Constructions in Lexical Functional Grammar

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Constructional approaches in formal grammar

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Outline

Lexical Functional Grammar
Multiple levels of representation
Meaning in LFG
Templates and hierarchies

Lexical integrity

Constructions in LFG
Argument structure constructions
Other constructions
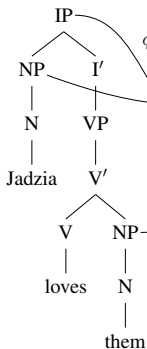
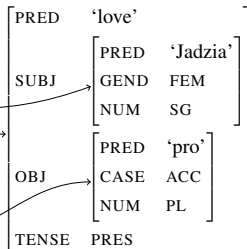## Conclusion

Lexical Functional Grammar

Lexical Functional Grammar

► Declarative/constraint-based (non-transformational)
► Two levels of syntactic analysis:

C-STRUCTURE   F-STRUCTURE

$$
\begin{bmatrix}
\text{PRED} & \text{'love'} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'Jadzia'} \\ \text{GEND} & \text{FEM} \\ \text{NUM} & \text{SG} \end{bmatrix} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'pro'} \\ \text{CASE} & \text{ACC} \\ \text{NUM} & \text{PL} \end{bmatrix} \\
\text{TENSE} & \text{PRES}
\end{bmatrix}
$$

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- ▶ C-structure nodes bear annotations describing f-structure.
    - ▶ ↓ ≡ the f-structure of this node
    - ▶ ↑ ≡ the f-structure of this node's mother
- ▶ Annotated phrase structure rules:

    (1)   IP →   NP   I′
                       (↑ SUBJ) = ↓   ↑ = ↓

- ▶ Lexical entries:

    (2)   Jadzia   N   (↑ PRED) = 'Jadzia'
                           (↑ NUM) = SG
                           (↑ GEND) = FEM

- Annotations can refer to non-local parts of f-structure.
- E.g. FUNCTIONAL CONTROL:

  (3)　　　seem　　V　($\uparrow$ PRED) = 'seem'
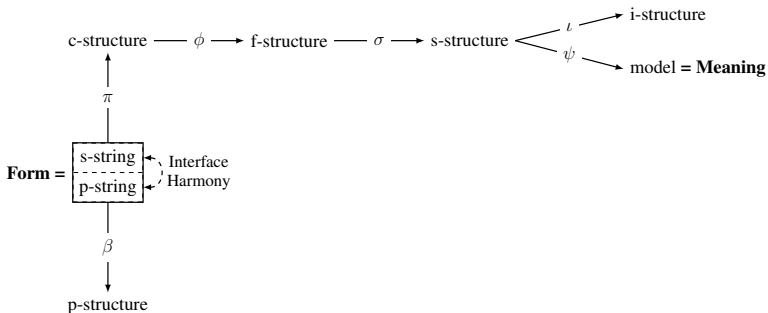 　　　　　　　　　　　　($\uparrow$ SUBJ) = ($\uparrow$ XCOMP SUBJ)

- E.g. FUNCTIONAL UNCERTAINTY: regular expressions for capturing arbitrarily long paths through f-structure:

  (4)　　CP $\rightarrow$　　　　　　　XP　　　　　　　C$'$
  　　　　　　　　　　　　($\uparrow$ FOCUS) = $\downarrow$　　　$\uparrow$ = $\downarrow$
  　　　　　　　　　　($\uparrow$ FOCUS) = ($\uparrow$ COMP* GF)

- Kaplan (1987) *et seq.*: a rich PARALLEL PROJECTION ARCHITECTURE, encompassing all levels of linguistic representation, including meaning.
  - Potentially including usage-based information. (e.g. Bod & Kaplan 1998)

- ► Annotations (in PSRs and lexical entries) can make reference to any level of representation.
- ► Levels exist in parallel and are **mutually constraining**.
- ► Subscripting convention:

(5) $\uparrow_\sigma \equiv \sigma(\uparrow)$

▶ Status of semantic structure and meaning in the LFG architecture has been variable – see Findlay (in press) for an overview.

▶ Modern approaches make use of GLUE SEMANTICS:
(Dalrymple et al. 1993; Dalrymple et al. 2019: ch. 8)

    ▶ Meaning contributions via MEANING CONSTRUCTORS:

    (6) $M : G$

    (7)   a.   **jadzia** $: \uparrow_\sigma$

          b. $\lambda x \lambda y.\textbf{love}(x, y) : (\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{OBJ})_\sigma \multimap \uparrow_\sigma$

(8)
$$
f\begin{bmatrix} \text{PRED} & \text{'love'} \\ \text{SUBJ} & s\begin{bmatrix} \text{"Jadzia"} \end{bmatrix} \\ \text{OBJ} & o\begin{bmatrix} \text{"them"} \end{bmatrix} \end{bmatrix}
$$

(9)
$$
\dfrac{\dfrac{\textbf{jadzia} : s_\sigma \quad \lambda x\lambda y.\textbf{love}(x, y) : s_\sigma \multimap o_\sigma \multimap f_\sigma}{\lambda y.\textbf{love}(\textbf{jadzia}, y) : o_\sigma \multimap f_\sigma} \quad \textbf{them} : o_\sigma}{\textbf{love}(\textbf{jadzia}, \textbf{them}) : f_\sigma}
$$

► TEMPLATE: a named bundle of annotations.

(10)   loves   V   ($\uparrow$ PRED) = 'love'
                         ($\uparrow$ SUBJ PERS) = 3
                         ($\uparrow$ SUBJ NUM) = SG

(11)   3SG-SUBJECT :=
                 ($\uparrow$ SUBJ PERS) = 3
                 ($\uparrow$ SUBJ NUM) = SG

(12)   loves   N   ($\uparrow$ PRED) = 'love'
                         @3SG-SUBJECT

► A grammar with templates is extensionally equivalent to one without.

▶ Templates can be nested:

(13)   a.   3-SUBJECT :=
                ($\uparrow$ SUBJ PERS) = 3

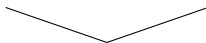   b.   SG-SUBJECT :=
                ($\uparrow$ SUBJ NUM) = SG

(14)   3SG-SUBJECT :=
                @3-SUBJECT
                @SG-SUBJECT

► This nesting creates an implicit hierarchy between templates.

(15)   3-SUBJECT   SG-SUBJECT

3SG-SUBJECT

► The whole grammar can be factorised in this way; see Przepiórkowski (2017) for a detailed example.

Cf. also discussion in Dalrymple et al. (2004); Asudeh et al. (2013: 17ff.); Findlay (2020: 133).

Lexical integrity

▶ LEXICAL INTEGRITY PRINCIPLE: *contra* CxG axiom of 'constructions all the way down'. (Goldberg 2006: 18)

   (16)   No constituent structure rule may order any element
           into or out of lexical categories such as N, A, V. That is,
           constituent structure rules are blind to the internal
           structure of lexical categories. (Simpson 1983: 74)

   (17)   [W]ords are built out of different structural elements and
           by different principles of composition than syntactic
           phrases. (Bresnan & Mchombo 1995: 181)

▶ Words cannot be divided/interrupted/have their internal
  structure tampered with by syntax. (Bresnan & Mchombo 1995; Booij 2009)

  ▶ No gapping of sub-lexical units:

  (18) a. John liked the play, and Mary, the movie.
        b. *John liked the play, and Mary, *dis*- it.
                                                  (Simpson 1991: 51)

  ▶ Noun incorporation without case-marking. (Mohanan 1995)
  ▶ Morpheme order fixed even when word order free (e.g. Latin,
    Warlpiri).

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- ▶ Formal distinction between morphology and syntax.
  (Asudeh et al. 2013: 4–5)
- ▶ **Morphology**:
  - ▶ Mostly requires no more than regular power
  - ▶ Root-and-pattern
  - ▶ Reduplication
    (if unbounded, requires more than regular power to describe)
- ▶ **Syntax**:
  - ▶ Mostly requires no more than context-free power
  - ▶ Unbounded dependencies
    (cross-serial dependencies require more than context-free power
    to describe)

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- In keeping with many generative approaches:
  - **Lexicon:** stored idiosyncrasies (= words)
  - **Grammar:** rule-based regularities (= phrases)
- But . . .

Constructions in LFG

- ▶ Neo-Davidsonian event semantics allows valency/argument structure to be separated from core verbal meaning:

    (19) a. $\lambda e.\mathbf{smile}(e) : (\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma$

    b. $\lambda P \lambda x \lambda e. P(e) \wedge \mathbf{agent}(e, x) :$
        $[(\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma] \multimap$
        $\qquad (\uparrow \text{ SUBJ})_\sigma \multimap (\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma$

- ▶ AGENT-FRAME := (19b)

- ► Such annotations can freely be associated with lexical entries *or* PSRs. (Cf. Asudeh et al. 2014)

  (20)　　smile　　V　($\uparrow$ PRED) = 'smile'
  　　　　　　　　　　　　$\lambda e.\textbf{smile}(e) : (\uparrow_\sigma$ EVENT$) \multimap \uparrow_\sigma$
  　　　　　　　　　　　　@AGENT-FRAME

  (21)　　IP $\rightarrow$　　NP　　　　　　　I′
  　　　　　　　　　　($\uparrow$ SUBJ) = $\downarrow$　　　$\uparrow = \downarrow$
  　　　　　　　　　　　　　　　　　　　@AGENT-FRAME

- ► Thus, the formalism itself is compatible with either a lexical or constructional view of argument structure.
  - ► Cf. discussion in Müller (2018).

- We can extend this approach to other kinds of construction. (Asudeh et al. 2013)

    - **Lexically flagged**, e.g. English *way*-construction (*Jake sweet-talked his way into the conference*):
        - Lexical entry for lexical flag hosts constructional meaning.
    - **Syntactically flagged**, e.g. relative clauses with no relative pronoun/complementiser:
        - Special phrase structure rule to host constructional meaning.

(22) $CP \rightarrow \{$ XP | ϵ $\}$ C′
                    (↑ TOPIC) = ↓   (↑ TOPIC PRED) = 'pro'   ↑ = ↓
                    (↑ TOPIC) = (↑ COMP* GF)   (↑ TOPIC) = (↑ COMP* GF)   @**REL-MEANING**
                            ⋮   ⋮

(Dalrymple 2001: 419)

Substantive idioms

- ► So far: constructional meaning *in addition to* literal/compositional meaning.

- ► Many substantive idioms/MWEs: constructional meaning *instead of* the literal/compositional one.

  (23) a. *take the biscuit* 'be especially shocking/egregious'
        b. *pull oneself together* 'calm down'
        c. *let the cat out of the bag* 'reveal a secret'

► Various totally fixed MWEs: just 'words with spaces'?
(Sag et al. 2002)

    (24)   all the same, by the by, in short, . . .

► Cf.

    (25)   nevertheless, notwithstanding, although, . . .

► A single lexical entry: (Dyvik et al. 2019)

    (26)   all␣the␣same   Adv   ($\uparrow$ PRED) = 'all-the-same'
                                                                  $\vdots$

More flexible idioms

- ▶ But inflection, modification, syntactic distortion, . . .

    (27) a. take/takes/took/has taken the biscuit
          b. let the political/financial/diplomatic cat out of the bag
          c. (i)   The cat was let out of the bag.
              (ii) Which strings did they say she pulled?

Lexical ambiguity approach

- ▶ Special versions of idiom words which select for one another. (E.g. Dyvik et al. 2019)

  (Cf. also Lichte & Kallmeyer 2016 and Bargmann & Sailer 2018 for similar approaches in other frameworks)

- ▶ Various issues: (see Findlay 2019: 60ff.)

  - ▶ Hard to describe the relationship between idiom parts (especially w.r.t. relative clauses)
  - ▶ Syntactic idiosyncrasies (e.g. *trip the light fantastic*)
  - ▶ Less well motivated for non-decomposable idioms
  - ▶ At odds with psycholinguistic evidence
  - ▶ **Not explanatorily satisfying**

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▶ Lexical entries can include descriptions of all levels of the projection architecture *except c-structure*.

▶ Proposal: allow descriptions of c-structure as well.

(Findlay 2019: ch. 5; cf. Vijay-Shanker 1992; Kaplan 1989, 1995)

(28)   a.   IP

             NP   I$'$
      ($\uparrow$ SUBJ) = $\downarrow$ $\uparrow$ = $\downarrow$
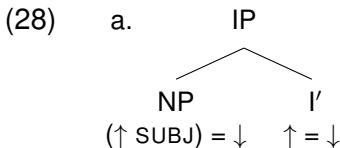
b. $\lambda(n_1)$ = IP
     $\lambda(n_2)$ = NP
     $\lambda(n_3)$ = I$'$
     $\mathcal{M}(n_2)$ = n_1
     $\mathcal{M}(n_3)$ = n_1
     $n_2 \prec n_3$
     $(\phi(n_1)$ SUBJ$)$ = $\phi(n_2)$
     $\phi(n_3)$ = $\phi(n_1)$

▶ CANONICAL-SUBJECT-TREE := (28b)

► More or less radical versions:
   1. Like LTAG, all lexical items contain information about their extended maximal projection, and include slots for any arguments.
   2. Only MWEs/phrasal constructions include information about larger stretches of c-structure.

► Templates to capture regularities.

   (29) ACTIVE-TRANSITIVE-TREE :=
            @CANONICAL-SUBJECT-TREE
            @CANONICAL-OBJECT-TREE

► Linguistic analysis consists in unifying all descriptions associated with a sentence.

- Blurred or eliminated the lexicon/grammar distinction.
  - BUT kept the word/phrase (morphology/syntax) one.
- Can describe form-meaning pairings of arbitrary size.
  - A fully-fledged constructional LFG?

Conclusion

- ▶ LFG is a well-formalised theory of grammar.
    - ▶ Computational implementation: XLE. (Crouch et al. 2017)
- ▶ Canonical LFG already embodies many CxG assumptions.
- ▶ Addition of templates ⇒ hierarchical network of linguistic knowledge.
- ▶ Inclusion of c-structure descriptions ⇒ properly extended domain of locality.
- ▶ Weakening of lexicon/grammar distinction does not imply weakening of word/phrase distinction.

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Questions

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