Wao Terero lexical suffixes: Bridging the lexicon and discourse

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Major sections of this talk

1. Description of Wao Terero lexical suffix and classifier constructions
2. The morphology-semantics interface in Lexical Proof Morphology

What this talk is about

The focus of this talk is formal theory and the morphology-semantics interface.
Within a morphological context, how do we model the relationship between intrinsic lexical meanings and extrinsic discourse meanings?

Highlights

I provide a word-based approach to data that violates (the not infrequently violated) anaphoric island constraint on words (Postal, 1969).

Role of the data.

The fieldwork data from Wao Terero that I present demonstrates *some* of the relationships and meaning types that need to be articulated in an adequate theory of the morphology-semantics interface.

Basic information about Wao Terero.

Wao Terero is a linguistic isolate spoken in the Ecuadorian Amazon. Speakers I work with come from Geyepade.

What are lexical suffixes?

Lexical suffixes are bound elements that provide nominal meanings to their host constructions (Sapir, 1911). (LS for 'lexical suffix')

(1)	*kewe-ñabo*	(2)	*Onom-po*	*kem-po-tabopa.*
	cassava-LS.**leaf**		body-LS.**hand**	cut-LS.**hand**-1.past
	'cassava leaf'		'I cut my hand.'	

Example (1) demonstrates a typical nominal compound-like meaning. Example (2) demonstrates a verbal usage with so-called "doubling", where a nominal argument co-occurs with a verb containing a lexical suffix with a similar meaning.

There is a subsystem of classifiers constructions.

- They occur on adjectives, demonstratives, numerals, quantifiers, verbs etc. Aikhenvald (2000) calls it a *multi-classifier system*.
- There are about 35-ish suffixes. It is a *closed class* with edge cases.
- Examples may look like agreement but *classifiers occur only occasionally* in collected narratives that serve as the foundation of available corpora.
- Their use is *not grammatically obligatory*.

Today I will focus on adjectival classifier construction meanings.

Classifier constructions exhibit polysemy

(3) a. *ñene-we*
big-CLF.**plant/tree/pole**

'big (plant/tree/pole)'

b. *ñene-mo*
big-CLF.**eye/fruit/face/ball**

'big (eye/fruit/face)'

c. *ñenem-po*
big-CLF.**canoe/hand/finger**

'big (canoe/hand/finger)'

d. *ñenen-ta*
big-CLF.**shell/skull/paper/claw**

'big (canoe/hand/finger)'

Look at these glosses as "potential referents", not compound-like meanings.

Note that in a word-based theory, polysemy is a property of the *word*, not the affix.

Discourse context narrows polysemous potential

Contextual Cue	Construction	Referential Interpretation
	okawem-po	red-CLF.canoe
	okawem-po	red-CLF.hand

This isn't just for anaphora or Wao Terero. Context also determines the interpretation of English 'draw'.

Discourse introduces diverse extrinsic interpretations

A lone adjective may serve as an anaphor. This includes adjectives with a classifier affix. When an adjective has a classifier affix, two interpretations of its meaning are possible, globally non-proffered and partially proffered.

Not all classifier constructions are anaphoric.

A standard diagnostic for anaphoric properties involves negation.

(4) *wii* *giita-mo*$_1$ *dipene* *ino* *inamain* *impa.*
NEG small-CLF.fruit left side COP.NEG COP

giita-mo$_1$ *tome* *ino* *impa*
small-CLF.fruit right side COP

'The small one isn't on the left. The small one is on the right.'

The picture establishes an antecedent. Neither smallness nor fruitness are proffered (globally non-proffered). Therefore, neither are negated. Only the predicate concerning the location of the discourse referent is negated.

Partially proffered: The adjectival content may be proffered when the classifier content is not.

Context: A man (A) walks up from the river and tells another man (B) he saw a boat. (B) asks if it was red.

(5) a. A: *obatawem-po*$_1$ *inamain* *impa*
red-CLF.boat COP.NEG COP

'It wasn't a red one.'

b. B: *boto* *mempo* *ki*$_1$ *impa.*
my father POSS COP

'It is my father's.'

Redness is negated but the father's boat is the "not red one".

* This is a violation of Postal's anaphoric islandhood constraint on words.

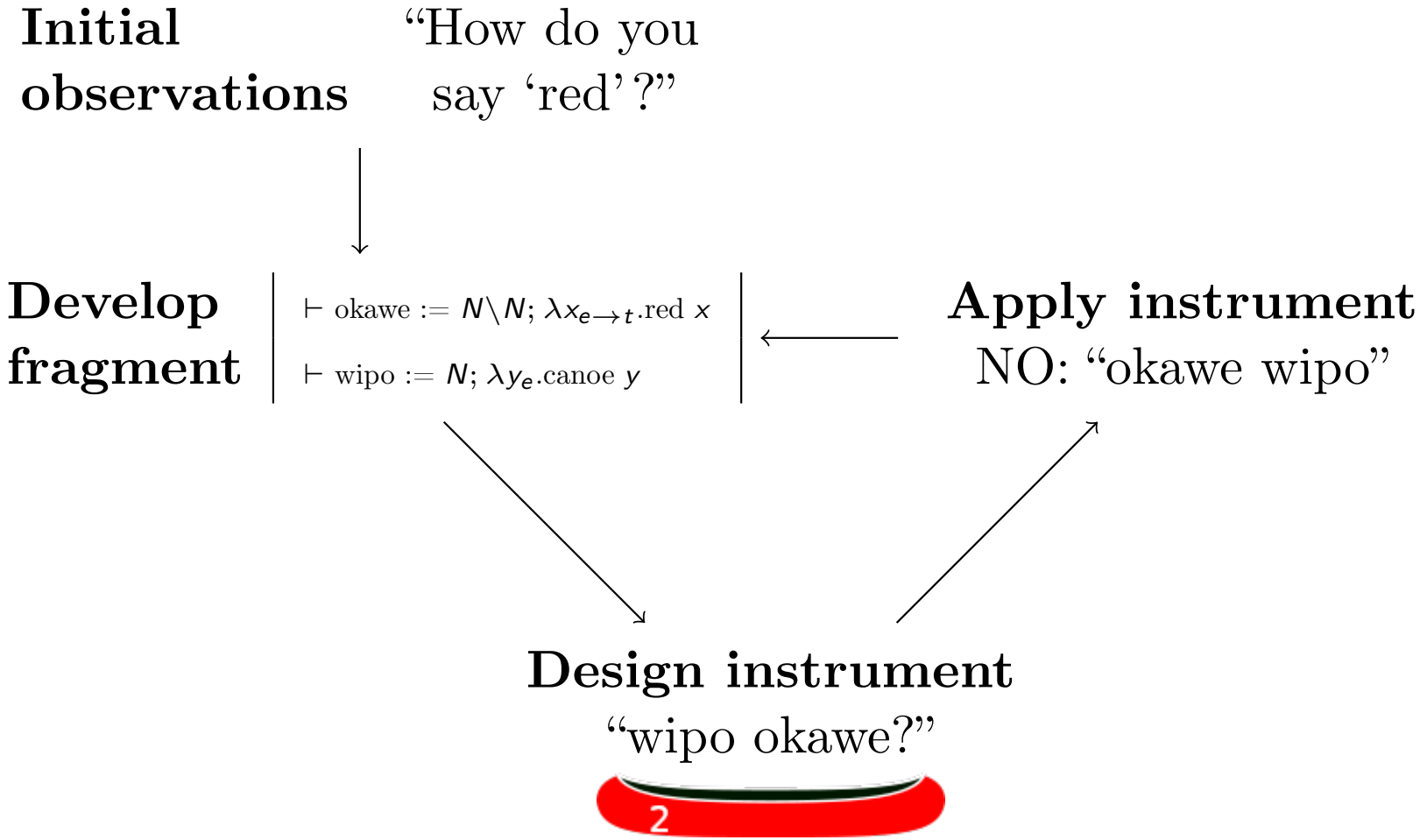
What these meaning patterns indicate.

Adjectival classifier constructions, such as *ñenem-po*, 'big-CLF', sit at the intersection of semantic multiplicity in lexical and discourse domains. The meanings associated with the constructions may be complex, not only in terms of lexical composition, but also in terms of the proffered status of embedded predicates. Discourse meanings "recompose" or reinterpret lexical meanings in conventional ways. Context also "filters" polysemy.

1. How do we represent the polysemous potential of the word-form?
2. How do we represent the contextual interaction that narrows felicitous interpretations?
3. How do we represent the "recomposition" of lexical meanings in dynamic contexts?

Methodological need for a formal theory.

I utilize a fragment methodology.



I designed Lexical Proof Morphology (LP) to meet this need.

It is a word-based theory (Singh and Starosta, 2003; Blevins, 2006).

It is important in my work to make no unnecessary theoretical commitments so that I can focus on observable issues.

Method of formalization.

The theory is formalized using modern type theory (Martin-Löf, 1984; Coquand and Huet, 1988). This allows for development of fragments using proof assistants like Coq (The Coq Development Team, 2019) Inria.

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Inductive meaning : sense → l₁ → mₘ → Prop :=
  m₁ : ∀ s l m, m = baseₘ → In (l, s) lexmeaning → meaning s l m
| m₂ : ∀ (s₁ : e → prop) (s₂ : e → prop) l m,
    m = poₘ →
    In (l, existT Sns (func ent prp) s₁) lexmeaning →
    In (m, existT Sns (func ent prp) s₂) catmeaning →
    meaning (existT Sns (func ent prp) (conjmeaning s₁ s₂)) l m.
```

A fragment of code corresponding to the *meaning* relation featured later in this talk.

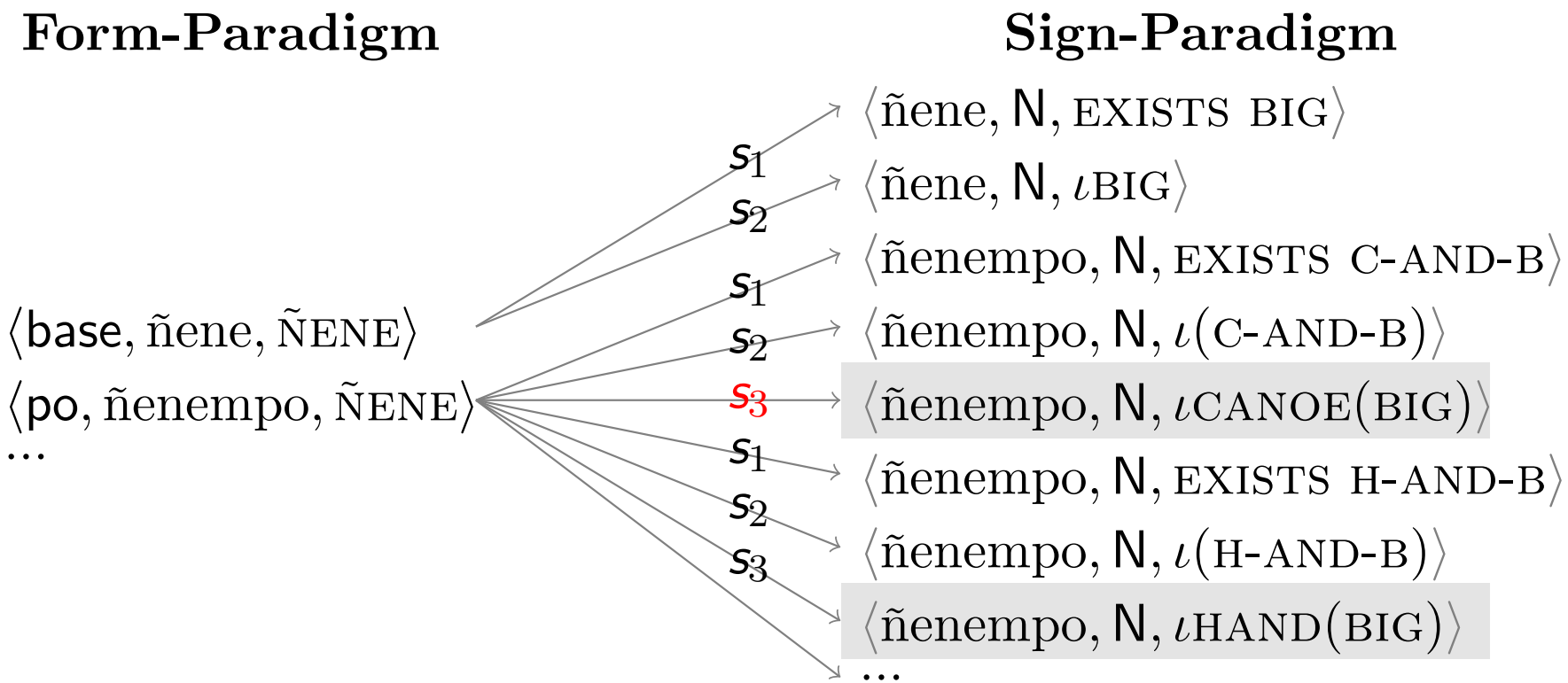
https://git.diewald.me/noah/morphexamples

Interface with categorial grammars.

I specifically assume Linear Categorial Grammar (LCG) (Mihaliček and Pollard, 2012), which provides an interface to an advanced theory of compositional dynamic semantics (Martin and Pollard, 2012; Yasavul, 2017).

When semantics and formal validity matters, go categorial.

LP is a multi-tiered theory.



The Form-Paradigm

mcat	**mform**	**lexeme**
base	ñenempo	ÑENE

- Form-paradigms are phonologically contrastive. For any pair of a lexeme and a morphological category there is only one form (mform).
- A morphological category (mcat) is similar to the concept of m-features in Sadler and Spencer (2001).

Paradigms are non-Cartesian (i.e. no PFM-like feature multiplication or full specification). They are not necessarily uniform. They do form an equivalence class relative to the lexeme, similar to paradigm shapes in Bonami and Strnadová (2019). That is to say that there is a reflexive, symmetrical, transitive relation on paradigms (both Form and Sign).

The Sign-Paradigm

pheno	**tecto**	**semantics**
ñenempo	N	ιCANOE(BIG)

- lexical entries in Linear Categorial Grammar (LCG)
- **pheno** $\approx$ HPSG PHON
- **tecto** $\approx$ HPSG SYN (Here I am using "filler" categories.)
- **semantics** (in this case) terms in 2012-style Dynamic Categorial Grammar (Martin and Pollard, 2012)

The semantics here represents the partially proffered anaphoric meaning. BIG is the proffered part.

Understanding the semantic portion

$$\iota\text{CANOE}(\text{BIG})$$

$$\vdash \text{BIG} = (\text{dyn}_1\ \text{big}) = \lambda nkc.(\text{big}\ [n])\ \text{and}\ (k(c + \text{big}\ [n]))$$

The dyn_i function **lifts static semantic terms into dynamic semantics**. The i is for the number of entity arguments required. n is a discourse referent. c is the context and k is something composed with BIG. The brackets [] return the static entity indexed by the discourse referent.

The ι notation

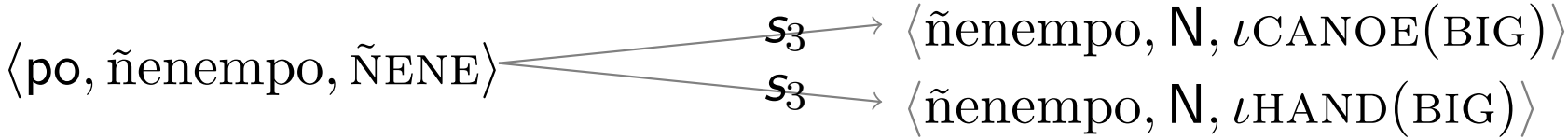
$$\iota\text{CANOE}\big(\text{BIG}\big)$$

$$\iota(\text{CANOE}) = \lambda Dkc.D(\text{def}(c, \text{CANOE}))\ k\ c$$

The *def* function retrieves a discourse referent matching a property given a context.

"Inflectional" realization in LP.

Mappings between paradigms utilize declarative, natural deduction-style rules.



The mapping S_3 is given below:

$$\frac{\langle \text{mc},\ \text{mf},\ \text{lx}\rangle \qquad \text{mc} \leq \kappa \qquad \text{meaning(mc,lx,s)}}{\langle \text{mf}, \mathsf{N}, \lambda P_{(e\to t)\times(e\to t)}.(\iota(\text{dyn}_1\pi_1 P)\text{dyn}_1\pi_2 P)s\rangle}$$

Understanding the mapping rule

$$\frac{\langle \text{mc, mf, lx} \rangle \qquad \text{mc} \leq \kappa \qquad \text{meaning(mc,lx,s)}}{\langle \text{mf}, \mathsf{N}, \lambda P_{(e \to t) \times (e \to t)}.(\iota(\text{dyn}_1 \pi_1 P)\text{dyn}_1 \pi_2 P)s \rangle}$$

Given some Form-Paradigm entry with an mcat (mc), an mform (mf) and a lexeme (lx)...

Constraints on mcats

$$\frac{\langle \text{mc},\ \text{mf},\ \text{lx}\rangle \qquad \text{mc} \leq \kappa \qquad \text{meaning(mc,lx,s)}}{\langle \text{mf}, \mathsf{N}, \lambda P_{(e\to t)\times(e\to t)}.(\iota(\text{dyn}_1\pi_1 P)\text{dyn}_1\pi_2 P)s\rangle}$$

Rather than feature structures, which use subset-like relations, an external relation holds between all mcats. Here κ is a super-category for all classifier affixed Form-Paradigm entries.

Preliminary introduction to the *meaning* relation

$$\frac{\langle \text{mc},\ \text{mf},\ \text{lx}\rangle \qquad \text{mc} \leq \kappa \qquad \text{meaning(mc,lx,s)}}{\langle \text{mf}, \mathsf{N}, \lambda P_{(e\to t)\times(e\to t)}.(\iota(\text{dyn}_1\pi_1 P)\text{dyn}_1\pi_2 P)\mathsf{s}\rangle}$$

Given a lexeme and an mcat, see if there is some meaning s such that s has the type required by the variable P (here a pair of properties).

This mechanism feeds a particular lexical semantic meaning to the external meaning context, where it may be "manipulated". Due to the fact that this is a proof, any lexical meaning s *that meets the constraints will do.*

Example applications

$$\frac{\langle \mathsf{po}, \text{ñenempo}, \tilde{\text{N}}\text{ENE}\rangle \qquad \mathsf{po} \leq \kappa \qquad \text{meaning}(\mathsf{po}, \tilde{\text{N}}\text{ENE}, \langle \text{canoe},\ \text{big}\rangle)}{\langle \text{ñenempo}, \mathsf{N}, \iota(\text{dyn}_1\ \text{canoe})\text{dyn}_1\ \text{big}\rangle}$$

$$\frac{\langle \mathsf{po}, \text{ñenempo}, \tilde{\text{N}}\text{ENE}\rangle \qquad \mathsf{po} \leq \kappa \qquad \text{meaning}(\mathsf{po}, \tilde{\text{N}}\text{ENE}, \langle \text{hand},\ \text{big}\rangle)}{\langle \text{ñenempo}, \mathsf{N}, \iota(\text{dyn}_1\ \text{hand})\text{dyn}_1\ \text{big}\rangle}$$

$$\frac{\langle \mathsf{we}, \text{okawe}, \text{OKA}\rangle \qquad \mathsf{we} \leq \kappa \qquad \text{meaning}(\mathsf{we}, \text{OKA}, \langle \text{plant},\ \text{short}\rangle)}{\langle \text{okawe}, \mathsf{N}, \iota(\text{dyn}_1\ \text{plant})\text{dyn}_1\ \text{short}\rangle}$$

Once the dyn_{n} functions apply these are exactly the Sign-Paradigm entries expected.

A deeper look at the *meaning* relation

The meaning relation is inductively defined, with numerous clauses.
These clauses may be represented as natural deduction-style rules.

A clause for simple meanings

$$\frac{\mathrm{mc} \leq \mathsf{base} \qquad \mathit{LxS}(\mathrm{lx}, s)}{\mathrm{meaning}(\mathrm{mc},\ \mathrm{lx}, s)}$$

In simple cases, where there is no lexical suffix, a base form will only have the polysemous meanings associated with a lexeme. LxS is a relation for acquiring meanings s for a lexeme.

A clause for combined meanings

$$\frac{\mathrm{mc} \leq \kappa \qquad \mathit{Rel}(\mathrm{lx}, s_l, \mathrm{mc}, s_m, R)}{\mathrm{meaning}(\mathrm{mc}, \mathrm{lx}, R(s_l, s_m))}$$

Rel is similar to the treatment of compounds in construction morphology (Booij, 2010). It is defined in cases where some triple of a lexeme meaning s_l, a category meaning s_m and a relation R between them holds.

Example clauses for *Rel*

In fact, these are specified using more basic patterns but here it is convenient to list them as though they are axioms.

...

$\vdash \mathrm{Rel}(\tilde{\text{NENE}}, \mathrm{big}, \mathsf{po}, \mathrm{canoe}, \lambda xy.x \text{ and } y)$

$\vdash \mathrm{Rel}(\tilde{\text{NENE}}, \mathrm{big}, \mathsf{po}, \mathrm{hand}, \lambda xy.x \text{ and } y)$

$\vdash \mathrm{Rel}(\tilde{\text{NENE}}, \mathrm{big}, \mathsf{po}, \mathrm{canoe}, \lambda xy.\langle x, y\rangle)$

...

The last is the relation type that is used for S_3.

A combined proof

$$\dfrac{\langle \mathsf{po}, \text{ñenempo}, \tilde{\text{N}}\text{ENE}\rangle \qquad \mathsf{po} \leq \kappa \qquad \dfrac{\mathsf{po} \leq \kappa \qquad \mathit{Rel}(\tilde{\text{N}}\text{ENE}, \text{big}, \mathsf{po}, \text{canoe}, \lambda xy.\, \langle x, y\rangle)}{\text{meaning}(\mathsf{po}, \tilde{\text{N}}\text{ENE}, \langle \text{canoe},\ \text{big}\rangle)}}{\langle \text{ñenempo}, \mathsf{N}, \iota(\text{dyn}_1\ \text{canoe})\text{dyn}_1\ \text{big}\rangle}$$

Though this proof could be further articulated, for instance, *Rel* could be proven rather than provided as an axiom, we can see how proofs bind together related lexical information. From a Word and Paradigm perspective, this highlights the fundamental claim that morphology is a system of reasoning over structured patterns, rather than a morph-by-morph calculation.

How does the context narrow polysemous potential?

$$\dfrac{\langle \mathsf{po}, \text{ñenempo}, \tilde{\text{N}}\text{ENE}\rangle \qquad \mathsf{po} \leq \kappa \qquad \dfrac{\mathsf{po} \leq \kappa \qquad \mathit{Rel}(\tilde{\text{N}}\text{ENE}, \text{big}, \mathsf{po}, \text{canoe}, \lambda xy.\, \langle x, y\rangle)}{\text{meaning}(\mathsf{po}, \tilde{\text{N}}\text{ENE}, \langle \text{canoe},\ \text{big}\rangle)}}{\langle \text{ñenempo}, \mathsf{N}, \iota(\text{dyn}_1\ \text{canoe})\text{dyn}_1\ \text{big}\rangle}$$

$$\iota(\text{CANOE}) = \lambda \mathit{Dkc}.\mathit{D}(\text{def}(\mathit{c}, \text{CANOE}))\ \mathit{k}\ \mathit{c}$$

The *def* function retrieves a discourse referent matching a property given a context. If there is no matching discourse referent in the context c, the proof of the larger discourse will fail.

The Sign-Paradigm entry serves as a theorem in a larger proof.

The globally non-proffered case

(6) *wii* *giita-mo*$_1$ *dipene* *ino* *inamain* *impa.* *giita-mo*$_1$
NEG small-CLF.fruit left side COP.NEG COP small-CLF.fruit
tome *ino* *impa*
right side COP

'The small one isn't on the left. The small one is on the right.'

This requires rule S_2.

$$\dfrac{\langle \mathsf{mo}, \text{giitamo}, \text{GIITA}\rangle \qquad \mathsf{mo} \leq \kappa \qquad \dfrac{\mathsf{mo} \leq \kappa \qquad \mathit{Rel}(\text{GIITA}, \text{small}, \mathsf{mo}, \text{fruit}, \lambda xy.\lambda z.x\ z \text{ and } y\ z)}{\text{meaning}(\mathsf{mo}, \text{GIITA}, \lambda z.\text{fruit z and small z})}}{\langle \text{giitamo}, \mathsf{N}, \iota(\text{dyn}_1\ (\lambda z.\text{fruit z and small z}))\rangle}$$

S_2 is used for non-classifier uses as well

$$\dfrac{\langle \mathsf{base}, \text{giita}, \textsc{giita}\rangle \qquad \mathsf{base} \leq \kappa \qquad \dfrac{\mathsf{base} \leq \mathsf{base} \qquad \mathit{LxS}(\textsc{giita}, \text{small})}{\text{meaning}(\mathsf{base}, \textsc{giita}, \text{small})}}{\langle \text{giita}, \mathsf{N}, \iota(\text{dyn}_1\ \text{small})\rangle}$$

Here base is also ordered below κ. The lexical semantic potential of GIITA makes proofs of S_3 (for partially proffered instances) impossible.

What about globally proffered instances?

Context: "Out of the blue"

(7) # *epene* *oka-we*$_1$ *de ampa.* *oka-we*$_1$
water.LOC short-CLF.log exist.NEG short-CLF.log
okone *impa.*
house.LOC COP

'# The short ones are not in the river. The short ones are by the house.'

With no antecedent, the existence of a discourse referent matching the description does not project. A following mention is interpreted as an introduction.

Further work is needed

$$\mathrm{dyn}_1\ \lambda z.x\ z \text{ and } y\ z$$

I do not believe this is the right formula for non-anaphoric adjectival classifier expressions. I believe the classifier meaning should be represented as a **conventional implicature**. This has implications for the earlier representations as well.

Summary

In Lexical Proof Morphology one sets up the axioms and relationships that hold between lexical objects. These are core hypotheses of the theory. Using logical proofs one can explore predictions these make concerning the grammar. These proofs provide a network of interdependent hypotheses that can be tested in a fieldwork setting.

Due to its interface to categorial grammars and their accompanying interfaces to semantics, Lexical Proof Morphology is well suited to explorations of the morphology-semantics interface.

Here I have demonstrated how the theory is able to model interactions between the lexical semantic and dynamic semantic domains. This serves as a suitable foundation for grammar scale projects.

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