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Information Structure with ICONS

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ICONS (Individual CONstraintS)

Introduction

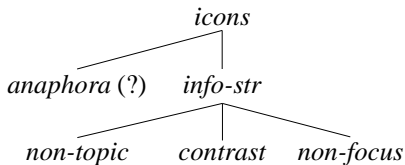
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- Thanks to Ann Copestake and Dan Flickinger for the idea of using ICONS for information structure
- ICONS are constraints relating two (referential) indices
- We can represent information structure as **binary relations between individuals and events** via ICONS in the same manner.



ICONS (cont'd)

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- Our previous approach using variable properties has two difficulties.
 - ① **focus projection**: how to handle the spreading of focus beyond the lexical item
 - ② **multicausal constructions**: how to represent semantic indices shared across clauses
- The ICONS solution moves in the right direction
 - ① an underspecified representation of information structure (from which focus projection can be calculated)
 - ② which anchors the constraints on information structure with respect to the clause

Progress

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- what we have done so far
 - matrix.tdl
 - toy grammars in English and Japanese
 - grammars for pseudo languages
- what we have to do from now
 - a grammar library for information structure
 - various types of utterances/languages
 - MRS+ICONS
 - (work out details of focus projection)
- what problems we have for now
 - generation
 - other analyzers: PET, ACE, AGREE

Differences in Felicity

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- Allosentences do not always share the same felicity condition.
- MMT can be improved by making them sensitive to such constraints.
 - (1) a. The **dog** BARKS. | The DOG barks.
b. inu-wa hoeru | inu-ga hoeru
dog-TOP bark dog-NOM bark (jpn)
c. sobaka laet | laet sobaka
dog bark bark dog (rus)

ICONS

<i>mrs</i>		
HOOK	$\left[\begin{array}{ll} \textit{hook} & \\ \text{LTOP} & \textit{handle} \\ \text{INDEX} & \textit{individual} \\ \text{XARG} & \textit{individual} \\ \text{--ICONS} & \textit{info-str} \\ \text{--CLAUSE} & \textit{event} \end{array} \right]$	
RELS	<i>diff-list</i>	
HCONS	<i>diff-list</i>	
ICONS	$\left\langle ! \dots, \left[\begin{array}{ll} \textit{info-str} & \\ \text{CLAUSE} & \textit{individual} \\ \text{TARGET} & \textit{individual} \end{array} \right], \dots ! \right\rangle$	

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info-str

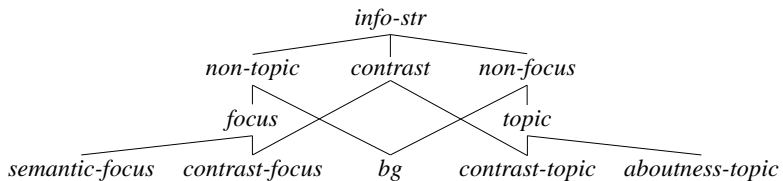
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A Sample Derivation

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(2) inu-ga hoeru
dog-NOM bark (jpn)

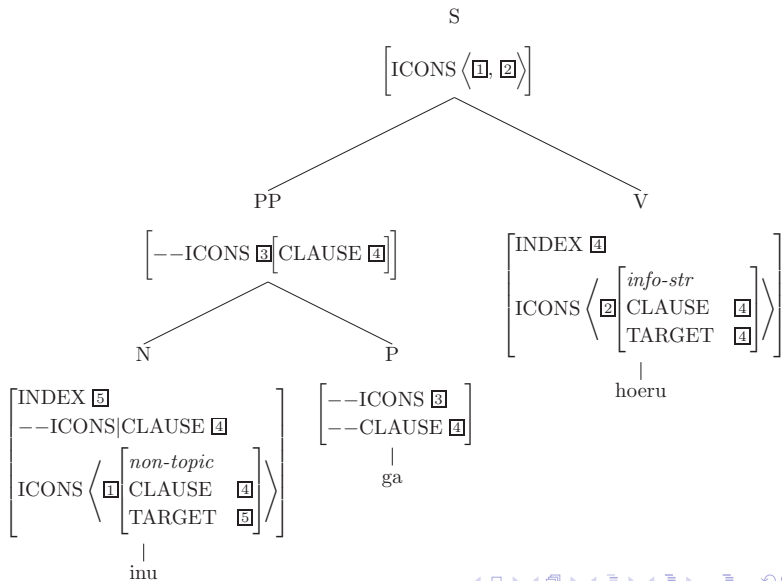
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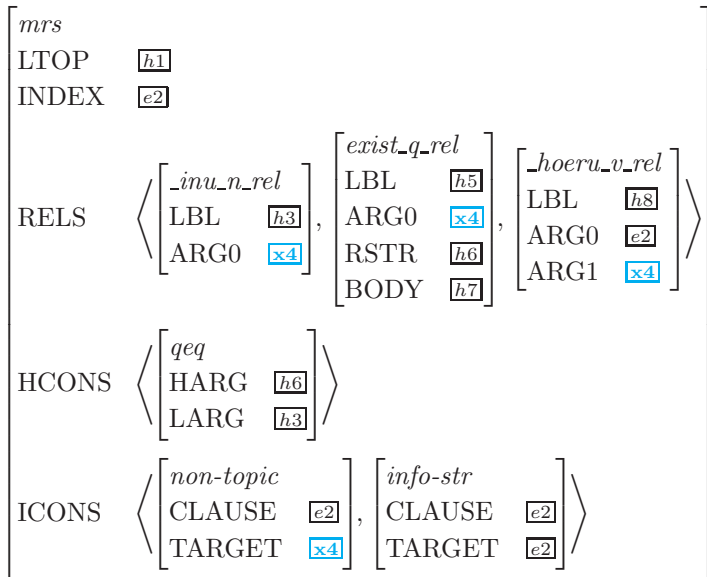
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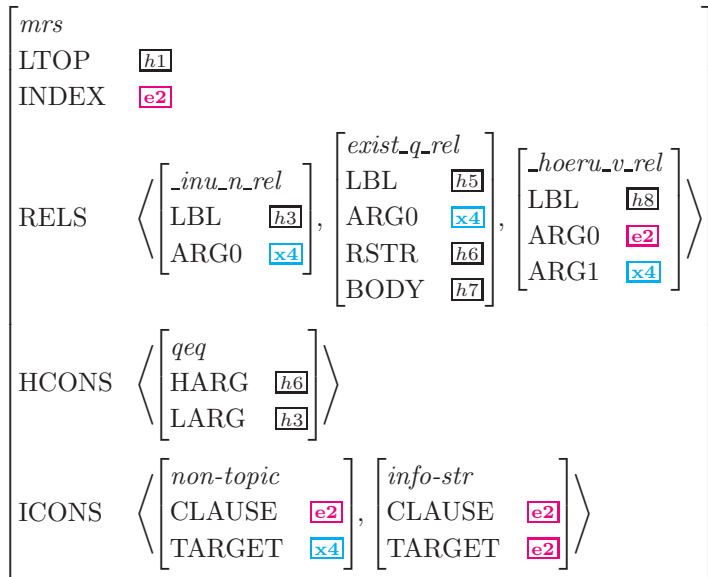
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<i>mrs</i>				
LTOP		$\boxed{h1}$		
INDEX		$\boxed{e2}$		
RELS	$\left\langle \left[\begin{array}{l} _inu_n_rel \\ \text{LBL} \quad \boxed{h3} \\ \text{ARG0} \quad \boxed{x4} \end{array} \right], \left[\begin{array}{l} exist_q_rel \\ \text{LBL} \quad \boxed{h5} \\ \text{ARG0} \quad \boxed{x4} \\ \text{RSTR} \quad \boxed{h6} \\ \text{BODY} \quad \boxed{h7} \end{array} \right], \left[\begin{array}{l} _hoeru_v_rel \\ \text{LBL} \quad \boxed{h8} \\ \text{ARG0} \quad \boxed{e2} \\ \text{ARG1} \quad \boxed{x4} \end{array} \right] \right\rangle$			
HCONS	$\left\langle \left[\begin{array}{l} qeq \\ \text{HARG} \quad \boxed{h6} \\ \text{LARG} \quad \boxed{h3} \end{array} \right] \right\rangle$			
ICONS	$\left\langle \left[\begin{array}{l} non_topic \\ \text{CLAUSE} \quad \boxed{e2} \\ \text{TARGET} \quad \boxed{x4} \end{array} \right], \left[\begin{array}{l} info_str \\ \text{CLAUSE} \quad \boxed{e2} \\ \text{TARGET} \quad \boxed{e2} \end{array} \right] \right\rangle$			





Dependency Graphs

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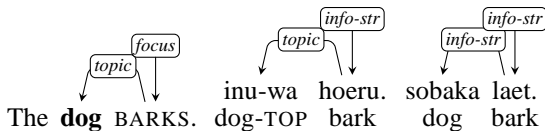
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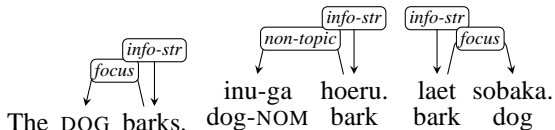
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(3) a.



b.



Underspecifiability

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- (4) a. [_f The DOG] barks.
b. [_f The DOG barks.]

We can assume either

- 1 the two readings correspond to two distinct parse trees or,
- 2 the two readings are further specializations of one MRS with some underspecified values.

Underspecified Representations

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- A large number of trees has an adverse effect on performance as well as accuracy.
- As with HCONS and the underspecification of scopal ambiguities in MRS (Copestake et al, 2005), underspecified ICONS can be resolved with monotonic addition of constraints.

Multiclausal Utterances

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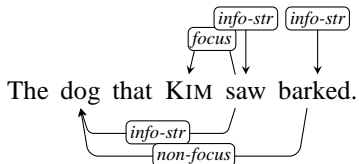
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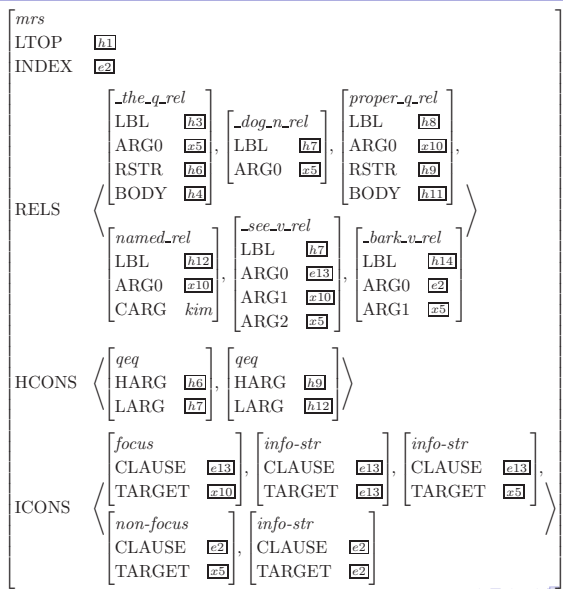
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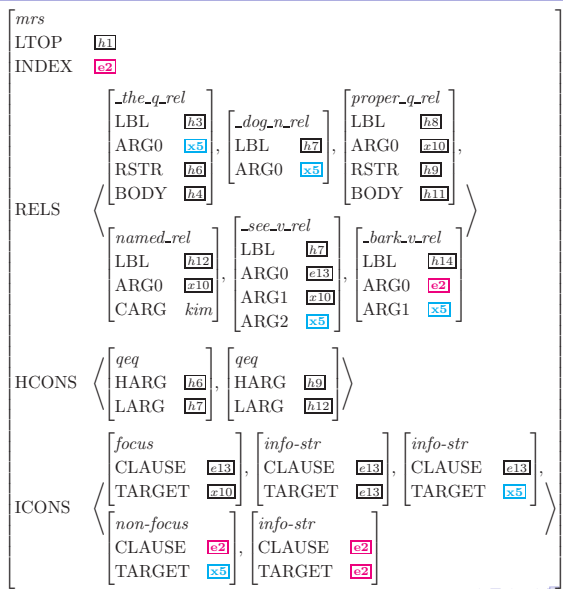
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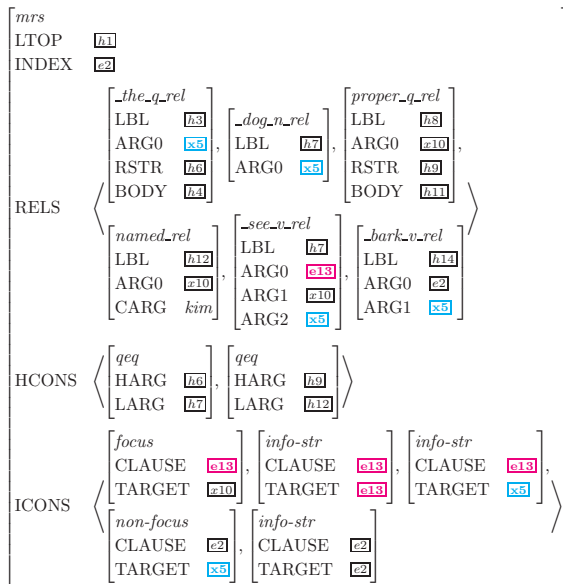
(5) a. The dog that [_f [_f KIM] saw] barked.

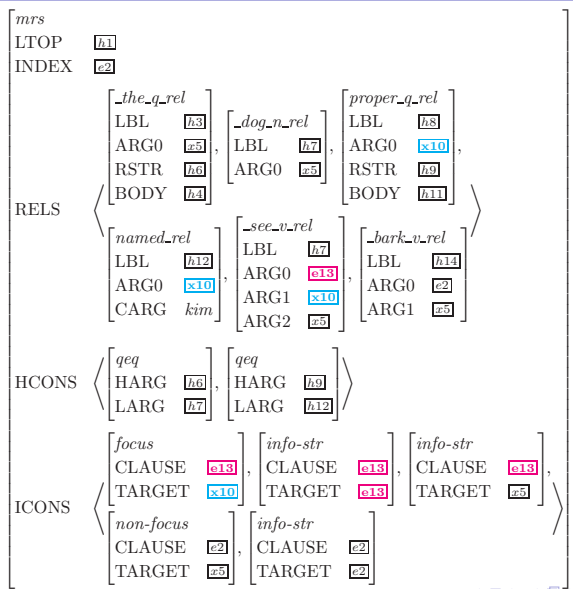
b.





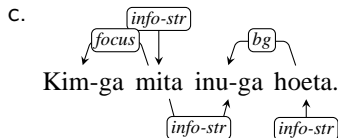
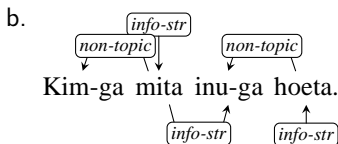






A Sample Translation

(6) a. Kim-ga mita inu-ga hoeta
Kim-NOM saw dog-NOM barked (jpn)



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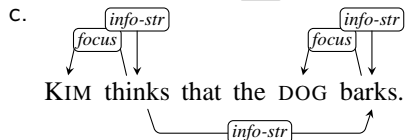
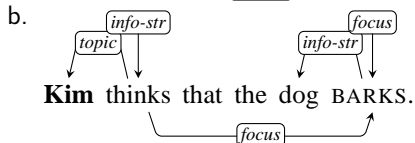
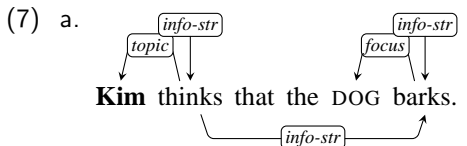
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Other Multiclausal Utterances

- embedded clauses



Other Multicausal Utterances (cont'd)

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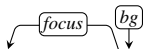
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- clefts

(8)



~~It is~~ the DOG ~~that~~ barks.

- control verbs

(9)

info-str



The DOG tries to bark.

focus

info-str

English: The dog barks.

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- dog
 - dog: info-str [ICONS: < e2 info-str x4 >]
 - dog-a: focus [ICONS: < e2 focus x4 >]
 - dog-b: topic [ICONS: < e2 topic x4 >]
- barks
 - barks: info-str [ICONS: < e2 info-str e2 >]
 - barks-a: focus [ICONS: < e2 focus e2 >]

Paraphrasing in English

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- The dog barks [< e2 info-str x4 e2 info-str e2 >]
 - 1 The dog barks
 - 2 The dog-a barks
 - 3 The dog barks-a
 - 4 The dog-a barks-a
 - 5 The dog-b barks
 - 6 The dog-b barks-a

Paraphrasing in English (cont'd)

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- The dog-a barks [< e2 **focus** x4 e2 info-str e2 >]
 - ① The dog barks
 - ② The dog-a barks
 - ③ The dog barks-a
 - ④ The dog-a barks-a
 - ⑤ ~~The dog-b barks~~
 - ⑥ ~~The dog-b barks-a~~

Paraphrasing in English (cont'd)

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- The dog-**b** barks [< e2 **topic** x4 e2 info-str e2 >]
 - 1 The dog barks
 - 2 ~~The dog-a barks~~
 - 3 The dog barks-a
 - 4 ~~The dog-a barks-a~~
 - 5 The dog-b barks
 - 6 The dog-b barks-a

Japanese: The dog barks.

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- inu 'dog'
 - inu ga: non-topic [ICONS: < e2 non-topic x4 >]
 - inu wa: topic [ICONS: < e2 topic x4 >]
 - inu : topic [ICONS: < e2 topic x4 >]
- hoeru 'bark'
 - hoeru: info-str [ICONS: < e2 info-str e2 >]

Paraphrasing in Japanese

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- inu **ga** hoeru [< e2 **non-topic** x4 e2 info-str e2 >]
 - ① inu ga hoeru
 - ② inu-wa-hoeru
 - ③ inu hoeru

Paraphrasing in Japanese (cont'd)

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- inu **wa** hoeru [< e2 **topic** x4 e2 info-str e2 >]
 - ① inu-ga-hoeru
 - ② inu wa hoeru
 - ③ inu hoeru

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- Theoretically
 - how information structure works in more various types of embedded clauses (e.g. clefts, control constructions)
 - what kinds of embedded constituents create their own information structural domains (e.g. relative clauses vs. progressive participles used as modifiers)
- Distributionally
 - exploiting multilingual parallel texts
 - applying ICONS to other languages from a cross-linguistic viewpoint