA, Bauer et al. 2013: 373)

- *un-* negates the value of an attribute of the base lexeme.
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- *un-* negates the value of an attribute of the base lexeme.
Stereotype negation: Unified lexical rule for *un-*
Unified lexical entry for *undiet*

**lexeme**
- **PHON** /ʌn/-[x]
- **CAT N**
- **SEM**
  - **IND** [y]
  - **RESTR**
    - **PURPOSE weight loss**
    - **EATING**: restricted
    - ...

**M-DTRS**
- **lexeme**
  - **PHON** /daɪət/[x]
  - **CAT N**
  - **SEM**
    - **PURPOSE weight loss**
    - **EATING**: restricted
    - ...

Back to -ment!
Formalizing -ment across verb classes
Formalizing *-ment* across verb classes

- **lexeme**
  - PHON \(x\)-*ment*
  - CAT N
  - SEM \(y\)
  - M-DTRS \(z\)

- **lexeme**
  - PHON \(x\)
  - CAT V

- **SEM psych causation**
  - STIMULUS 1
  - EXPERIENER 2
  - ACTOR 1
  - UNDERGOER 2

- **change of psych state**
  - EFFECT 4
  - INITIAL STATE 5
  - RESULT STATE 6

- \(5 \neq 6\)
Unification and inheritance

[Diagram showing the unification of lexemes with their respective categories and features, including PHON, CAT, SEM, M-DTRS, and their associated values.]
• Where do the referential restrictions reside?
  PSYCH VERBS: \( \text{REF} = \{y, 1, 3, 4, 6\} \)
  CHANGE-OF-STATE VERBS: \( \text{REF} = \{y, 3, 4, 5, 7, 2-7\} \)
  ILLUSTRATE VERBS: \( \text{REF} = \{0, 3, 4, 5\} \)
• Underspecification?
• Inheritance hierarchy?
• Where do the referential restrictions reside?
  PSYCH VERBS: $\text{REF} = \{y, 1, 3, 4, 6\}$
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• Underspecification?

• Inheritance hierarchy?
Frame-based approach can be fruitfully employed to model derivational semantics

- Interaction of base and affix
- Interpretation of derivatives: metonymic shift in the frame of the base

Problems with the metonymy approach to word formation

- Overgeneral notion of metonymy
- Metonymic expressions proper vs. metonymy in word-formation
- There are instances of word formation that cannot be explained by metonymy

Problems with frame-based formalization

- Unification and prediction?
- Constraints (e.g. never PURPOSE)?
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Thank you very much for your attention!

Acknowledgements

We gratefully acknowledge financial support by

- *Deutsche Forschungsgemeinschaft* (SFB 991, Project C 08)
- LABEX, U Paris-Diderot