Reconstructing HPSG Morphology

Olivier Bonami
Building on joint work with Gilles Boyé, René Lacroix, Pollet Samvelian, Greg Stump, Delphine Tribout, Gert Webelhuth

U. Paris-Sorbonne,
UMR 7110 “Laboratoire de Linguistique Formelle”,
Institut Universitaire de France

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Introduction

While there is quite a bit of interesting work done on morphology in HPSG, little connection with current theoretical, typological or empirical discussions in the morphology community.

This is a missed opportunity:
- Morphological descriptions are often in need of more formally explicit analyses
- While there are formally explicit frameworks for morphology, these lack a worked-out interface with syntax and semantics
- HPSG is well-suited to provide such an interface, because of its rich ontology.

Goal of this talk:
- Illustrate by example the challenges of the description of complex inflectional systems
- Propose a way of integrating an inferential-realizational approach to inflection with HPSG
Outline

1. HPSG and Inflection
2. Laz conjugation
3. Laz morphology in PFM
4. Inferential-realizational morphology in HPSG
Stump’s typology of frameworks

- Stump (2001) introduces a two-dimensional typology of morphological frameworks
  - **inferential**: uses syncategorematic rules to deduce a word’s form from more basic stems
  - **lexical**: treats morphologically complex words as the combination of lexically listed formatives
  - **realizational**: deduces the phonological form of a word from its syntactic and semantic description
  - **incremental**: builds the syntactic and semantic description of a word form compositionally in parallel with its phonological form

- **Examples**
  - Traditional Item-and-Arrangement approaches, including most generative approaches, are lexical and incremental
  - Traditional Item-and-Process approaches are inferential and incremental
  - **Distributed morphology** (Halle and Marantz, 1993) is lexical and realizational
HPSG and Stump’s typology

It seems that an inferential-realizational approach is most likely to be combined with HPSG:

- Strong lexicalism implies that morphology and syntax are different, and HPSG syntax is decidedly lexical-incremental.
- Realizational approaches presuppose a feature-based interface between inflection and syntax based on a rich feature system.
- There are extant IR approaches, most prominently Paradigm Function Morphology (Stump, 2001) and Network Morphology (Corbett and Fraser, 1993; Brown and Hippisley, in press) that are formally explicit enough that an interface can easily be designed or analytic techniques be imported.
- Sociological factor: extant IR approaches focus on in-depth high precision descriptions of complex linguistic systems, which (hopefully) HPSG is also committed to.
HPSG and Stump’s typology

In actual practice:

- Much work in HPSG morphology presupposes an IR approach but does not spell it out in any detail.
  - E.g. Kupść and Tseng (2005); Bonami and Boyé (2006); Bonami and Samvelian (2009); Samvelian and Tseng (2010); Bonami and Webelhuth (in press)
- Since Riehemann (1998) and Koenig (1999), most explicit work on morphology in HPSG is decidedly inferential rather than lexical
  - Borderline case: (Crysmann, 2002)’s morph-based approach
- However there is a tendency to be incremental rather than realizational:
  - The few extant descriptions of complex inflectional systems (e.g. Crysmann, 2002; Goodman and Bender, 2010) rely on cascades of lexical rules with the formal power of nonmonotonously and incrementally modifying syntactic and semantic descriptions.
  - Some explicit proposals, e.g. Müller (2003); Sag (in press), explicitly rely on the introduction of semantic predicates by inflection rules.
On the dangers of incrementality

- Multiple exponence: in inflectional systems of any complexity, the exponence of semantically potent features can be distributed over multiple morphs.

\[ \text{(1) Ils aime-r-ont} \]
\[ \text{They love-FUT-FUT.3PL} \]
\[ \text{‘They will love.’} \]

(French)

- If inflectional rules directly introduce semantic predicates, the future predicate will be introduced twice.

- Of course there could be workarounds, i.e. -ont suffixation could be defined to merge its semantic contribution with the input semantics if possible, or to be semantically empty but dependent on the application of a prior rule introducing the future predicate.

- Yet given the widespread nature of multiple exponence, the more general and elegant solution is to interpret the tense feature at word-level rather than interpret each exponent of the feature.
On the dangers of incrementality

- Semantically-potent features typically correspond to phrase-level predicates.
- Example: French aspectually-sensitive tenses (de Swart, 1998)
  - Tense must scope above aspectual modifiers: the choice of a tense can be influenced by an aspectual transition introduced by the modifier.

(2) a. Jean était content.
   Jean be.PST.IPfv happy
   ‘Jean was happy.’

b. # Pendant une heure, Jean était content.
   For an hour Jean be.PST.IPfv happy

c. Pendant une heure, Jean a été content.
   For an hour Jean has been happy
   ‘Jean was happy for an hour.’

- Bonami (2002)’s MRS solution:
  - Tense is introduced lexically with type \((\text{evy} \rightarrow \text{prop}) \rightarrow \text{prop}\), with underspecified scope.
  - Aspectual operators are of type \((\text{evy} \rightarrow \text{prop}) \rightarrow (\text{evy} \rightarrow \text{prop})\) and thus have to scope below tense.
On the dangers of incrementality

- Not general enough. In the following examples, a single tense predicate scoping over the shared modifier must be introduced, despite the occurrence of two independent tense-carrying words.

(3) a. Pendant une heure, [Jean a été content et Marie a boudé]
   For an hour Jean has been happy and Marie has sulked
   ‘For an hour, Jean was happy and Mary sulked.’

b. # Pendant une heure, [Jean était content et Marie boudait]

- Once again, there can be workarounds; e.g. semantic composition in coordination might be defined so as to fuse tense predicates

- Yet a simpler, more standard solution is to assume that:
  - Tense exponents realize a morphosyntactic tense feature.
  - The tense feature is transmitted along the head path.
  - Tense is interpreted at clause level, above any clause-internal operators.
A diagnosis and a plan

- The issues discussed above in the context of HPSG correspond to well-known debates within morphology that are considered as settled by many.
- The fact that they still need to be discussed in the context of HPSG shows that we have not been focusing enough on the description of complex inflectional systems, rather than showing that something is wrong with the way morphologists think about the issues.
- My plan for the rest of this section:
  - Sketch the description of an inflection system that is complex enough to illustrate the concerns of practicing morphologists.
  - Illustrate how extant morphological frameworks can account for such systems, provided they are combined with an adequate interface to syntax and semantics.
  - Outline a way of integrating Paradigm Function Morphology with HPSG that precisely provides for such an interface.
  - Discuss conceptual and practical virtues of that type of strategy for the modeling of inflection within HPSG.
1. HPSG and Inflection
2. Laz conjugation
3. Laz morphology in PFM
4. Inferential-realizational morphology in HPSG
Laz

- Belongs to the South Caucasian language family, which also includes Georgian, Mingrelian and Svan
- Spoken in North-East Turkey and South-West Georgia
- Approximately 250,000 speakers (Feurstein 1983).
- Endangered: speakers under the age of ca. 25 do not speak Laz.
- Four dialect areas. The data presented here are from the dialect of Arhavi. They are taken from published sources and from René Lacroix’s fieldwork (e.g. Lacroix, 2009).
### Position classes

- 10 mutually exclusive position classes
- Some position classes may host lexical, derivational or inflectional exponents

<table>
<thead>
<tr>
<th>aff. pbv</th>
<th>locative pbv</th>
<th>person marking</th>
<th>valency/aspect</th>
<th>stem</th>
<th>thematic suffix</th>
<th>TAM</th>
<th>TAM</th>
<th>person marking</th>
<th>TAM/evalidity</th>
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<td>2</td>
<td>-i</td>
<td>-t</td>
</tr>
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<td>go-</td>
<td>m-</td>
<td>o-</td>
<td>k’untsx-in</td>
<td>-t’</td>
<td></td>
<td></td>
<td>-t</td>
<td>-doe</td>
</tr>
<tr>
<td>PV</td>
<td>PV</td>
<td>OBJ.1</td>
<td>VAL1</td>
<td>wake_up-CAUS</td>
<td>TH</td>
<td>PST.IPFV</td>
<td>PST</td>
<td>SBJ.12PL</td>
<td>EVD</td>
</tr>
</tbody>
</table>

'you(pl.) were waking me up, I’m told’
Multiple exponence

- The prefix \( b^- \) realizes (among other things) agreement with a first person subject
- The suffix \( -t \) realizes (among other things) agreement with a plural non third person subject

<table>
<thead>
<tr>
<th>SUBJECT</th>
<th>1SG</th>
<th>2SG</th>
<th>3SG</th>
<th>1PL</th>
<th>2PL</th>
<th>3PL</th>
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</thead>
<tbody>
<tr>
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<td>—</td>
<td>—</td>
<td>b-dzir-om</td>
<td>—</td>
<td>g-dzir-om-t</td>
<td>b-dzir-om</td>
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<tr>
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<td>—</td>
<td>dzir-om</td>
<td>m-dzir-om-t</td>
<td>—</td>
<td>dzir-om</td>
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<td>g-dzir-om-s</td>
<td>dzir-om-s</td>
<td>m-dzir-om-an</td>
<td>g-dzir-om-an</td>
<td>dzir-om-s</td>
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<td>—</td>
<td>g-dzir-om-t</td>
<td>b-dzir-om-t</td>
<td>—</td>
<td>g-dzir-om-an</td>
<td>b-dzir-om-t</td>
</tr>
<tr>
<td>2PL</td>
<td>m-dzir-om-t</td>
<td>—</td>
<td>dzir-om-t</td>
<td>m-dzir-om-t</td>
<td>—</td>
<td>dzir-om-t</td>
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<tr>
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<td>g-dzir-om-an</td>
<td>dzir-om-an</td>
<td>m-dzir-om-an</td>
<td>g-dzir-om-an</td>
<td>dzir-om-an</td>
</tr>
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</table>

Present of \( lal \) ‘bark’

Present of \( dzir \) ‘see’
Fused exponence

- In the future there is a specific set of person markers occurring in slot 4

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<th>3</th>
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<td>-t</td>
<td>OBJ.1</td>
<td>see</td>
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<td>dzir</td>
<td>-i</td>
<td>-t</td>
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<td>see</td>
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<tr>
<td>$m$-</td>
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<td>-om</td>
<td>-t’</td>
<td>-i</td>
<td>-t</td>
</tr>
<tr>
<td>$m$-</td>
<td>dzir</td>
<td>-i</td>
<td>-aten</td>
<td>OBJ.1</td>
<td>see</td>
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</table>
Portmanteau morphs

- In the past perfective, some paradigm cells use **portmanteau morphs** occupying two position classes simultaneously.

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<th>SUBJECT</th>
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<td>1SG</td>
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</tr>
<tr>
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<tr>
<td>3SG</td>
<td>m-dzir-om-s</td>
</tr>
<tr>
<td>1PL</td>
<td>—</td>
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<tr>
<td>2PL</td>
<td>m-dzir-om-t</td>
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<tr>
<td>3PL</td>
<td>m-dzir-om-an</td>
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**Present of dzir ‘see’**

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<th>SUBJECT</th>
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<td>1SG</td>
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<tr>
<td>1SG</td>
<td>—</td>
</tr>
<tr>
<td>2SG</td>
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</tr>
<tr>
<td>3SG</td>
<td>m-dzir-[u]</td>
</tr>
<tr>
<td>1PL</td>
<td>—</td>
</tr>
<tr>
<td>2PL</td>
<td>m-dzir-i-t</td>
</tr>
<tr>
<td>3PL</td>
<td>m-dzir-[es]</td>
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</table>

**Past perfective forms of dzir ‘see’**
Discontinuous stems

- In addition to a (possibly derived) stem, lexical phonological information associated with a lexeme may consist of:
  - A locative preverb in slot $-3$
  - A valence marker in slot $-1$
  - A thematic suffix in slot 1
- These have a complex distribution:
  - Thematic suffixes are used only in some TAM combinations.
  - Some TAM combinations realize an inflectional exponent in the slot normally used by the thematic suffix

<table>
<thead>
<tr>
<th>Slot</th>
<th>Spellout</th>
<th>Meaning</th>
</tr>
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<tr>
<td>$-4$</td>
<td>$m$-</td>
<td></td>
</tr>
<tr>
<td>$-3$</td>
<td>dzir</td>
<td>You (sg) see us’</td>
</tr>
<tr>
<td>$-2$</td>
<td>-om</td>
<td></td>
</tr>
<tr>
<td>$-1$</td>
<td>see</td>
<td><strong>OBJ.1</strong></td>
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<tr>
<td>0</td>
<td>TH</td>
<td><strong>SBJ.12</strong> present</td>
</tr>
<tr>
<td>1</td>
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<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
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<thead>
<tr>
<th>Slot</th>
<th>Spellout</th>
<th>Meaning</th>
</tr>
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<tr>
<td>$-4$</td>
<td>$m$-</td>
<td></td>
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<tr>
<td>$-3$</td>
<td>dzir</td>
<td>You (sg) saw us’</td>
</tr>
<tr>
<td>$-2$</td>
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<td>$-1$</td>
<td>see</td>
<td><strong>OBJ.1</strong></td>
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<td>TH</td>
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<th>Meaning</th>
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<td>$-4$</td>
<td>$m$-</td>
<td></td>
</tr>
<tr>
<td>$-3$</td>
<td>dzir</td>
<td>You (sg) were seeing us’</td>
</tr>
<tr>
<td>$-2$</td>
<td>-om</td>
<td></td>
</tr>
<tr>
<td>$-1$</td>
<td>see</td>
<td><strong>OBJ.1</strong></td>
</tr>
<tr>
<td>0</td>
<td>TH</td>
<td><strong>IPFV</strong> past imperfective</td>
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<tr>
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<td>-t’</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-i</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>-t</td>
<td></td>
</tr>
<tr>
<td>4</td>
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<tr>
<td>$-4$</td>
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<td></td>
</tr>
<tr>
<td>$-3$</td>
<td>dzir</td>
<td>If only you had seen us!</td>
</tr>
<tr>
<td>$-2$</td>
<td>-om</td>
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</tr>
<tr>
<td>$-1$</td>
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<td>-t’</td>
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<td>2</td>
<td>-i</td>
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<td>3</td>
<td>-t</td>
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<td>5</td>
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</table>
Discontinuous stems

- Valence markers usually reflect a derivational operation
- However, many underived verbs begin with the valence marker o-
- In the perfect, whatever marker would be expected is replaced by an inflectional exponent cumulating subject person marking and aspect.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>p-</th>
<th>č’op</th>
<th>-um</th>
<th>‘I catch it’</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>1&gt;3</td>
<td>catch</td>
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<table>
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<tr>
<th></th>
<th></th>
<th>m-</th>
<th>a-</th>
<th>č’op</th>
<th>-er</th>
<th>-n</th>
<th>‘I am able to catch it’</th>
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<td>POT</td>
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<tr>
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<th></th>
<th>b-</th>
<th>o-</th>
<th>gn</th>
<th>-am</th>
<th>‘I hear it’</th>
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<table>
<thead>
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<th></th>
<th>m-</th>
<th>i-</th>
<th>č’op</th>
<th>-u</th>
<th>-n</th>
<th>‘I have caught it.’ or</th>
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<td>catch</td>
<td>PRF</td>
<td>OBJ.3SG</td>
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<th></th>
<th>b-</th>
<th>u-</th>
<th>č’op</th>
<th>-u</th>
<th>-t</th>
<th>‘He has caught us.’ or</th>
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<tbody>
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<td></td>
<td>3&gt;1</td>
<td>PRF.SUBJ.3SG</td>
<td>catch</td>
<td>PRF</td>
<td>OBJ.PL</td>
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</table>
Laz verbs come in inflection classes, which manifest themselves mostly by the choice of person marking suffixes in the present.

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<th>3SG</th>
<th>1PL</th>
<th>2PL</th>
<th>3PL</th>
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<td>A</td>
<td></td>
<td></td>
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<td>C</td>
<td>B</td>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1PL</td>
<td></td>
<td></td>
<td></td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2PL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>3PL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B</td>
</tr>
</tbody>
</table>

A: \( \) elsewhere
\( \emptyset \) elsewhere

B: \( anoren \) in the future
portmanteau \( es \) in the past
\( nan \) in the present, classes II and III
\( an \) in the present, class I
\( n \) elsewhere

C: \( asen \) in the future
portmanteau \( u \) in the past
\( n \) in the present, class III
\( s \) elsewhere

D: \( aten \) in the future
\( t \) elsewhere

Thematic suffixes are predictors of inflection class, but not the other way around.

Inflection classes
Inverse constructions

- There are two types of constructions for Laz verbs:
  - In the **plain** constructions, the subject is ergative and the object is dative or absolutive
  - In the **inverse** constructions, the subject is dative and the object is absolutive

(4) a. Bere-\textit{k} otsxodž me-tk’oč-u
child-\textit{ERG} comb[ABS] PV-throw-AOR.SBJ.3SG
‘The boy threw the comb.’

   (Dumézil 1937, text 1)

b. K’oči-s čxomi va a-č’op-u
man-DAT fish[ABS] NEG VAL.A-take-AOR.SBJ.3SG
‘The man could not catch fish.’

   (Lacroix, 2009)

**NB:** As Lacroix (2009) shows at length, the plain-inverse distinction is not a matter of variation of alignment between semantic roles and grammatical functions: the dative argument in inverse constructions has all syntactic properties of a subject.
Inverse constructions

- The plain/inverse distinction cuts across the inflection/derivation boundary:
  - Most verbs use the plain construction in all TAM combinations except the present perfect and the past perfect.

<table>
<thead>
<tr>
<th>TAM</th>
<th>1PL&gt;3SG form of <em>dzir</em> ‘see’</th>
</tr>
</thead>
<tbody>
<tr>
<td>present</td>
<td>bdziromt</td>
</tr>
<tr>
<td>past imperfective</td>
<td>bdziromt’it</td>
</tr>
<tr>
<td>aorist</td>
<td>bdzirit</td>
</tr>
<tr>
<td>future</td>
<td>bdziraten</td>
</tr>
<tr>
<td>present perfect</td>
<td>midzirunan</td>
</tr>
<tr>
<td>past perfect</td>
<td>midzirut’es</td>
</tr>
<tr>
<td>subjunctive</td>
<td>bdziromt’at</td>
</tr>
<tr>
<td>optative</td>
<td>bdzirat</td>
</tr>
<tr>
<td>past optative</td>
<td>bdzirat’it</td>
</tr>
</tbody>
</table>
The plain/inverse distinction cuts across the inflection/derivation boundary:

- A few underived verbs always use the inverse construction, irrespective of TAM
- Some derivation operations output a verb which always uses the inverse construction, irrespective of TAM

(5) \( k'\text{o}\tilde{c}i-s \quad a-\text{\v{s}kuin-u} \)
man-DAT VAL_A-fear-AOR.CPL.3SG

‘The man was scared.’

(Lacroix, 2009)

(6) \( k'\text{o}\tilde{c}i-s \quad \text{\v{c}xomi} \text{\textit{va}} \quad a-\text{\v{c}op-u} \)
man-DAT fish NEG VAL_A-take-AOR.CPL.3SG

‘The man could not catch fish.’

(Lacroix, 2009)
ICs as morphological reversals

- The distribution of person markers in the two constructions are (almost) mirror images

Morphological reversal (Baerman, 2007)

<table>
<thead>
<tr>
<th></th>
<th>1SG</th>
<th>2SG</th>
<th>3SG</th>
<th>1PL</th>
<th>2PL</th>
<th>3PL</th>
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</thead>
<tbody>
<tr>
<td>1SG</td>
<td>—</td>
<td>g-∅</td>
<td>b-∅</td>
<td>—</td>
<td>g-t</td>
<td>b-∅</td>
</tr>
<tr>
<td>2SG m-∅</td>
<td>—</td>
<td>∅-∅</td>
<td>—</td>
<td>m-t</td>
<td>—</td>
<td>∅-∅</td>
</tr>
<tr>
<td>3SG m-n</td>
<td>g-n</td>
<td>∅-n</td>
<td>m-nan</td>
<td>g-nan</td>
<td>( ∅-n )</td>
<td></td>
</tr>
<tr>
<td>1PL</td>
<td>—</td>
<td>g-t</td>
<td>b-t</td>
<td>—</td>
<td>g-t</td>
<td>b-t</td>
</tr>
<tr>
<td>2PL m-t</td>
<td>—</td>
<td>∅-t</td>
<td>m-t</td>
<td>—</td>
<td>∅-t</td>
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<tr>
<td>3PL m-nan</td>
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<td>∅-nan</td>
<td>m-nan</td>
<td>g-nan</td>
<td>∅-nan</td>
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<table>
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<tr>
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<th>3SG</th>
<th>1PL</th>
<th>2PL</th>
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<tr>
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<td>m-n</td>
<td>—</td>
<td>m-t</td>
<td>m-n</td>
<td></td>
</tr>
<tr>
<td>2SG g-∅</td>
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<td>g-n</td>
<td>g-t</td>
<td>—</td>
<td>g-n</td>
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</tr>
<tr>
<td>3SG b-∅</td>
<td>∅-∅</td>
<td>∅-n</td>
<td>b-t</td>
<td>—</td>
<td>∅-n</td>
<td></td>
</tr>
<tr>
<td>1PL</td>
<td>( m-t )</td>
<td>m-nan</td>
<td>—</td>
<td>m-n</td>
<td></td>
<td>m-nan</td>
</tr>
<tr>
<td>2PL g-t</td>
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<td>g-nan</td>
<td>g-t</td>
<td>—</td>
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<td>g-nan</td>
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<tr>
<td>3PL b-∅</td>
<td>∅-∅</td>
<td>( ∅-nan )</td>
<td>b-t</td>
<td>∅-t</td>
<td></td>
<td>∅-nan</td>
</tr>
</tbody>
</table>
Morphosyntactic mismatch

- Systematic syncretism common to all subparadigms of all verbs
- Bonami and Lacroix (forthcoming): The distribution can be explained by assuming a **morphosyntactic mismatch** (Hippisley, 2007): morphology treats 3PL objects as 3SG

<table>
<thead>
<tr>
<th></th>
<th>1SG</th>
<th>2SG</th>
<th>3SG</th>
<th>1PL</th>
<th>2PL</th>
<th>3PL</th>
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<tr>
<td>1SG</td>
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<td>b-∅</td>
<td>—</td>
<td>g-t</td>
<td>b-∅</td>
</tr>
<tr>
<td>2SG</td>
<td>m-∅</td>
<td>—</td>
<td>Ø-∅</td>
<td>m-t</td>
<td>—</td>
<td>Ø-∅</td>
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<tr>
<td>3SG</td>
<td>m-(ñ)</td>
<td>g-(ñ)</td>
<td>Ø-(ñ)</td>
<td>m-nan</td>
<td>g-nan</td>
<td>Ø-(ñ)</td>
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<tr>
<td>1PL</td>
<td>—</td>
<td>g-t</td>
<td>b-t</td>
<td>—</td>
<td>g-t</td>
<td>b-t</td>
</tr>
<tr>
<td>2PL</td>
<td>m-t</td>
<td>—</td>
<td>Ø-t</td>
<td>m-t</td>
<td>—</td>
<td>Ø-t</td>
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<td>3PL</td>
<td>m-nan</td>
<td>g-nan</td>
<td>Ø-nan</td>
<td>m-nan</td>
<td>g-nan</td>
<td>Ø-nan</td>
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</table>

**inverse construction**

<table>
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<th>2PL</th>
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<tr>
<td>1SG</td>
<td>—</td>
<td>m-∅</td>
<td>m-n</td>
<td>—</td>
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<td>m-n</td>
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<tr>
<td>2SG</td>
<td>g-∅</td>
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<td>g-n</td>
<td>g-t</td>
<td>—</td>
<td>g-n</td>
</tr>
<tr>
<td>3SG</td>
<td>b-∅</td>
<td>Ø-∅</td>
<td>Ø-n</td>
<td>b-t</td>
<td>-t</td>
<td>Ø-n</td>
</tr>
<tr>
<td>1PL</td>
<td>—</td>
<td>m-t</td>
<td>m-nan</td>
<td>—</td>
<td>m-t</td>
<td>m-nan</td>
</tr>
<tr>
<td>2PL</td>
<td>g-t</td>
<td>—</td>
<td>g-nan</td>
<td>g-t</td>
<td>—</td>
<td>g-nan</td>
</tr>
<tr>
<td>3PL</td>
<td>b-∅</td>
<td>Ø-∅</td>
<td>Ø-nan</td>
<td>b-t</td>
<td>Ø-t</td>
<td>Ø-nan</td>
</tr>
</tbody>
</table>
Morphosyntactic mismatch

- The morphological reversal is complete, although the OBJ.3PL cells in the morphological paradigm are never used directly.

### Plain construction (form paradigm)

<table>
<thead>
<tr>
<th></th>
<th>1SG</th>
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<th>1PL</th>
<th>2PL</th>
<th>3PL</th>
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</thead>
<tbody>
<tr>
<td>1SG—the</td>
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<td>b-∅</td>
<td>—</td>
<td>g-t</td>
<td>b-∅</td>
<td></td>
</tr>
<tr>
<td>2SGm-∅</td>
<td>—</td>
<td>∅-∅</td>
<td>m-t</td>
<td>—</td>
<td>∅-∅</td>
<td></td>
</tr>
<tr>
<td>3SGm-n</td>
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<td>∅-n</td>
<td>m-nan</td>
<td>g-nan</td>
<td>∅-n</td>
<td></td>
</tr>
<tr>
<td>1PL—the</td>
<td>g-t</td>
<td>b-t</td>
<td>—</td>
<td>g-t</td>
<td>b-t</td>
<td></td>
</tr>
<tr>
<td>2PL m-t</td>
<td>—</td>
<td>∅-t</td>
<td>m-t</td>
<td>—</td>
<td>∅-t</td>
<td></td>
</tr>
<tr>
<td>3PL m-nan</td>
<td>g-nan</td>
<td>∅-nan</td>
<td>m-nan</td>
<td>g-nan</td>
<td>∅-nan</td>
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</table>

###Inverse construction (form paradigm)

<table>
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<th>3SG</th>
<th>1PL</th>
<th>2PL</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1SG—the</td>
<td>m-∅</td>
<td>m-n</td>
<td>—</td>
<td>m-t</td>
<td>m-nan</td>
<td></td>
</tr>
<tr>
<td>2SGg-∅</td>
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<td>g-n</td>
<td>g-t</td>
<td>—</td>
<td>g-nan</td>
<td></td>
</tr>
<tr>
<td>3SGb-∅</td>
<td>∅-∅</td>
<td>∅-n</td>
<td>b-t</td>
<td>-t</td>
<td>∅-nan</td>
<td></td>
</tr>
<tr>
<td>1PL—the</td>
<td>(m-t)</td>
<td>(m-nan)</td>
<td>—</td>
<td>m-t</td>
<td>m-nan</td>
<td></td>
</tr>
<tr>
<td>2PL g-t</td>
<td>—</td>
<td>g-nan</td>
<td>g-t</td>
<td>—</td>
<td>g-nan</td>
<td></td>
</tr>
<tr>
<td>3PL b-∅</td>
<td>∅-∅</td>
<td>(∅-nan)</td>
<td>b-t</td>
<td>∅-t</td>
<td>∅-nan</td>
<td></td>
</tr>
</tbody>
</table>
1. HPSG and Inflection
2. Laz conjugation
3. Laz morphology in PFM
4. Inferential-realizational morphology in HPSG
A synopsis of PFM

- The inflection system of a language is stated as a paradigm function mapping a lexeme and morphosyntactic property set to an appropriate phonological form.
- The paradigm function itself is stated using realization rules that map an input stem indexed for the lexeme it instantiates and a set of morphosyntactic properties to a phonological form.
- Realization rules are of two types:
  - Rules of exponence specify directly the output form as a phonological function of the input stem, i.e. as an affixed form.
  - Rules of referral refer the realization of some morphosyntactic property set to that of another morphosyntactic property set.
- The rules are organized into a sequence of rule blocks (Anderson, 1992)
- Competition between rules in the same block is arbitrated by specificity (Pāṇini’s Principle).
- A rule may span multiple blocks at once: this gives rise to portmanteau morphs.
<table>
<thead>
<tr>
<th>Step</th>
<th>Overhead</th>
<th>Head</th>
<th>Target</th>
<th>Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>$X_{\text{verb}}, \sigma : { \text{AFF} + }$</td>
<td>$\rightarrow$</td>
<td>$\text{ko}X$</td>
<td></td>
</tr>
<tr>
<td>-3</td>
<td>$X_{\text{verb}}, \sigma : { }$</td>
<td>$\rightarrow$</td>
<td>$\text{loc-pvb}(X)$</td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td>$X_{\text{verb}}, \sigma : { \text{AGR2 1} }$</td>
<td>$\rightarrow$</td>
<td>$\text{m}X$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{AGR2 2} }$</td>
<td>$\rightarrow$</td>
<td>$\text{g}X$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{AGR1 1, AGR2 3} }$</td>
<td>$\rightarrow$</td>
<td>$\text{b}X$</td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td>$X_{\text{verb}}, \sigma : { }$</td>
<td>$\rightarrow$</td>
<td>$\text{val-mk}(X)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{PRF +} }$</td>
<td>$\rightarrow$</td>
<td>$\text{i}X$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{PRF +, AGR2 3sg} }$</td>
<td>$\rightarrow$</td>
<td>$\text{u}X$</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>$X_{\text{verb}}, \sigma : { \text{PFV -} }$</td>
<td>$\rightarrow$</td>
<td>$\text{ths}(X)$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{PRF +} }$</td>
<td>$\rightarrow$</td>
<td>$\text{Xu}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{TNS pst, MOOD opt} }$</td>
<td>$\rightarrow$</td>
<td>$\text{Xa}$</td>
<td></td>
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<td>2</td>
<td>$X_{\text{verb}}, \sigma : { \text{TNS pst, PFV -} }$</td>
<td>$\rightarrow$</td>
<td>$\text{Xt'}$</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>$X_{\text{verb}}, \sigma : { \text{TNS pst, PRF -} }$</td>
<td>$\rightarrow$</td>
<td>$\text{Xi}$</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>$X_{\text{verb}}, \sigma : { }$</td>
<td>$\rightarrow$</td>
<td>$\langle X, \sigma \rangle : A$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{AGR1 3} }$</td>
<td>$\rightarrow$</td>
<td>$\langle X, \sigma \rangle : B$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{AGR1 3sg, AGR2 sg} }$</td>
<td>$\rightarrow$</td>
<td>$\langle X, \sigma \rangle : C$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{AGR1 12pl} }$</td>
<td>$\rightarrow$</td>
<td>$\langle X, \sigma \rangle : D$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$X_{\text{verb}}, \sigma : { \text{AGR1 12sg, AGR2 12pl} }$</td>
<td>$\rightarrow$</td>
<td>$\langle X, \sigma \rangle : D$</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>$X_{\text{verb}}, \sigma : { \text{MOOD ind, EVID ind} }$</td>
<td>$\rightarrow$</td>
<td>$\langle X, \sigma \rangle : \text{Xdoren}$</td>
<td></td>
</tr>
</tbody>
</table>
Laz conjugation in PFM

Block sequence $-1 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow -2 \rightarrow -3 \rightarrow -4 \rightarrow 5$

Portmanteau 3 $\rightarrow$ 4 rules

\[
X_{\text{verb}}, \sigma : \{ \text{AGR1 3, TNS pst, PFV +} \} \rightarrow X\text{es}
\]

\[
X_{\text{verb}}, \sigma : \{ \text{AGR1 3sg, AGR2 sg, TNS pst, PFV +} \} \rightarrow X\text{u}
\]

Unordered rule blocks

\[
A : \begin{cases}
X_{\text{verb}}, \sigma : \{ \text{TNS fut} \} \rightarrow X\text{are} \\
X_{\text{verb}}, \sigma : \{ \text{TNS fut} \} \rightarrow X\text{anoren} \\
X_{\text{verb}}, \sigma : \{ \text{TNS prs} \} \rightarrow X\text{nan} \\
X_{\text{i}}, \sigma : \{ \text{TNS prs, PRF -} \} \rightarrow X\text{an} \\
X_{\text{verb}}, \sigma : \{ \} \rightarrow X\text{n} \\
\end{cases}
\]

\[
B : \begin{cases}
X_{\text{verb}}, \sigma : \{ \text{TNS fut} \} \rightarrow X\text{ asen} \\
X_{\text{ill}}, \sigma : \{ \text{TNS prs} \} \rightarrow X\text{n} \\
X_{\text{verb}}, \sigma : \{ \} \rightarrow X\text{s} \\
\end{cases}
\]

\[
C : \begin{cases}
X_{\text{verb}}, \sigma : \{ \text{TNS fut} \} \rightarrow X\text{oten} \\
X_{\text{verb}}, \sigma : \{ \} \rightarrow X\text{t} \\
\end{cases}
\]

Portmanteau $-1 \rightarrow 5$ rule

\[
X_{\text{verb}}, \sigma : \{ \text{INV +, AGR1 } \varphi, \text{AGR2 } \psi \} \rightarrow \langle X, \sigma/\{ \text{INV -, AGR2 } \psi, \text{AGR1 } \varphi \} \rangle : -1 \rightarrow 5
\]
Sample analysis: plain construction

Input \( \left( dzir_{DZIR} \{ PRF -, TNS prs, MOOD ind, AFF -, INV -, AGR1 1pl, AGR2 3sg \} \right) \)

1 Applicable rules: \( X_{\text{verb}}, \sigma : \{ \} \rightarrow \text{val-mk}(X) \)
   As it happens, \( \text{val-mk}(X_{DZIR}) = X_{DZIR} \)
   \( \Rightarrow dzir_{DZIR} \)

1 Applicable rules: \( X_{\text{verb}}, \sigma : \{ \text{PFV} - \} \rightarrow \text{ths}(X) \)
   As it happens, \( \text{ths}(X_{DZIR}) = X_{om_{DZIR}} \)
   \( \Rightarrow dzirom_{DZIR} \)

2 Applicable rules: none \( \Rightarrow dzirom_{DZIR} \)

3 Applicable rules: none \( \Rightarrow dzirom_{DZIR} \)

4 Applicable rules: \( X_{\text{verb}}, \sigma : \{ \} \rightarrow \langle X, \sigma \rangle : \text{A} \)
   \( X_{\text{verb}}, \sigma : \{ \text{AGR1 12pl} \} \rightarrow \langle X, \sigma \rangle : \text{D} \)
   \( \Rightarrow \text{Referred to block D} \)
   Applicable rules: \( X_{\text{verb}}, \sigma : \{ \} \rightarrow X_{t} \)
   \( \Rightarrow dzirom_{t_{DZIR}} \)
Sample analysis: plain construction

Input $\langle \text{dzie}_D\text{ZIR} \{ \text{PRF} -, \text{TNS} \text{ prs}, \text{MOOD} \text{ ind}, \text{AFF} -, \text{INV} -, \text{AGR1} \text{ 1pl}, \text{AGR2} \text{ 3sg} \} \rangle$

$\Rightarrow \text{dziromt}_D\text{ZIR}$

- 2 Applicable rules: $X_{\text{verb}}, \sigma : \{ \text{AGR2} \text{ 1} \} \rightarrow mX$
  
  $X_{\text{verb}}, \sigma : \{ \text{AGR1} \text{ 1}, \text{AGR2} \text{ 3} \} \rightarrow bX$

$\Rightarrow \text{bdziromt}_D\text{ZIR}$

- 3 Applicable rules: $X_{\text{verb}}, \sigma : \{ \} \rightarrow \text{loc-pvb}(X)$
  
  As it happens, $\text{loc-pvb}(X_{\text{DZIR}})=X_{\text{DZIR}}$

$\Rightarrow \text{bdziromt}_D\text{ZIR}$

- 4 Applicable rules: none $\Rightarrow \text{bdziromt}_D\text{ZIR}$

- 5 Applicable rules: none $\Rightarrow \text{bdziromt}_D\text{ZIR}$
Sample analysis: inverse construction

Input: \( \langle dzir_{DZIR} \{ PRF +, TNS \text{ prs}, MOOD ind, AFF −, INV +, AGR1 1pl, AGR2 3sg \} \rangle \)

\(-1 > 5\) Applicable portmanteau rule:
\[ X_{verb}, \sigma : \{ INV +, AGR1 \varphi, AGR2 \psi \} \rightarrow \langle X, \sigma/\{ INV −, AGR2 \psi, AGR1 \varphi \} \rangle : -1 > 5 \]

\(\leadsto\) referred to:
\( \langle dzir_{DZIR} \{ PRF +, TNS \text{ prs}, MOOD ind, AFF −, INV −, AGR1 3sg, AGR2 1pl \} \rangle \)

\(-1\) Applicable rules: \( X_{verb}, \sigma : \{ PRF + \} \rightarrow iX \)

\(\leadsto\) \( idzir_{DZIR} \)

1 Applicable rules: \( X_{verb}, \sigma : \{ PRF + \} \rightarrow Xu \)

\(\leadsto\) \( idziru_{DZIR} \)

2 Applicable rules: none \(\leadsto\) \( idziru_{DZIR} \)

3 Applicable rules: none \(\leadsto\) \( idziru_{DZIR} \)
Sample analysis: inverse construction

Input \( \left\langle dzir_{\text{DZIR}} \{ \text{PRF}+, \text{TNS} \text{ prs}, \text{MOOD} \text{ ind}, \text{AFF} -, \text{INV} -, \text{AGR1} 3sg, \text{AGR2} 1pl \} \right\rangle \)

... \Rightarrow idzirunan_{\text{DZIR}}

4 Applicable rules: 
\[
\begin{align*}
X_{\text{verb}}, \sigma : \emptyset & \quad \rightarrow \quad \langle X, \sigma \rangle : A \\
X_{\text{verb}}, \sigma : \{ \text{AGR1} 3 \} & \quad \rightarrow \quad \langle X, \sigma \rangle : B \\
X_{\text{verb}}, \sigma : \emptyset & \quad \rightarrow \quad Xn
\end{align*}
\]

\Rightarrow \text{Referred to block B}

Applicable rules: 
\[
\begin{align*}
X_{\text{verb}}, \sigma : \{ \text{TNS} \text{ prs} \} & \quad \rightarrow \quad Xn
\end{align*}
\]

\Rightarrow idzirunan_{\text{DZIR}}

\rightarrow mX

\Rightarrow midzirunan_{\text{DZIR}}

-3 Applicable rules: 
\[
\begin{align*}
X_{\text{verb}}, \sigma : \emptyset & \quad \rightarrow \quad \text{loc-pvb}(X)
\end{align*}
\]

As it happens, \( \text{loc-pvb}(X_{\text{DZIR}}) = X_{\text{DZIR}} \)

\Rightarrow midzirunan_{\text{DZIR}}

-4 Applicable rules: none \Rightarrow midzirunan_{\text{DZIR}}

5 Applicable rules: none \Rightarrow \boxed{midzirunan_{\text{DZIR}}}


1. HPSG and Inflection
2. Laz conjugation
3. Laz morphology in PFM
4. Inferential-realizational morphology in HPSG
The strategy

- As the preceding example shows, the elegant description of complex inflectional systems often relies on mechanisms that could only cumbersomely be modeled using HPSG lexical rules:
  - Pāṇinian competition between rules
  - Rule blocks and portmanteau rules
  - Rules of referral
- On the other hand, the analysis is in need of an explicit interface with a well worked-out syntactic description
- The strategy used here:
  - Rephrase the ontology of PFM using typed feature structures.
  - Model a Paradigm Functions as a relational constraint linking a lexical morphological information, morphosyntactic descriptions, and phonological forms.
  - Embed that relational constraint in an HPSG grammar as a constraint on possible words.
A (less than satisfactory) first try

- Bonami and Webelhuth (in press) implements such an approach directly in SBCG:

\[
\text{Definition of } \text{synthetic-infl}: \\
\begin{align*}
\begin{bmatrix}
\text{lexeme} \\
\text{SYN} \quad \begin{bmatrix}
\text{CAT} & \begin{bmatrix}
\text{LID} & 1
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}
\end{align*}
\rightarrow
\begin{align*}
\begin{bmatrix}
\text{word} \\
\text{PHON} & \text{pdgm-fn}(1,2) \\
\text{SYN} \quad \begin{bmatrix}
\text{CAT} & \begin{bmatrix}
\text{LID} & 1 \\
\text{MORSYN} & 2
\end{bmatrix}
\end{bmatrix}
\end{bmatrix}
\end{align*}
\]

- Oddly enough:
  - Under such an approach, there is a single, and presumably universal, synthetic inflection rule
  - The presence of an object of type \textit{lexeme} actually plays no role in the analysis: words and lexemes never need to disagree on the value of any feature.
For at least 10 years, Ivan Sag (e.g. Sag, 2010, in press) has been arguing that HPSG grammars should be set up so as to constrain the accessibility between different components of linguistic analysis. Strict separation between the *sign* and *construct* hierarchies in SBCG. The feasibility of such a move within syntax has been disputed (e.g. Richter and Sailer, 2009). Locality arguments clearly favor a strict separation between inflection and syntax of the type implemented in SBCG: No rule of syntax is ever sensitive to purely morphological properties of the words it combines, such as their individual phonological form, inflection class, inflectional (ir)-regularity, participation in a suppletive stem alternation, etc. Arguably, this is the main empirical prediction of strong lexicalism. Separating clearly inflection from syntax is one of the design goals of the approach presented here.
The general architecture

- Lexical entries are not signs, but a new type of object constraining the relation between a syntactic word and a feature structure characterizing the inflectional paradigm that word belongs to:

```
ling-object

[sign
  PHON
  SYNSEM
  phrase
  word]

[phon
  synsem]

[lex-entry
  WORD
  word
  INFL
  PID
  MORSYN]

[morph
  pid
  morsyn]
```

- **The Lexical Principle**: any object of type *word* used as part of an utterance must correspond to the value of the *WORD* feature of some lexical entry in the lexicon.
The inflectional component

- The inflectional component is defined by a relation $\text{pdgm-rln}$ relating objects of type $\text{pid}$ and objects of type $\text{morsyn}$ to objects of type $\text{phon}$:

- **The Inflection Principle**

  \[
  \text{lex-entry} \rightarrow \begin{bmatrix}
  \text{WORD} \\
  \text{INFL} \\
  \text{PID} \\
  \text{MORSYN}
  \end{bmatrix} 
  \begin{bmatrix}
  \text{PHON} [3] \\
  [
  \text{PID} [1] \\
  \text{MORSYN} [2]
  \end{bmatrix} \land \text{pdgm-rln}(1, 2, 3)
  \]

- We use a relation rather than a function, because of the phenomenon of *overabundance* (Thornton, in press): there may be more than one form filling a given paradigm cell (e.g. English *dived/dove*).

- Contra Bonami and Boyé (2007), this is still compatible with Pāṇinian rule competition; see (Bonami and Stump, forthcoming) for discussion.
The structure of PID

- PID is the home of all idiosyncratic information characterizing an inflectional paradigm, such as:
  - Minimally, the phonological representation of a STEM
  - Inflection class information, coded as a subtyping of pid values
  - In some languages, discontinuous thematic elements (preverbs, theme vowels, etc.)
  - In some languages, indexed collections of allomorphic stems (Bonami and Boyé, 2006)
- The structure of the pid hierarchy needs to be fine-grained enough that quasi-homophonous lexemes (e.g. English lie/ lied vs. lie/lay have different pid values.
- No need to introduce individual types for paradigm identifiers (contra Spencer, 2010): the inflection of quasi-homophonous lexemes always differ either in terms of inflection class or lexemic phonological information.
- PID is complementary with LID (Sag, in press) but plays a different role: homophonous lexemes will have the same PID value but different LIDS.
The structure of PID in Laz

```
[ pid
  STEM phon ]

[ verbal-pid
  PVB phon
  THS phon ]

class-i-vb

... [ om-vb
  THS om ]

class-ii-vb

... [ athematic-vb
  THS ∅ ]

class-iii-vb

... [ er-vb
  THS er ]

dzir:

[ WORD
  SYNSEM
  CAT
  HEAD
  [ verb
    LID see-rel ] ]

[ INFL
  PID
  [ om-vb
    STEM dzir
    PVB ∅ ] ]
```
The morphosyntactic interface

- Inflection normally realizes syntactic features residing within \textit{WORD}. However:
  - Which features are available for inflectional realization is a highly parochial matter
    - Some, but not all, \textit{HEAD} features
    - In languages with agreement and/or pronominal affixes, some, but not all, aspects of \textit{ARG-ST}
    - In many languages, some \textit{EDGE} features (e.g. Kupść and Tseng, 2005; Samvelian and Tseng, 2010)
  - Existence of \textbf{morphosyntactic mismatches}: cases where morphology seems to realize feature values other than those provided by syntax
    - Default agreement to 3sg for non-nominal subject in English or French
    - Deponency phenomena (Stump, 2006; Baerman, 2007)
    - Here: Lack of number agreement in the 3rd person in Laz

- For this reason, it is best to constrain explicitly the relationship between word-level syntactic properties and the input to inflection
- This is done by positing a \textit{MORSYN} structure whose feature values are related to features in \textit{WORD} explicitly.
The morphosyntactic interface in Laz

- Remember: we need to map ARG-ST into MORSYN so that 3sg object agreement exponents are used where 3pl exponents would be expected.
The morphosyntactic interface in Laz

- In HPSG parlance:

\[(8) \quad \begin{align*}
&\text{a. } \text{WORD} \cdot \text{HEAD} \begin{bmatrix} \text{verb} \\ \text{VFORM} \end{bmatrix} \rightarrow \begin{bmatrix} \text{INFL} \begin{bmatrix} \text{MORSYN} & \text{TAM} \end{bmatrix} \end{bmatrix} \\
&\text{b. } \text{WORD} \cdot \text{HEAD} \begin{bmatrix} \text{verb} \end{bmatrix} \rightarrow \begin{bmatrix} \text{INFL} \begin{bmatrix} \text{MORSYN} & \text{AGR1} \end{bmatrix} \end{bmatrix} \\
&\text{c. } \text{WORD} \cdot \text{HEAD} \begin{bmatrix} \text{verb} \end{bmatrix} \rightarrow \begin{bmatrix} \text{INFL} \begin{bmatrix} \text{MORSYN} & \text{AGR2} \begin{bmatrix} \text{PER} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
&\text{d. } \text{WORD} \cdot \text{HEAD} \begin{bmatrix} \text{verb} \end{bmatrix} \rightarrow \begin{bmatrix} \text{INFL} \begin{bmatrix} \text{MORSYN} & \text{AGR2} \begin{bmatrix} \text{NB} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\
&\text{e. } \text{WORD} \cdot \text{HEAD} \begin{bmatrix} \text{verb} \end{bmatrix} \rightarrow \begin{bmatrix} \text{INFL} \begin{bmatrix} \text{MORSYN} & \text{AGR2} \begin{bmatrix} \text{NB} & \text{SG} \end{bmatrix} \end{bmatrix} \end{bmatrix}
\end{align*} \]
Congruence as MORSYN typing

- Remember that:
  - All verbs are inverse in the perfect
  - Some verbs are inverse throughout their paradigms
- Such paradigm structure conditions can be modelled as conditions on morsyn objects:

```
morsyn
  [congruent
    TAM PRF 1
    INV 1]
  [noncongruent
    INV +
  ]
```

```
dzir:
  WORD
  SYNSEM
  CAT HEAD
  INFL
  PID
  MORSYN
  [om-vb
    STEM dzir
    LPVB ∅
  ]
  [verb
    LID see-rel
  ]
```
A side benefit

- Long-standing issue in the modeling of the inflection of South-Caucasian languages: analysis of person prefixes
  - \( m \)- is used whenever there is a 1st person object
  - \( g \)- is used whenever there is a 2nd person object
  - \( b \)- is used:
    - With intransitive verbs having a 1st person subject
    - With transitive verbs having a 1st person subject and a 3rd person complement

\( b \) is generally taken to be a 1st person subject agreement prefix

\( \Rightarrow \) extrinsic rule ordering (Anderson 1992, Halle & Marantz 1993), multiple modes of rule application (Stump, 2001), etc.

- Trivial solution: this is a morphological mismatch, where intransitives realize the exponents of a transitive verb with a 3sg object.

\[
(9) \quad \text{WORD} \quad \begin{bmatrix} \cdots \mid \text{HEAD} \mid \text{verb} \end{bmatrix} \rightarrow \text{INFL} \quad \begin{bmatrix} \text{MORSYN} \quad \left[ \text{AGR2} \quad \left[ \text{PER} \quad \text{3} \right] \quad \text{NB} \quad \text{3sg} \right] \end{bmatrix}
\]
Notable features of this approach

- Strongly lexicalist
  - Words are the only lexical objects known to syntax.
  - Syntactic and inflectional rules are of an entirely different nature.
  - Morphology-internal notions (inflection class, etc.) are inaccessible to the syntactic component.
  - The interface between syntactic-semantic features and morphological exponence is constrained explicitly, on a language-by-language basis.

- Conservative
  - HPSG syntactic analyses need not be altered in any way.
    - Post-inflectional unary rules can still be used as usual to model syntactic alternations.
    - Derivation rules can still be modeled as transitions from lexical entries to lexical entries.
  - PFM analyses are only minimally altered to accommodate a different underlying ontology.
  - More conservative vision of the lexeme, as an underspecified notion of word, rather than as a sign distinct from the word.
Conclusions

1. As a community we should worry more about what HPSG has to say about inflection (and morphology in general, and phonology, and . . .)

☞ The design features of HPSG make it ideal to address complex interface issues, not making use of these features is a waste.

2. Yet the right approach is not to reinvent the wheel but to first see how the insights of theoretical morphology from the past 20 years can be integrated in HPSG.

3. One property of inflection systems is that they differ in complexity

☞ Designing a theory of morphology on the basis of French or German is unadvisable; designing one on the basis of English is nonsensical.

4. If we take the modeling of morphology seriously, HPSG can be very helpful both to field/descriptive linguists and to typologists, in a way that less explicit theoretical linguistic approaches can not afford.


