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CCxG-Sign

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CCxG-Sign: computational construction grammar for sign languages

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BEEHAIF



Belgian Evolutionary and Hybrid AI Foundation

Construction Grammar & Sign Language

Construction Grammar is well suited for modelling sign languages because...

! ... it assumes a **lexicon-grammar continuum**, in contrast to a lexicon-grammar split in generative approaches. Lexical, partly lexical, grammatical signs and gestures are therefore all modeled using the same data structure, and constructions can **contain information from all linguistic levels of structure**. (cf. van Trijp, 2015, Hoffmann, 2017, Beuls and Van Eecke, 2023)

! ... It can access **multiple sources of information** simultaneously and is not restricted to oral articulations. It can, therefore, process multiple manual and non-manual articulations simultaneously. (cf. van Trijp, 2015, Hoffmann, 2017, Zima and Bergs, 2017)

Data

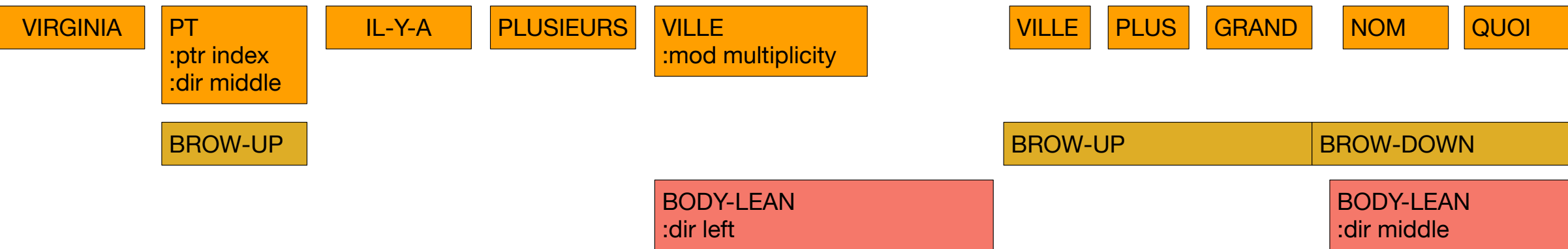
Geoquery

"what is the biggest city in Arizona"

```
"SELECT CITYalias0.CITY_NAME FROM CITY AS CITYalias0 WHERE CITYalias0.POPULATION = ( SELECT MAX( CITYalias1.POPULATION ) FROM CITY AS CITYalias1 WHERE CITYalias1.STATE_NAME = \"Arizona\" ) AND CITYalias0.STATE_NAME = \"Arizona\""
```



Geoquery-sign (LSFB)

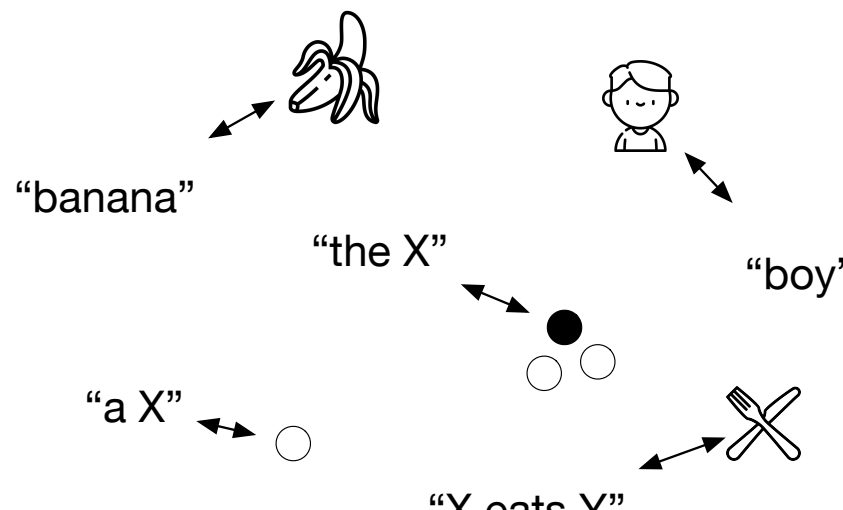


```
"SELECT CITYalias0.CITY_NAME FROM CITY AS CITYalias0 WHERE CITYalias0.POPULATION = ( SELECT MAX( CITYalias1.POPULATION ) FROM CITY AS CITYalias1 WHERE CITYalias1.STATE_NAME = \"Arizona\" ) AND CITYalias0.STATE_NAME = \"Arizona\""
```

Original dataset: Zelle and Mooney, 1996, Iyer et al., 2017

Sign Language Notation: productions are written down using a notation system inspired by the AZee system (Filhol et al, 2017, Challant and Filhol, 2022)

Constructions



Meaning



Form

"The boy eats a banana"

Example

A frequent construction in the geoquery dataset is the **open-question-cxn**, which can be visualised as follows:

open-question-cxn

queried attribute

question-word

BROW-DOWN

BODY-LEAN
:dir middle

Queried attribute and question-word are **slots in the open-question-cxn** that can be **filled by units from previously applied constructions**:

Queried attribute slot:

- nom-cxn
- taille-cxn
- nombre-cxn

Question word slot:

- quoi-cxn
- qui-cxn
- combien-cxn

Research Question

! Use **Fluid Construction Grammar** (FCG – Steels, 2011, van Trijp et al. 2022, Beuls and Van Eecke, 2023) to model LSFB grammar by...

... **manually designing constructions**

... **automatically learning constructions**: through intention reading and pattern finding (cf. Nevens et al., 2022, Doumen et al., 2023)

References

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In FCG, the open-question-cxn can be formalised as follows:

open-question-cxn (cxn 0.50) show attributes	
?question-unit	
# meaning:	{select(?result-0, ?column-1, ?filter-9, ?filter-7)}
# form:	{during(?brow-movement, ?question-word), during(?body-lean, ?question-word), before(?queried-attribute, ?question-word, 120), during(?brow-movement, ?queried-attribute), during(?body-lean, ?queried-attribute)}
?queried-attribute-unit	
Ø	
category:	queryable-attribute
variable:	?queried-attribute
?questionword-unit	
Ø	
category:	question-word
variable:	?question-word
?body-lean-unit	
Ø	
# form:	{articulation(?body-lean-1, body-lean), dir(?body-lean-1, midssp)}
?brow-unit	
Ø	
# form:	{articulation(?brow-down-1, brow-down)}

To learn more about FCG, **check out its website: <https://www.fcg-net.org>**

