Morphological Marking of Constituent Questions. A Case for Nonlocal Amalgamation

DELPH-IN 2021

Olga Zamaraeva

Department of Linguistics, University of Washington

July 20 2021

Introduction summary

- **Data:** Constituent (*wh*-) questions cross-linguistically
- **Project:** The Grammar Matrix
  - Implemented system of HPSG grammars using one "core"
  - Restricted version of formalism, esp. wrt lists [1]

1 Copestake 2000

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- ...or, reanalyze fronting with flexible word order?
- ...or/and, revisit arguments/adjuncts distinction

1 Copestake 2000

2 Bouma et al. 2001; Ginzburg and Sag 2000

Data: Constituent questions

- Questions about *who* did *what to whom where*, etc.
- Different marking strategies across languages, including:
  - Question phrase fronting
  - Morphological marking

(1) Gde kto chto
where who.NOM what.ACC
vidit?
see.3SG
'Who sees what where?'
(Russian [rus]; IE)[3]

(2) eeva iche -ǯa -m?
what see -FUT.Q -1SG.Q
'What will I see?'
(Negidal [neg]; Tungusik)[4]

3 Constructed by a native speaker of Russian.
4 Hölzl 2018

Data: Constituent questions

- Fronting can be long distance
- Morphological marking can be distinct in polar vs. wh-

(3)

Gde	kto	chto	my
where	who.NOM	what.ACC	1PL.NOM
vyjasnili		vidit?	
find.out.PL.PAST		see.3SG	

'Who did we find out sees what where?' [rus][5]

(4)

ačaq=qa	dudu'k
who=CONTENT.3SG	sing

'Who is singing?' (Makah [myh]; Wakashan)[6]

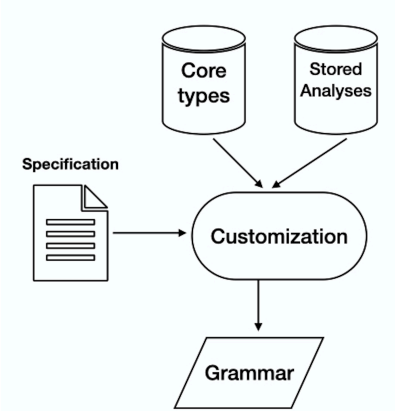
- **Goal:** Have a system of analyses for a range of phenomena such as above
  - All grammars share the same core

5 Constructed by a native speaker of Russian.

6 Davidson 2002

The Grammar Matrix

- Meta-grammar engineering framework[7]
- Input: Typological specification, lexicon, morphological rules
- Output: Implemented HPSG grammar fragment
  - Parse and generate sentences
  - Output syntactic and **semantic** representations
- Many syntactic phenomena are supported[8]
  - Most recently: *wh*-questions[9]



7 https://matrix.ling.washington.edu/customize/matrix.cgi

8 Zamaraeva, Howell, et al. 2019; Howell and Zamaraeva 2018; Saleem 2010; Song 2014; Nielsen 2018; Drellishak and Bender 2005; Crowgey 2013; Bender and Flickinger 2005; Zamaraeva 2021

9 Zamaraeva 2021; Zamaraeva and Emerson 2020

DELPH-IN formalism

- A restricted version of HPSG[10]
- Unification the only native operation
  - i.e. no shuffle operator, no linearization
  - Number and order of daughters are fixed (lists have fixed, bounded length)
  - List append has to be explicitly encoded[11]

$$\begin{bmatrix} \textit{append-list} & \\ \text{LIST} & \boxed{0}\textit{list} \\ \text{APPEND} & \begin{bmatrix} \textit{list} \\ \text{APPEND-RESULT } \boxed{0} \end{bmatrix} \end{bmatrix}$$

10 Copestake 2000

11 Copestake 2000; Zamaraeva and Emerson 2020; Emerson 2017, 2019

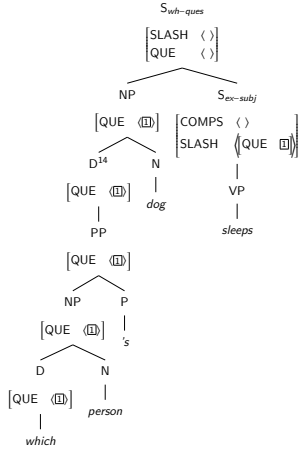
List-valued features in DELPH-IN HPSG

- Valence (SUBJ, COMPS, adjuncts (MOD))
  - No DEPS list combining arguments and adjuncts
- Semantics (RELS, CONT, ICONS)
- Nonlocal (SLASH, QUE, REL)
  - QUE necessary for *wh*-question semantics and for pied piping; SLASH for any kind of fronting/dislocation

SLASH and QUE: Nonlocal dependencies

(5) Which person's (son's) dog (do you think) sleeps? [eng]

- SLASH creates LDD with the verb argument[12]
- QUE creates LDD with the *wh*-word
  - non-*wh* words have empty QUE
  - (Perhaps a better name: WH[13])



12 Pollard and Sag 1994

13 Ginzburg and Sag 2000

14 Nielsen 2018

Nonlocal amalgamation[15]

- Idea: Head's NONLOCAL is the union of the daughters' NONLOCALs
- Motivation:
  - Fewer extraction rules required (in theory)
  - *easy*-adjectives: simply stipulate the argument has a gap (nonempty SLASH)
  - LDD can be encoded locally throughout the derivation (e.g. Chamorro)

$$\left[\begin{array}{l}\textit{basic-two-arg-lex-item}\\ \text{ARG-ST} \quad \left\langle \left[\text{NON-LOCAL} \left[\begin{array}{ll}\text{SLASH} & \boxed{1}\\ \text{REL} & \boxed{2}\\ \text{QUE} & \boxed{3}\end{array}\right]\right], \left[\text{NON-LOCAL} \left[\begin{array}{ll}\text{SLASH} & \boxed{4}\\ \text{REL} & \boxed{5}\\ \text{QUE} & \boxed{6}\end{array}\right]\right]\right\rangle\\ \text{SYNSEM|NON-LOCAL} \left[\begin{array}{ll}\text{SLASH|APPEND} & \langle \boxed{1}, \boxed{4} \rangle\\ \text{REL|APPEND} & \langle \boxed{2}, \boxed{5} \rangle\\ \text{QUE|APPEND} & \langle \boxed{3}, \boxed{6} \rangle\end{array}\right]\end{array}\right]$$

15 Bouma et al. 2001

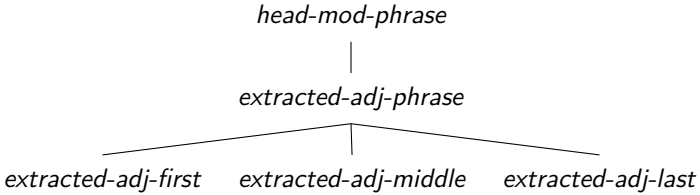
Extraction rules in DELPH-IN

- Extraction rules may not be needed for English but they probably are needed cross-linguistically
  - E.g. valence-changing morphology
- Bouma et al.'s analysis relies on DEPS (arguments and adjuncts together)
  - Not adopted in DELPH-IN; e.g. counting adjuncts is hard
- **Bottom line**: DELPH-IN maintains extraction rules
  - ...but NA is used in e.g. the English Resource Grammar,[16] for *easy*-adjectives

16 Flickinger 2000, 2011

Multiple question fronting in DELPH-IN HPSG[17]

- With the **combination** of DELPH-IN lists and NA:
- Extraction rules merely specify some list is nonempty
  - They do not extend or combine SLASH sets/lists
  - Need to say: An adjunct is extracted before/after/between the arguments
- Implementing multiple question phrase fronting with flexible word order thus necessitates **even more** extraction rules



17 Zamaraeva and Emerson 2020

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- Goal: Have a system of analyses (the Grammar Matrix) covering multiple question phrase fronting **as well** as other phenomena
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  - ...Much simpler with NA!

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- This talk: A counterpoint:
  - Morphological marking of interrogative constructions
  - ...Much simpler with NA!
    - ...for a certain typological profile at least

Morphologically marked interrogatives

(6) oǯa-va iche-ǯee-v
track-ACC see-FUT-1SG
'I will see the tracks.' [neg][18]

(7) ii-ǰə-m =i?
enter-FUT.Q-1SG.Q =Q
'Shall I come in?' [neg]

(8) eeva iche-ǯa-m?
what see-FUT.Q-1SG.Q
'What will I see?' [neg]

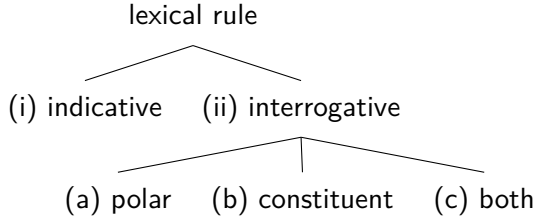
(9) ʔačaq=qaːɬ dudu'k
who=CONTENT.3SG sing
'Who is singing?' [myh][19]

(10) dudu'k='aƛ=qaːk=s
sing=TEMP=POLAR=1SG
'Am I singing?' [myh]

18 Hölzl 2018
19 Davidson 2002

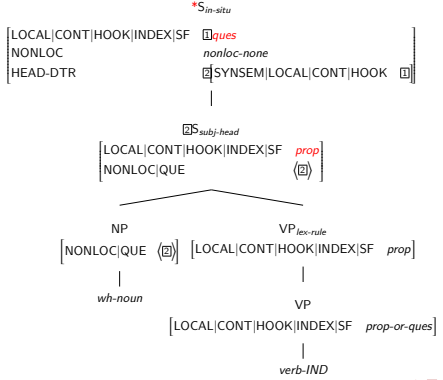
Morphologically marked interrogatives: Typology

- Special paradigm(s) for interrogatives:
  - Polar and constituent questions may have **distinct** paradigms
  - In DELPH-IN HPSG:
    - Modeling the (i) vs (ii),(c) distinction is easy with or without NA
    - Modeling (a)–(b) distinction without NA is **not trivial** without NA



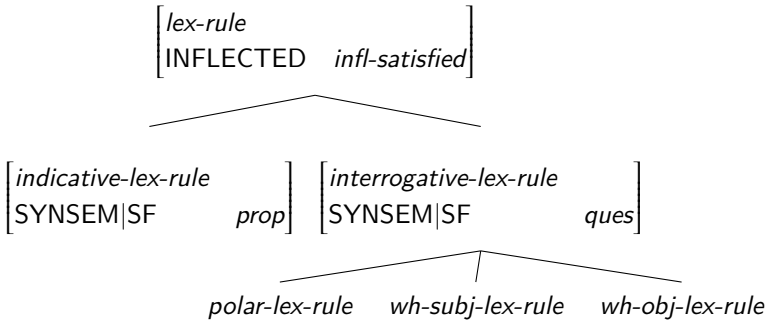
Indicative vs. interrogative, NA does not matter

- Distinction between (i) indicative and (ii) interrog. lex. rules is easy
  - (c) by extension (same as (ii))
- The sentential force SF semantic feature will block any interrogative phrase structure rule



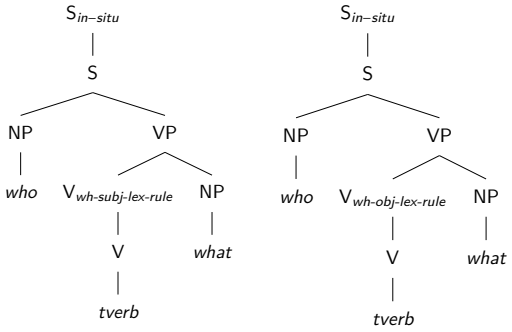
Analysis without nonlocal amalgamation: (a) vs (b)

- Lex. rules for *wh-* (and not polar) questions need to explicitly posit which argument of the head is or isn't *wh*
  - No way to just say: **Some** argument is *wh* (in DELPH-IN HPSG)



Frame Title

- But, the *wh-obj-lex-rule* will apply spuriously!
  - ...in languages where there is only one morpheme to mark any *wh*-question
  - Cannot constrain it's SUBJ to be empty (saturated)
  - ...would violate the assumption that lexical rules apply before phrasal



Analysis without nonlocal amalgamation: (a) vs (b)

$$\begin{bmatrix} \textit{non-wh-cons} & \\ \text{FIRST} & \begin{bmatrix} \textit{synsem} \\ \text{NON-LOCAL.QUE.LIST} \quad \langle\,\rangle \end{bmatrix} \\ \text{REST} & \textit{non-wh-list} \end{bmatrix}$$

$$\begin{bmatrix} \textit{polar-lex-rule} & \\ \text{SYNSEM|LOCAL|CAT|VAL} & \begin{bmatrix} \text{SUBJ} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} \quad \langle\,\rangle \end{bmatrix} \right\rangle \\ \text{COMPS} & \textit{non-wh-list} \end{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} \textit{wh-subj-lex-rule} \\ \text{SYNSEM|LOCAL|CAT|VAL|SUBJ} \quad \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} \quad \textit{cons} \end{bmatrix} \right\rangle \end{bmatrix}$$

$$\begin{bmatrix} \textit{wh-obj-lex-rule} & \\ \text{SYNSEM|LOCAL|CAT|VAL} & \begin{bmatrix} \text{SUBJ} & \textit{non-wh-list} \\ \text{COMPS} & \left\langle \begin{bmatrix} \text{NON-LOCAL|QUE|LIST} \quad \textit{cons} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Analysis with nonlocal amalgamation

- With NA, **can** say: **some** arg is *wh*!
- It is the same as to say QUE *cons*!
- For (c), just leave QUE underspecified
- No need to think about number or order of args!
- No need to posit any additional types beyond the following two:

$$\begin{bmatrix} \textit{polar-lex-rule} & \\ \text{SYNSEM|SF} & \textit{ques} \\ \text{DTR|SYNSEM|NON-LOCAL|QUE|LIST} & \langle\,\rangle \end{bmatrix}$$

$$\begin{bmatrix} \textit{wh-lex-rule} & \\ \text{SYNSEM|SF} & \textit{ques} \\ \text{DTR|SYNSEM|NON-LOCAL|QUE|LIST} & \textit{cons} \end{bmatrix}$$

Conclusion

- In DELPH-IN HPSG, treatment of morphological marking and fronting of questions[20] seem to be in competition?
- Nonlocal amalgamation[21] seems important for morphological marking
  - Analysis is easy both conceptually and in terms of implementation
- It complicates multiple fronting with flexible word order but perhaps this means more work on word order is required?
- Or maybe languages like Makah are very rare?..

20 Bender, Flickinger, and Oepen 2002; Bender, Drellishak, et al. 2010
21 Zamaraeva 2021
22 Zamaraeva and Emerson 2020
23 Bouma et al. 2001

A question from a reviewer

- How would a lexical verb be sensitive to QUE?

"The lexical verb can see SLASH elements, but QUE is percolated in a different area of the structures. Since QUE is a nonlocal feature and only local features are shared between filler and gap, the QUE value is not available at the extraction site, i.e. at the verb. Maybe no extraction is involved in the respective languages but if there is, the analysis seems to not work"

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