Integrating GIVENness into a structured meaning approach in HPSG

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Overview

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  - multiple fronted elements (Bildhauer & Cook 2010)
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- None of the HPSG approaches so far capture the important empirical generalizations established by Schwarzschild (1999) around the notion of givenness.

- In this talk, we extend our HPSG approach to capture givenness, explaining the so-called deaccenting cases.
Background
Intonation and Focus

- English and German are intonation languages
  - Information structuring is signaled by the intonation of an utterance, including different types of pitch accents.
  - Presence and nature of an accent is an indicator of the discourse function of a particular part of a sentence (cf., e.g., Beckman & Pierrehumbert 1986; Grice et al. 2002).
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  - Presence and nature of an accent is an indicator of the discourse function of a particular part of a sentence (cf., e.g., Beckman & Pierrehumbert 1986; Grice et al. 2002).

- Most widely discussed discourse function: focus
  - Intuitively, the “most important” or “new” information of an utterance (e.g., Krifka 2007).
  - Every focused expression must contain a pitch accent.
Background

More on Focus

- Focus can be understood to be the part of an answer corresponding to the *wh*-element of a question.

(1) a. *What did John rent?*
   
   b. *He rented [*a BICYCLE*]$_F$.* (narrow NP focus)

- The answer in (1b) provides the element asked for, the focus, which is marked with [* ][ ]$_F$.

- Out of the various alternative things John could have rented, he picked a bicycle.
Focus Projection

- Observation: The same prosodic realization of an utterance can appear in different contexts.
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(2) *John rented a BICYCLE.*

(3) a. *What did John rent?* (narrow NP focus)
   
   \[
   \text{John rented } \left[ \text{a BICYCLE} \right]_F.
   \]
Focus Projection

- Observation: The same prosodic realization of an utterance can appear in different contexts.

(2) John rented a BICYCLE.

(3) a. What did John rent? (narrow NP focus)
   
   John rented [a BICYCLE]_F.

b. What did John do? (wide VP focus)

   John [rented a BICYCLE]_F.
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   John rented [a BICYCLE]$_F$.

b. What did John do? (wide VP focus)
   John [rented a BICYCLE]$_F$.

c. What happened yesterday? (wide S focus)
   [John rented a BICYCLE]$_F$. 
Focus Projection

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   John rented \([a \text{ BICYCLE}]_F\).

b. What did John do? (wide VP focus)
   John \([\text{rented a BICYCLE}]_F\).

c. What happened yesterday? (wide S focus)
   \([\text{John rented a BICYCLE}]_F\).

- Lexical and syntactic conditions have been formulated to define when focus can project (e.g., Gussenhoven 1983; von Stechow & Uhmann 1986; Uhmann 1991; Selkirk 1995).
Givenness

Schwarzschild (1999) observed an important dissociation of focus and new information:

- when focused material is already given in the discourse, the focus includes unaccented substantive material

→ so-called **deaccenting** of given material
Givenness

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(4) The conference participants are renting all kind of vehicles. Yesterday, Bill came to the conference driving a red convertible.

a. What did John rent?
b. He rented [a GREEN convertible]_F.
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- when focused material is already given in the discourse, the focus includes unaccented substantive material
  → so-called deaccenting of given material

(4) *The conference participants are renting all kind of vehicles. Yesterday, Bill came to the conference driving a red convertible.*

a. *What did John rent?*

b. *He rented [[a GREEN convertible]] \(F\).*

- Where given material occurs in the focus, the pitch accent is realized on another, new word in the focus.
Our approach

- Büring (2006) shows that deaccenting of given material is a widespread phenomenon.
  - Yet, currently it is not captured by any HPSG approach.
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- Büring (2006) shows that deaccenting of given material is a widespread phenomenon.
  - Yet, currently it is not captured by any HPSG approach.

⇒ Extend HPSG to capture givenness structure and make the proper predictions for deaccenting examples.
  - We provide an HPSG account using structured meanings (Krifka 1992).
An HPSG analysis incorporating givenness

- Starting point: information structure-syntaxis interface developed in De Kuthy (2002) and De Kuthy & Meurers (2003)
- inspired by Engdahl & Vallduví (1996) in that it is lexically driven and constraint-based, but differing in
  - where information structure is encoded,
  - what is represented, and the
  - empirical coverage of the focus projection principles
Integrating GIVENness into a structured meaning approach in HPSG

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Overview

Background

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info struc

What to represent

Lexical information structure

Basic example

Phrasal information structure

Focus projection in NPs

Focus projection and givenness

Eliminate focus attribute?

Outlook

Uniform approach to givenness and what can be projected over?

Empirical status of focus projection

Summary

Representing information structure in HPSG

Where?

- We introduce information structure as appropriate for signs
  - not for local objects as in Engdahl & Vallduví (1996)
- Motivation: required for proper interaction with UDCs
  - fillers relevant for information structure, not the traces
Representing information structure in HPSG

What?

- We represent information structure as a structuring of **semantic representations**, following structured meaning approaches (von Stechow 1981; Jacobs 1983; Krifka 1992).
  - not entire *signs* as in Engdahl & Vallduví (1996)
Representing information structure in HPSG

What?

- We represent information structure as a structuring of **semantic representations**, following structured meaning approaches (von Stechow 1981; Jacobs 1983; Krifka 1992).
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- We use a standard semantic object language: Ty2
  - Ty2 integrated into HPSG by Sailer (2000).
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- We introduce **focus** and **given** attributes with lists of Ty2 expressions as values, so-called *meaningful expressions*. 
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Overview

Background

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info struc

What to represent

Lexical information structure

Basic example

Phrasal information structure

Focus projection in NPs

Focus projection and givenness

Eliminate focus attribute?

Outlook

Uniform approach to givenness and what can be projected over?

Empirical status of focus projection

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  - not entire signs as in Engdahl & Vallduví (1996)
- We use a standard semantic object language: Ty2
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- We introduce focus and given attributes with lists of Ty2 expressions as values, so-called meaningful expressions.

(5) **What did John do?**

____

(wide VP focus)

John \[[rented a BICYCLE]_F\].

```
[PHON \langle John, rented, a, BICYCLE \rangle
SYNSEM | LOC | CONT | LF \exists x [bicycle' (x) \land rent' (j, x)]
INFO-STRUC [FOCUS \langle \lambda y \exists x [bicycle' (x) \land rent' (y, x)] \rangle
GIVEN \langle \lambda P [P (john')] \rangle]
```
Representing information structure in HPSG

Accents and lexical information structure

- To encode whether a word bears an accent or not, we enrich the phonology with the boolean feature `ACCENT`.

\[
\begin{bmatrix}
\text{sign} \\
\text{PHON} \\
\text{ACCENT}
\end{bmatrix}
\begin{bmatrix}
\text{PHON-STR} \\
\text{list} \\
\text{bool}
\end{bmatrix}
\]

- In general, different accent types can be introduced, e.g., following ToBI (Beckman & Pierrehumbert 1986).
Representing information structure in HPSG

Accents and lexical information structure

- To encode whether a word bears an accent or not, we enrich the phonology with the boolean feature ACCENT.

\[
\begin{align*}
\text{sign} & \quad \text{PHON} \\
\text{PHON-STR list} & \quad \text{ACCENT bool}
\end{align*}
\]

- In general, different accent types can be introduced, e.g., following ToBI (Beckman & Pierrehumbert 1986).

- Relating accent placement and focus for words:

\[
\text{word} \rightarrow \begin{cases} 
\text{PHON|ACCENT} + \\
\text{SS|LOC|CONT|LF 1} \\
\text{INFO-STRUC} \quad \text{FOCUS 1} \\
\end{cases} \quad \bigvee \begin{cases} 
\text{PHON|ACCENT} - \\
\text{INFO-STRUC} \quad \text{FOCUS } \langle \rangle \\
\end{cases}
\]
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Overview

Background

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info struct

What to represent

Lexical information structure

Basic example

Phrasal information structure

Focus projection in NPs

Focus projection and givenness

Eliminate focus attribute?

Outlook

Uniform approach to givenness and what can be projected over?

Empirical status of focus projection

Summary
Information structure of phrases

• Focus projection principles define which parts of the sentence can be in the focus given an accent placement.
Information structure of phrases

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Base case: no focus projection

- Collect the focus values of the daughters.
Information structure of phrases

- Focus projection principles define which parts of the sentence can be in the focus given an accent placement.

Base case: no focus projection

- Collect the focus values of the daughters.

\[
\text{phrase} \rightarrow \begin{cases} 
\text{INFO-STRUC}|FOCUS \oplus 2 \\
\text{HEAD-DTR}|\text{INFO-STRUC}|FOCUS \; 1 \\
\text{NON-HEAD-DTR}|\text{INFO-STRUC}|FOCUS \; 2 
\end{cases}
\]

\[\lor \ldots \text{the focus projection cases} \ldots\]
Information structure of phrases
Focus projection in NPs and PPs (De Kuthy 2002)

- Focus can project in a PP or NP if the rightmost constituent in it is focused.
Focus can project in a PP or NP if the rightmost constituent in it is focused.

\[
\text{phrase} \rightarrow \begin{cases} 
\text{INFO-STRUC|FOCUS} & 1 \oplus 2 \\
\text{HEAD-DTR|INFO-STRUC|FOCUS} & 1 \\
\text{NON-HEAD-DTR|INFO-STRUC|FOCUS} & 2 \\
\end{cases}
\]

\[
\begin{align*}
\text{PHON|PHON-STR} & \oplus 2 \\
\text{S|LOC [CAT|HEAD noun} & \lor \text{prep]}
\end{align*}
\]

\[
\begin{align*}
\text{CONT|LF} & 3 \\
\vee
\end{align*}
\]

\[
\text{INFO-STRUC|FOCUS} \langle 3 \rangle
\]

\[
\text{either-dtr} ( \\
\begin{cases} 
\text{PHON|PHON-STR} & 2 \\
\text{S|CONT|LF} & 4 \\
\text{INFO-STRUC|FOCUS} & \langle 4 \rangle \\
\end{cases}
, )
\]

Focus projection in NPs and PPs (De Kuthy 2002)
Focus can project in a PP or NP if the rightmost constituent in it is focused.

\[
\text{phrase} \rightarrow \begin{cases}
\text{INFO-STRUC|FOCUS 1} \\ 
\text{HEAD-DTR|INFO-STRUC|FOCUS 1} \\ 
\text{NON-HEAD-DTR|INFO-STRUC|FOCUS 2}
\end{cases}
\]

\[
\begin{align*}
\text{PHON|PHON-STR 1} & \oplus 2 \\
\text{S|LOC [CAT|HEAD noun \lor \text{prep}]} & \\
\text{CONT|LF 3} & \\
\text{INFO-STRUC|FOCUS \langle 3 \rangle} & \\
\text{either-dtr (PHON|PHON-STR 2, S|CONT|LF 4, INFO-STRUC|FOCUS \langle 4 \rangle)} & \\
\end{align*}
\]

\[
either-dtr (1,2) := \begin{cases}
\text{HEAD-DTR 1} \\ 
\text{NON-HEAD-DTR 2} \\ 
\text{HEAD-DTR 2} \\ 
\text{NON-HEAD-DTR 1}
\end{cases}
\]
Information structure of phrases
Focus projection in the presence of givenness

- Focus can project from any focused daughter if the other daughter is given.
Information structure of phrases
Focus projection in the presence of givenness

Focus can project from any focused daughter if the other daughter is given.

\[
\text{phrase} \rightarrow \begin{cases}
\text{INFO-STRUC|FOCUS } 1 \oplus 2 \\
\text{HEAD-DTR|INFO-STRUC|FOCUS } 1 \\
\text{NON-HEAD-DTR|INFO-STRUC|FOCUS } 2 \\
\text{PHON|PHON-STR } 1 \oplus 2 \\
\text{S|LOC } \begin{cases}
\text{CAT|HEAD noun } \lor \text{ prep } \\
\text{CONT|LF } 3 \\
\text{INFO-STRUC|FOCUS } 3
\end{cases}
\end{cases}
\]

\[
\text{either-dtr} \left( \begin{cases}
\text{INFO-STRUC|FOCUS } 3 \\
\text{PHON|PHON-STR } 2 \\
\text{S|L|CONT|LF } 4
\end{cases}, \ldots \right)
\]

\[
\text{either-dtr} \left( \begin{cases}
\text{INFO-STRUC|FOCUS } 3 \\
\text{SS|LOC|CONT|LF } 3 \\
\text{INFO-STRUC|FOCUS } 3
\end{cases}, \ldots \right)
\]

\[
\text{either-dtr} \left( \begin{cases}
\text{INFO-STRUC|FOCUS } 4 \\
\text{INFO-STRUC|GIVEN } 5
\end{cases}, \ldots \right)
\]
Focus projection with deaccenting

Example revisited

(4) *The conference participants are renting all kind of vehicles.*
*Yesterday, Bill came to the conference driving a red convertible.*

a. *What did John rent?*
b. *He rented [a GREEN convertible]_F.*
Focus projection with deaccenting

John rented a GREEN convertible

\( S | LOC | CON | LF \) 
\( \exists x [ \text{convertible'}(x) \land \text{green'}(x) \land \text{rent'}(\text{john}, x)] \)

\( \text{INFO-STRUC} \)
\( \text{FOCUS} \langle \rangle \)
\( \text{GIVEN} \langle 1 \rangle \)

rented

\( S | LOC | CON | LF \)
\( \exists y \exists x [\text{convertible}(x) \land \text{green'}(x) \land \text{rent'}(y, x)] \)

\( \text{INFO-STRUC} \)
\( \text{FOCUS} \langle 3 \rangle \)
\( \text{GIVEN} \langle 2, 3 \rangle \)

a GREEN convertible

\( S | LOC | CON | LF \)
\( \exists z \exists x [\text{convertible'}(x) \land \text{green'}(x) \land \text{Q}(x)] \)

\( \text{INFO-STRUC} \)
\( \text{FOCUS} \langle 3 \rangle \)
\( \text{GIVEN} \langle 5 \rangle \)

GREEN convertible

\( S | LOC | CON | LF \)
\( \exists x [\text{convertible'}(x) \land \text{green'}(x)] \)

\( \text{INFO-STRUC} \)
\( \text{FOCUS} \langle 4 \rangle \)
\( \text{GIVEN} \langle 6 \rangle \)

GREEN convertible

Focus projection and givenness

Overview

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info struc
What to represent
Lexical information structure
Basic example
Phrasal information structure
Focus projection in NPs

Focus projection and givenness

Eliminate focus attribute?

Outlook

Uniform approach to givenness and what can be projected over?
Empirical status of focus projection

Summary
Focus projection with deaccenting

Focus projection in NPs

John rented a GREEN convertible

Rent a GREEN convertible

GREEN convertible

GREEN convertible

GREEN convertible

GREEN convertible
Focus projection with deaccenting

**Overview**

Integrating GIVENness into a structured meaning approach in HPSG

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**Background**

Intonation and Focus
Focus Projection

**Givenness**

Where to represent info struc
What to represent
Lexical information structure
Basic example
Phrasal information structure
Focus projection in NPs

Focus projection and givenness

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**Outlook**

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**Summary**

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Detmar Meurers

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Focus projection with deaccenting

John rented a GREEN convertible

$r$\,\langle \text{convertible} \,(x) \,\wedge \text{green} \,(x) \,\wedge \text{rent} \,(\text{John}, x) \rangle$

INFO-STRUC

\[
\begin{align*}
\text{given} & \quad \langle 1 \rangle \\
\text{focus} & \quad \langle 3 \rangle \\
\text{given} & \quad \langle 2 \rangle
\end{align*}
\]

\[
\begin{align*}
\text{focus} & \quad \langle 2 \rangle \\
\text{given} & \quad \langle 3 \rangle
\end{align*}
\]

\[
\begin{align*}
\text{focus} & \quad \langle 4 \rangle \\
\text{given} & \quad \langle 6 \rangle
\end{align*}
\]

\[
\begin{align*}
\text{focus} & \quad \langle 5 \rangle \\
\text{given} & \quad \langle 6 \rangle
\end{align*}
\]

\[
\begin{align*}
\text{focus} & \quad \langle 6 \rangle \\
\text{given} & \quad \langle 5 \rangle
\end{align*}
\]

\[
\begin{align*}
\text{focus} & \quad \langle 5 \rangle \\
\text{given} & \quad \langle 6 \rangle
\end{align*}
\]

\[
\begin{align*}
\text{focus} & \quad \langle 6 \rangle \\
\text{given} & \quad \langle 5 \rangle
\end{align*}
\]
Focus projection with deaccenting

John rented a GREEN convertible

\[\exists x [\text{convertible'}(x) \land \text{green'}(x) \land \text{rent'}(\text{john}, x)]\]

Our approach

Where to represent info struc

Lexical information structure

Basic example

What to represent

Phrasal information structure

Focus projection in NPs

Focus projection and givenness

Eliminate focus attribute?

Overview

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info struc

Lexical information structure

Basic example

Phrasal information structure

Focus projection in NPs

Focus projection and givenness

Eliminate focus attribute?

Outlook

Uniform approach to givenness and what can be projected over?

Empirical status of focus projection

Summary
Givenness of phrases

- Phrases collect the givenness of their daughters.
- Where both daughters are given, the entire meaning of the mother is given.

```
phrase →

[INFO-STRUC|GIVEN 1 ⊕ 2]
[HEAD-DTR|INFO-STRUC|GIVEN 1]
[NON-HEAD-DTR|INFO-STRUC|GIVEN 2]

∨

[SS|L|CONT|LF 1]
[INFO-STRUC|GIVEN 1]

[HEAD-DTR]
[SS|L|CONT|LF 2]
[INFO-STRUC|GIVEN 2]

[NON-HEAD-DTR]
[SS|L|CONT|LF 3]
[INFO-STRUC|GIVEN 3]
```
Could we only use givenness, eliminating focus?

It would fail to predict that in a focused VP where neither verb nor argument is given, the argument must be accented:

(6) *What did John do?* (wide VP focus)

a. *John *[rented a BICYCLE]*$_F$.

b. % *John *[RENTED a bicycle]*$_F$.

◮

It would fail to predict that in a focused VP where neither verb nor argument is given, the argument must be accented:
Outlook

Uniform approach to givenness and what can be projected over?

- Focus projection is limited for unexpected material:

  (7) Hi John, good to see you in the department, but why are you so pale?

  a. \([I \text{ just saw a man with an AXE!}]_F\)
Outlook

Uniform approach to givenness and what can be projected over?

- Focus projection is limited for unexpected material:

  (7) Hi John, good to see you in the department, but why are you so pale?

  a. \([I \text{ just saw a man with an AXE!}]_F\)

  b. % \([I \text{ just saw a chicken with an AXE!}]_F\)
Outlook

Uniform approach to givenness and what can be projected over?

- Focus projection is limited for unexpected material:
  
  (7) *Hi John, good to see you in the department, but why are you so pale?*
  
  a. \[ I \text{ just saw a man with an AXE!} \]_F
  
  b. % \[ I \text{ just saw a chicken with an AXE!} \]_F

- The material focus projected over cannot be too unexpected; it must be possible to accommodate it.
Outlook

Uniform approach to givenness and what can be projected over?

- Focus projection is limited for unexpected material:
  
  (7) Hi John, good to see you in the department, but why are you so pale?

  a. $[[I \text{ just saw a man with an AXE!}]_F$

  b. $%[[I \text{ just saw a chicken with an AXE!}]_F$

- The material focus projected over cannot be too unexpected; it must be possible to accommodate it.

- Is the required expectability of material focus-projected over related to the deaccenting of given material?
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Uniform approach to givenness and what can be projected over?

- Focus projection is limited for unexpected material:

  (7) *Hi John, good to see you in the department, but why are you so pale?*

  a. $\llbracket I \text{ just saw a man with an AXE!} \rrbracket_F$

  b. $\% \llbracket I \text{ just saw a chicken with an AXE!} \rrbracket_F$

- The material focus projected over cannot be too unexpected; it must be possible to accommodate it.

- Is the required expectability of material focus-projected over related to the deaccenting of given material?
  - Possible relation to purely pragmatic approaches eliminating focus projection (Roberts 2006; Kadmon 2006).
Recent formal pragmatic approaches have claimed that focus projection does not exist (Roberts 2006; Kadmon 2006)
Outlook
Empirical status of focus projection

- Recent formal pragmatic approaches have claimed that focus projection does not exist (Roberts 2006; Kadmon 2006)
- Requires empirical exploration (De Kuthy & Meurers 2010, 2012)
  - Survey of experimental evidence for focus projection
  - Exploration of annotated corpora
    - parsed versions off German IMS Radionews Corpus and Verbmobil Corpus

Overview
Background
Intonation and Focus
Focus Projection
Givenness
Our approach
Where to represent info struc
What to represent
Lexical information structure
Basic example
Phrasal information structure
Focus projection in NPs
Focus projection and givenness
Eliminate focus attribute?
Outlook
Uniform approach to givenness and what can be projected over?
Empirical status of focus projection
Summary
Outlook

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- Requires empirical exploration (De Kuthy & Meurers 2010, 2012)
  - Survey of experimental evidence for focus projection
  - Exploration of annotated corpora
    - parsed versions off German IMS Radionews Corpus and Verbmobil Corpus
- Corpora with information structure annotation
  - for English: NXT Switchboard (Calhoun et al. 2010)
  - but information structure annotation hard (Dipper et al. 2004)
  - Idea: collect corpora with explicit, linguistic task context
    - Corpus of answers to reading comprehension questions makes text & question explicit (Meurers et al. 2011, 2012).
Summary

- Extended our HPSG approach to information structure to capture givenness (Schwarzschild 1999).

- Correctly licenses *deaccenting* of given information, a widespread phenomenon (Büring 2006) not previously dealt with in HPSG.

- Issues we are currently exploring:
  - relation of deaccenting of given information to role of expected information
  - empirical exploration (corpora, experiments) of where and under what conditions focus projection occurs, and whether syntax plays a role in this
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Overview

Background

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info struc

What to represent

Lexical information structure

Basic example

Phrasal information structure

Focus projection in NPs

Focus projection and givenness

Eliminate focus attribute?

Outlook

Uniform approach to givenness and what can be projected over?

Empirical status of focus projection

Summary

References


Integrating GIVENness into a structured meaning approach in HPSG

Kordula De Kuthy and Detmar Meurers

Overview

Background

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info structure

What to represent

Lexical information structure

Basic example

Phrasal information structure

Focus projection and givenness

Eliminate focus attribute?

Outlook

Uniform approach to givenness and what can be projected over?

Empirical status of focus projection

Summary


Integrating GIVENness into a structured meaning approach in HPSG

Kordula De Kuthy and Detmar Meurers

Overview

Background

Intonation and Focus

Focus Projection

Givenness

Our approach

Where to represent info struc

What to represent

Lexical information structure

Basic example

Phrasal information structure

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