Degrees of periphrasis in Persian conjugation

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1 Periphrasis as an interface phenomenon

- Periphrastic inflection is by its very nature an interface phenomenon
- Syntacticians tend to disregard **paradigmatic** properties of periphrases:
  - Account for the intricate distribution of auxiliaries and nonfinite forms
  - Assume ad-hoc, abnormal lexical entries for auxiliaries
- Morphologists tend to disregard **syntagmatic** properties of periphrases:
  - Account for the integration of periphrases in inflectional paradigms
  - Generate periphrases as syntactic atoms (e.g. Hippisley, 2007) or small phrases (e.g. Ackerman and Stump, 2004).
- Our goal is to take seriously both the syntax and the inflectional morphology, by bringing together two traditions:
  - HPSG analyses of auxiliaries as *argument composition* predicates (e.g. Abeillé and Godard, 2002; Bouma and van Nood, 1998; Chung, 1998; Hinrichs and Nakazawa, 1994; Monachesi, 1999)
  - PFM/NM analyses of periphrases as paradigmatic elements (Börjars et al., 1997; Sadler and Spencer, 2001; Stump, 2002; Hippisley, 2007)
- Our test case: periphrasis in Persian conjugation

Outline

- Outline:

  1. Data (Pollet)
     - Outline of Persian conjugation
     - Three degrees of periphrasis
     - The morphosyntactic import of periphrastic forms
  2. An HPSG/PFM analysis (Olivier)
     - A paradigm-based analysis
     - Synthetic conjugation
     - The passive: syntacitc argument composition
     - A (semi-)reductionist account of true periphrases

2 Data

2.1 Outline of Persian conjugation

- We adopt with slight changes the description of (Lazard et al., 2006)

- Three series of periphrastic forms:

- Perfect participle + finite form of *budan* ‘be’:

  – full word form of *budan*: complex bounded past, complex subjunctive
  – clitic form of *budan*: complex present, complex unbounded past
  – (periphrastic) complex present of *budan*: complex perfect

- Bare present form of *xâstan* ‘want’ + base form: future

- Perfect participle + any form of *šodan* ‘become’: passive

- See appendix B for full conjugation tables

simple present *mi-xar-ad* UNBD-buy.S1-3SG	**complex present** *xarid-e=ast* buy.S2-PPART=be.PRST.3SG
simple bounded past *xarid* buy.S2	**complex bounded past** *xarid-e bud* buy.S2-PPART be.S2
simple unbd. past *mi-xarid* UNBD-buy.S2	**complex unbd. past** *mi-xarid-e=ast* UNBD-buy.S2-PPART=be.PRST.3SG
— — —	**complex perfect** *xarid-e bud-e=ast* buy.S2-PPART be.S2-PPART=be.PRST.3SG
— — —	**future** *xâh-ad xarid* want.S1-3SG buy.S2
simple subjunctive *be-xar-ad* SBJV-buy.S1-3SG	**complex subjunctive** *xarid-e bâš-ad* buy.S2-PPART be.IRR-3SG

Active forms of *xaridan* 'buy' (all examples 3SG)

simple present *xaride mišavad* bought becomes	**complex present** *xaride šode ast* bought become is
simple bounded past *xaride šod* bought became	**complex bounded past** *xaride šode bud* bought become was
simple unbd. past *xaride mišod* bought was.becoming	**complex unbd. past** *xaride mišode ast* bought having.become is
— — —	**complex perfect** *xaride šode bude ast* bought become been is
— — —	**future** *xaride xâhad šod* bought wants become
simple present *xaride bešavad* bought becomes.sbjv	**complex subjunctive** *xaride mišode bâšad* bought become be.sbjv

Passive forms of *xaridan* 'buy' (all examples 3SG)

2.2 Three degrees of periphrasis

2.2.1 Passive formation is quasi-analytic

The passive is a free combination of an auxiliary, *šodan* 'become' and a past participle, similar to that of a copula, such as *budan* 'to be', and an adjective.

- Aspectual and negation *prefixes* are carried by the auxiliary.

(1) In tâblo foruxte *ne-mi-*šav-ad.
this painting sold NEG-UNBD-become.S1-3SG
'This painting is not sold.'

- The auxiliary can have wide scope over the *coordination of two participles*.

(2) In tâblo (bevasileye do nâšenâs) *robude va foruxte* šod.
this painting (by two strangers) stolen and sold become.S2
'This painting was stolen and sold by two strangers.'

- *Adverbials* can intervene between *šodan* and the participle.

(3) In tâblo foruxte *hatman* šode ast.
this painting sold *certainly* become be.S1.3SG
'This painting has certainly been sold.'

- The two parts of the construction can undergo *scrambling*.

(4) In tâblo *šod* robude va foruxte.
this painting become.S2 stolen and sold
'It is this painting which was stolen and sold'

- The *participle* can be fronted.

(5) *Foruxte* fekr mi-kon-am agar in tâblo **be-šav-ad** (...)
sold thought UNBD-do.S1-1SG if this painting SBJV-become.S1-3SG
'I think that if this painting is sold (...).'

2.2.2 Recently morphologized synthetic forms

The complex present (present perfect) and the complex unbounded past are formed by the past participle and the clitic copula.

- aspect and negation are realized on the participle, not the auxiliary.

(6) Sâlhâ Maryam be madrase *ne-mi*-rafte=ast.
years Maryam to school NEG-UNBD-gone=be.PRST.3SG
'For years, Maryam didn't go to school' or
'For years, Maryam wouldn't have been going to school.'

- No morphological or syntactic material can intervene between the participle and the clitic copula.

(7) a. *Hatman* rafte=ast.
Certainly left=be.S1.3SG
'(S)he has certainly left.'

b. *Rafte *hatman*=ast.
left certainly=be.S1.3SG

- Clitic drop in the 3rd singular form and compensatory vowel lengthening in colloquial Persian, while Sandhi (vowel fusion). Compare:

(8) a. raftˈe=ast → raftˈe:
left=be.S1.3SG
'(S)he left.'

b. bardˈe=ast → bardˈast
slave=be.S1.3SG
'(S)he is a slave.'

- No scrambling and fronting:

(9) *Ne-mi-rafte sâlhâ Maryam be madrase=ast.
NEG-UNBD-gone years Maryam to school=be.S1.3SG

Conclusion:

- Historically the complex present and complex unbounded past were periphrases combining a perfect participle with a clitic auxiliary
- In contemporary Persian the clitic auxiliary has fused with the participle, giving rise to new synthetic forms.

2.2.3 The middle ground: true periphrasis

Dual behavior in the complex past, complex perfect and complex subjunctive:

1. like synthetic forms with respect to the placement of the negation prefix and the pronominal clitics.
2. like passive forms with respect to fronting

- The prefix placement is different from the passive. The negation prefix attaches to the participle and not to the auxiliary.

(10) a. *Na*-rafte bud.
NEG-gone be.S2
'(S)he hadn't left.'

b. *Rafte *na*-bud.
gone NEG-be.S2

- Object clitic pronouns only attach to the auxiliary This is in sharp contrast with the placement of the same clitics in the future forms.

(11) a. Foruxte bud-am=*aš*.
sold be.S2-1SG=3SG

b. *Foruxte=*aš* bud-am.
sold==3SG be.S2-1SG
'I had sold it.'

(12) a. Xâh-am foruxt=*aš*.
want-1.SG sell.S2=3.SG
'I will sell it.'

b. Xâh-am=*aš* foruxt.
want-1.SG=3.SG sell.S2
'I will sell it.'

- Fronting is possible.

(13) *Foruxte* fekr ne-mi-kon-am **bâš-ad** in tâblo=râ.
sold thought NEG-UNBD-do.S1-1SG be.SBJV-3SG ce painting=DDO
'I don't think that s/he has sold this painting.'

2.3 The morphosyntactic import of periphrastic forms based on *budan*

- The complex bounded past is the perfect form of the past (the pluperfect).

(14) Qabl az inke Omid be-res-ad, Maryam birun rafte bud.
before from that Omid SBJV-arrive.S1-3SG Maryam out gone be.S2
'Maryam had left (before Omid arrived).'

- Likewise, the complex subjunctive is the perfect form of the subjunctive.

(15) a. Fekr mi-kon-am Maryam mariz bâšad.
thought UNBD-do.S1-1SG Maryam sick be.SBJV
'I think Maryam is sick.'

b. Fekr mi-kon-am Maryam mariz bude bašad.
thought UNBD-do.S1-1SG Maryam sick been be.SBJV-3SG
'I think Maryam has been sick.'

- The complex unbounded past has an evidential value (Windfuhr, 1982; Lazard, 1985; Jahani, 2000)
  - Like the simple unbounded past, it refers to an unbounded past event.
  - Whereas the simple unbounded past is neutral in terms of evidentiality, the complex unbounded past signals that the speaker only has indirect evidence for what they are asserting.

(16) a. (Banâ bar gofte-ye Omid) Maryam dar sâl-e 1950 in xâne-râ
According to-EZ Omid Maryam in year-EZ 1950 this house-DDO
mi-sâxte=ast.
UNBD-built=be.S1.3SG
'According to Omid, Maryam would have been building this house in 1950.'

b. Maryam dar sâl-e 1950 in xâne-râ mi-sâxt.
Maryam in year-EZ 1950 this house-DDO UNBD-built
Maryam was building this house in 1950.'

- The complex perfect combines a perfect value and an indirect evidential value: it is the indirect equivalent of the complex unbounded past.

(17) (Az qarâr), qabl az inke Omid be-res-ad, Maryam birun rafte bude
apparently before from that Omid SBJV-arrive.S1-3SG, Maryam out gone been
ast
be.S1.3SG
'Apparently, Maryam had left before Omid arrived.'

- The complex present is *ambiguous* between a perfect and an evidential value.
  - In some contexts it is the perfect of the present:

(18) Maryam tâze reside=ast.
Maryam new arrived=be.S1.3SG
'Maryam has just arrived.'

  - In other contexts it is the indirect evidential form of the bounded past:

(19) (Banâ bar gofte-ye Omid) Maryam in xâne-râ dar sâl-e 1950
According to-EZ Omid) Maryam this house-DDO in year-EZ 1950
xaride=ast.
bought=be.S1.3SG
'According to Omid, Maryam bought this house in 1950.'

- Summary:

	PRESENT	PAST		SUBJUNCTIVE
		DIR. EV.	IND. EV.	
BOUNDED	***	bounded past	complex present	simple subjunctive
UNBOUNDED	simple present	unbounded past	cpl. unbd. past	
PERFECT	complex present	complex bnd. past	complex perfect	complex subjunctive

- Notice the relationship between form and function:
  - Indirect evidential forms are the recently morphologized synthetic forms
  - Perfect forms are the truly periphrastic forms (except for the present perfect)

3 An HPSG/PFM analysis

3.1 A paradigm-based analysis

- The passive is generated in the syntax, using argument composition.
- Recently morphologized exponents are a realization of [EVIDENCE *indirect*]
- True periphrases are a realization of [PERFECT +]
- A rule of referral relates the present perfect to the indirect evidential bounded past.

	PRESENT	PAST		SUBJUNCTIVE
		DIR. EV.	IND. EV.	
BOUNDED	***	bounded past	complex present	simple subjunctive
UNBOUNDED	simple present	unbounded past	cpl. unbd. past	
PERFECT	complex present	complex bnd. past	complex perfect	complex subjunctive

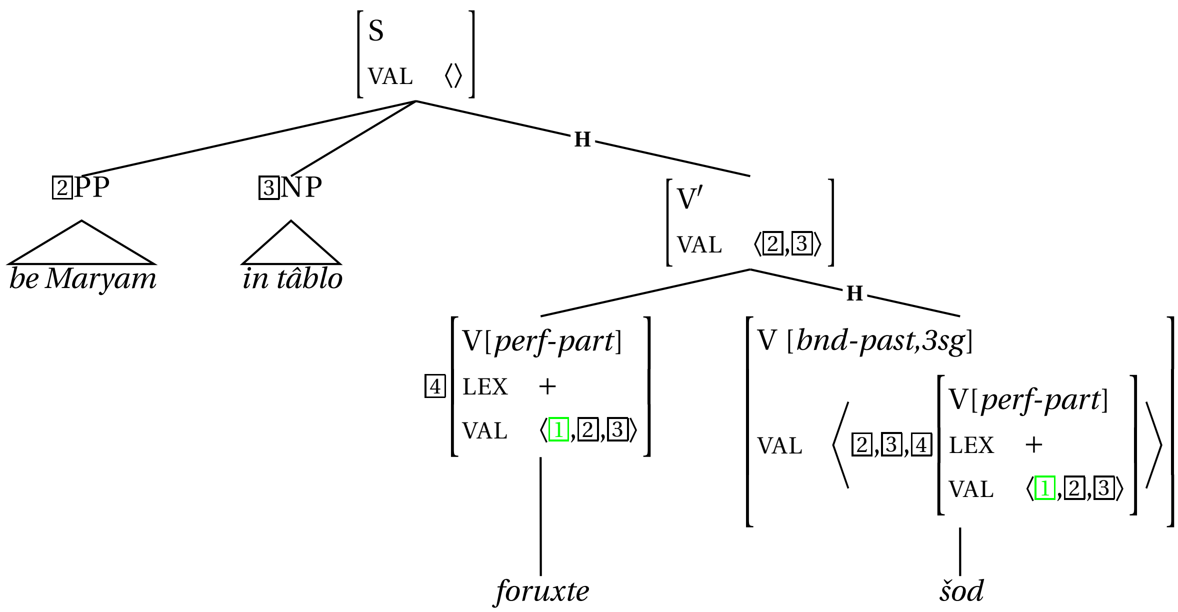
rule of periphrasis

referral to the indirect bounded past

evidential suffix *-e*, 3sg suffix *-ast*

3.2 The passive: syntactic argument composition

- The analysis we propose is directly inspired by HPSG analyses of auxiliaries in German (Hinrichs and Nakazawa, 1994), French (Abeillé and Godard, 2002), Dutch (Bouma and van Nood, 1998), Italian (Monachesi, 1999), Korean (Chung, 1998), etc.
  - The auxiliary is the syntactic head of the construction
  - Flat structure: the auxiliary subcategorizes for a lexical participle (that is, a word)
  - Argument composition (a.k.a. argument raising): the auxiliary inherits its valence requirement from the participle



3.3 Synthetic conjugation

- Disregarding evidential and perfect forms, there is a system of five rule blocks:

III	II	I	IV	V
na-	*mi-*	stem-selection	*-e*	*-am*
ne-			*-ande*	*-i*
be-			*an*	*-ad*/∅
				-im
				-id
				-and

- For indirect evidential forms, two possibilities:

Alternative A Treat them as *quasi-synthetic* forms using a portmanteau rule of referral.

(20) $X_{\mathrm{V}}, \sigma : \{\textsc{evid}\ \mathit{ind}\} \longrightarrow \langle X, \sigma / \{\textsc{form}\ \mathit{part}, \textsc{perf}\ +\}\rangle : \textsc{i-v} \oplus \langle \mathsf{bud}, \sigma / \{\textsc{tense}\ \mathit{prst}\}\rangle : \textsc{i-v}$

Alternative B Treat them as truly synthetic forms, adding two rules of exponence

(21) IV $X_V, \sigma : \{\textsc{evid}\ \mathit{indir}\} \longrightarrow X\mathsf{e}$
V $X_V, \sigma : \{\textsc{evid}\ \mathit{indir, 3sg}\} \longrightarrow X\mathsf{ast}$

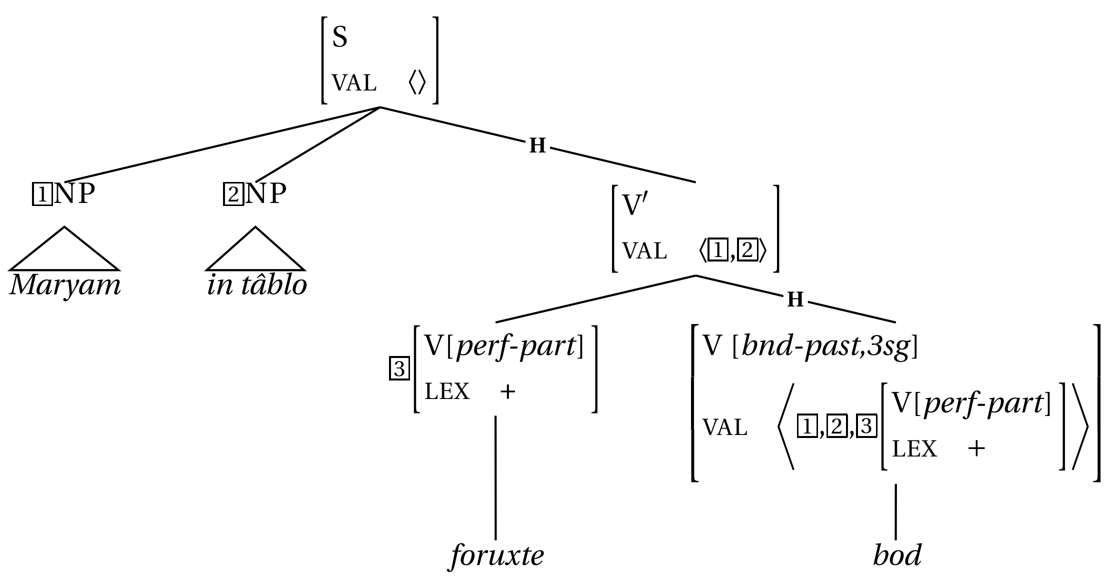
- Alternative B is preferable:
  - Alternative A requires the postulation of otherwise unattested *mi*-marked perfect participles
  - The reduction of e-ast to eː in colloquial Persian (8) calls for a portmanteau IV-V rule which alternative A does not allow for.

(22) IV-V $X_V, \sigma : \{\textsc{evid}\ \mathit{indir, 3sg}\} \longrightarrow X\mathsf{e\!:}$

3.4 True periphrases: a semi-reductionist account

- The syntactic structure is similar to that of passives

☞ Allows for an account of participle fronting



- Yet the periphrase fills a slot in the inflectional paradigm

☞ necessary if we want to state a rule of referral for the present perfect

- Solution: a perfect form of lexeme *L* a word
  - whose phonology is referred to a form of the lexeme *budan*, and

– which subcategorizes for a perfect participle of *L*.

(23) a. A form or the complex bounded past

$$\begin{bmatrix} \text{PHON} & \textsf{bud} \\ \text{HEAD} & \begin{bmatrix} \text{LXM} & \textit{xaridan} \\ \text{MORSYN} & \begin{bmatrix} \text{TENSE} & \textit{past} \\ \text{PERFECT} & + \\ \text{AGR} & \textit{3sg} \\ \text{POL} & + \end{bmatrix} \end{bmatrix} \\ \text{VAL} & \left\langle \text{NP, NP,} \begin{bmatrix} \text{LXM} & \textit{xaridan} \\ \text{MORSYN} & \begin{bmatrix} \text{FORM} & \textit{part} \\ \text{PERFECT} & + \\ \text{POL} & + \\ \text{LEX} & + \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

b. The passive auxiliary in the simple present

$$\begin{bmatrix} \text{PHON} & \textsf{mišavad} \\ \text{HEAD} & \begin{bmatrix} \text{LXM} & \textit{šodan} \\ \text{MORSYN} & \begin{bmatrix} \text{TENSE} & \textit{prst} \\ \text{AGR} & \textit{3sg} \\ \text{POL} & + \end{bmatrix} \end{bmatrix} \\ \text{VAL} & \boxed{L} \oplus \left\langle \begin{bmatrix} \text{FORM} & \textit{part} \\ \text{PERFECT} & + \\ \text{POL} & + \\ \text{LEX} & + \\ \text{VAL} & \langle \boxed{1} \rangle \oplus \boxed{L} \end{bmatrix} \right\rangle \end{bmatrix}$$

- We need rules of realization to be able to specify valence requirements

  – We change:[1]

(24) $X_L, \sigma : \{\cdots\} \longrightarrow X'_L$

to:

(25) $$\begin{bmatrix} \text{PHON} & X \\ \text{LXM} & Y \\ \text{VAL} & Z \end{bmatrix}, \sigma : \begin{bmatrix} \cdots \end{bmatrix} \longrightarrow \begin{bmatrix} \text{PHON} & X' \\ \text{LXM} & Y' \\ \text{VAL} & Z' \end{bmatrix}$$

[1]This extension is similar to that proposed by Spencer (2005) in a different context.

- Ordinary rules of realization only change the phonology, be they rules of exponence…

(26) $$\begin{bmatrix} \textsc{phon} & X \\ \textsc{lxm} & Y \\ \textsc{val} & Z \end{bmatrix}, \sigma{:}\begin{bmatrix} \textsc{per} & \mathit{1} \\ \textsc{nb} & \mathit{sg} \end{bmatrix} \longrightarrow \begin{bmatrix} \textsc{phon} & X\text{am} \\ \textsc{lxm} & Y \\ \textsc{val} & Z \end{bmatrix}$$

- …or rules of referral

(27) $$\begin{bmatrix} \textsc{phon} & X \\ \textsc{lxm} & Y \\ \textsc{val} & Z \end{bmatrix}, \sigma{:}\begin{bmatrix} \textsc{tense} & \mathit{present} \\ \textsc{perfect} & + \end{bmatrix} \longrightarrow \begin{bmatrix} \textsc{phon} & \text{refer to the indirect bounded past} \\ \textsc{lxm} & Y \\ \textsc{val} & Z \end{bmatrix}$$

(see (40) for the details)

- But periphrastic rules also change the valence

(28) $$\begin{bmatrix} \textsc{phon} & X \\ \textsc{lxm} & Y \\ \textsc{val} & Z \end{bmatrix}, \sigma{:}\begin{bmatrix} \textsc{perfect} & + \end{bmatrix} \longrightarrow \begin{bmatrix} \textsc{phon} & \text{refer to a form of } \textit{budan} \\ \textsc{lxm} & Y \\ \textsc{val} & \text{add a valence requirement} \\ & \text{for the perfect participle of } Y \end{bmatrix}$$

(see (41) for the details)

- This affords us a full account of perfect forms. In particular:
  - The complex perfect combines a indirect evidential synthetic form of *budan* with a perfect participle
  - The rule of referral for the present perfect can override periphrastic perfect formation via the normal rule competition mechanism
- Note that this is a partly reductionist account of Persian periphrases: periphrases are strange words, but they are words after all.

4 Conclusions

- Degrees of periphrasis

Analytic combination	ordinary head-complement structures	Persian subordinate clauses
Quasi-analytic	head-complement structures, some features not projected	Persian passive
True periphrasis	word whose phonology is borrowed from an auxiliary, selection for a specific word form	Persian perfect
Quasi-synthetic	word whose phonology is the merge of two other word forms	*Unattested in contemporary Persian*
Synthetic combination	ordinary rules of realization	Persian evidentials

- Unlike (Ackerman and Stump, 2004), we propose a semi-reductionist account of true periphrases:
  - Apparent discontinuous lexical items are reduced to a single item and a valence requirement (Müller, 2003)
  - What is filling the paradigm cell is a word after all
  - Competition between morphology and syntax (Poser, 1992; Bresnan, 2001; Kiparsky, 2005) is reduced to competition between affixal exponence and exponence as valence
- Nice features of the analysis:
  - Rule competition can be organized in the usual (PFM) way
  - The syntactic flexibility of auxiliary-participle combinations is accounted for
- Not all periphrases are alike
  - We distinguished five degrees of periphrasis in Persian
  - Our general approach allows for other possibilities, e.g. periphrases as multi-word lexical entries (Kathol, 1995; Crysmann, 2002)
  - More descriptive work on the typology of periphrases is needed

A Grammar fragment

A.1 Design decisions

We define a variant of PFM which differs from the framework of (Stump, 2001) in the following respects:

- Morphosyntactic features are modelled as typed feature structures as in HPSG (Pollard and Sag, 1994), rather than GPSG-like category structures (Gazdar et al., 1985).

- In standard PFM, realization rules input and output pairs consisting of a phonological representation and a lexemic index. We extend these to triplets consisting of a phonological representation, a lexemic index and a valence list.

(29) $$\begin{bmatrix} \text{PHON} & X \\ \text{LXM} & Y \\ \text{VAL} & Z \end{bmatrix}, \sigma: \begin{bmatrix} \cdots \end{bmatrix} \longrightarrow \begin{bmatrix} \text{PHON} & X' \\ \text{LXM} & Y' \\ \text{VAL} & Z' \end{bmatrix}$$

- By convention, each dimension of the triplet is left unchanged by the rules except where stated otherwise.

- Rule competition (including the assumption of a general Identity Function Default), block organization, etc. are unchanged.

The PFM grammar is interfaced with an HPSG grammar in the following way:

- The structure of HPSG HEAD values is changed to (30), where *morsyn* is the type for morphosyntactic feature bundles. Subtypes of *morsyn* corresponding to each part of speech specify appropriate features for that part of speech.

(30) $$\begin{bmatrix} \textit{head} & \\ \text{LXM} & \textit{lexemic-index} \\ \text{MORSYN} & \textit{morsyn} \end{bmatrix}$$

- A word meeting the description in (31) is well-formed iff the PFM grammar licenses phonology $\boxed{1}$ and valence $\boxed{2}$ as a realization of the features $\boxed{4}$ for the lexeme $\boxed{3}$.

(31) $$\begin{bmatrix} \text{PHON} & \boxed{1} \\ \text{VAL} & \boxed{2} \\ \text{HEAD} & \begin{bmatrix} \text{LXM} & \boxed{3} \\ \text{MORSYN} & \boxed{4} \end{bmatrix} \end{bmatrix}$$

A.2 Features

A.2.1 Feature inventory

The traditional indicative is taken to be a *realis* mood. The subjunctive and imperative are both instances of *irrealis* mood, the imperative (which has distinct forms only in the 2sg) being distinguished by a binary IMPERATIVE feature.

- FORM: *base*, *infinitive*, *participle* or *finite*[2]

[2]We leave aside gerunds, whose status as parts of inflection is disputable.

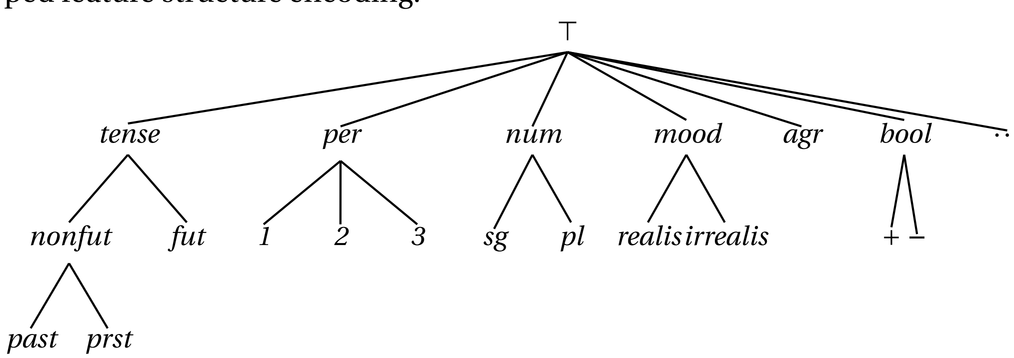
- MOOD: *realis* or *irrealis*.
- IMPERATIVE: + or −.
- TENSE: *present*, *past* or *future*.
- ASPECT: *bounded* or *unbounded*.
- EVIDENCE: *direct* or *indirect*.
- PERFECT: + or −.
- PERSON: 1, 2 or 3.
- NUMBER: *sg* or *pl*.
- POLARITY: + or −.

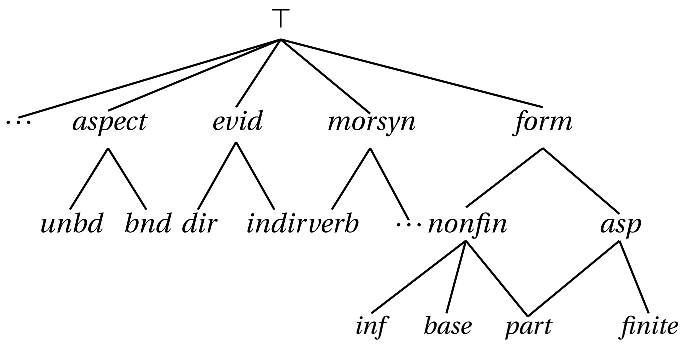
A.2.2 Feature cooccurrence restrictions

In prose:

(32) a. Mood distinctions are available only for finite forms.
b. The imperative is a variety of the irrealis mood.
c. Tense distinctions are available only in realis (indicative) mood.
d. Only finite forms and participles have aspectual distinctions.
e. Evidentiality is relevant only in the past.
f. No bounded present.
g. Only finite forms exhibit agreement.

Typed feature structure encoding:





(33) a. $\mathit{verb} \rightarrow \begin{bmatrix} \textsc{form} & \mathit{form} \\ \textsc{polarity} & \mathit{bool} \end{bmatrix}$

b. $\mathit{finite} \rightarrow \begin{bmatrix} \textsc{mood} & \mathit{mood} \\ \textsc{agr} & \mathit{agr} \end{bmatrix}$

c. $\mathit{asp} \rightarrow \begin{bmatrix} \textsc{aspect} & \mathit{aspect} \\ \textsc{perfect} & \mathit{bool} \end{bmatrix}$

d. $\mathit{agr} \rightarrow \begin{bmatrix} \textsc{per} & \mathit{per} \\ \textsc{nb} & \mathit{num} \end{bmatrix}$

e. $\mathit{realis} \rightarrow \begin{bmatrix} \textsc{tense} & \mathit{tense} \end{bmatrix}$

f. $\mathit{irrealis} \rightarrow \begin{bmatrix} \textsc{imperative} & \mathit{bool} \end{bmatrix}$

g. $\mathit{past} \rightarrow \begin{bmatrix} \textsc{evid} & \mathit{evid} \end{bmatrix}$

h. $\begin{bmatrix} \textsc{tense} & \mathit{prst} \end{bmatrix} \rightarrow \begin{bmatrix} \textsc{aspect} & \mathit{unbd} \end{bmatrix}$

In this encoding morphosyntactic features have nested structures. For instance the description of a 3sg positive simple present is as in (34a). Since the nested structure play no role in rules of exponence, for clarity we flatten the descriptions, as in (34b).

(34) a. Official description of a 3sg positive simple present

$$\begin{bmatrix} \mathit{verb} & \\ \textsc{form} & \begin{bmatrix} \mathit{finite} & \\ \textsc{mood} & \begin{bmatrix} \mathit{realis} & \\ \textsc{tense} & \mathit{prst} \end{bmatrix} \\ \textsc{agr} & \begin{bmatrix} \textsc{per} & 3 \\ \textsc{nb} & \textsc{sg} \end{bmatrix} \\ \textsc{aspect} & \mathit{unbd} \\ \textsc{perfect} & - \end{bmatrix} \\ \textsc{polarity} & + \end{bmatrix}$$

b. Simplified ('flattened') description of a 3sg simple present

$$\begin{bmatrix} \textit{verb} & \\ \text{FORM} & \textit{finite} \\ \text{MOOD} & \textit{realis} \\ \text{TENSE} & \textit{prst} \\ \text{PER} & 3 \\ \text{NB} & \text{SG} \\ \text{ASPECT} & \textit{unbd} \\ \text{PERFECT} & - \\ \text{POLARITY} & + \end{bmatrix}$$

A.3 Rules

Rules are organized in 5 blocks:

- Block I: stem selection
- Block II: aspect
- Block III: TAM and negation
- Block IV: form and aspect
- Block V: (subject) agreement

A.3.1 Block I: stem selection

(35) a. $\begin{bmatrix} \text{LXM} & Y \end{bmatrix}, \sigma : [\,] \longrightarrow \begin{bmatrix} \text{PHON} & \mathsf{stem}_2(Y) \end{bmatrix}$

b. $\begin{bmatrix} \text{LXM} & Y \end{bmatrix}, \sigma : \begin{bmatrix} \text{FORM} & \textit{finite} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{PHON} & \mathsf{stem}_1(Y) \end{bmatrix}$

c. $\begin{bmatrix} \text{LXM} & Y \end{bmatrix}, \sigma : \begin{bmatrix} \text{TENSE} & \textit{past} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{PHON} & \mathsf{stem}_2(Y) \end{bmatrix}$

d. $\begin{bmatrix} \text{LXM} & Y \end{bmatrix}, \sigma : \begin{bmatrix} \text{FORM} & \textit{participle} \\ \text{PERFECT} & - \end{bmatrix} \longrightarrow \begin{bmatrix} \text{PHON} & \mathsf{stem}_1(Y) \end{bmatrix}$

A.3.2 Block II: aspect and form

(36) a. $\begin{bmatrix} \text{PHON} & \text{X} \end{bmatrix}, \sigma : \begin{bmatrix} \text{MOOD} & \textit{realis} \\ \text{ASPECT} & \textit{unbounded} \end{bmatrix} \longrightarrow \begin{bmatrix} \text{PHON} & \mathsf{mi}X \end{bmatrix}$

A.3.3 Block III: TAM and polarity

(37) a. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{POLARITY} & -\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & \mathtt{na}X\end{bmatrix}$

b. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{MOOD} & \textit{realis}\\ \text{ASPECT} & \textit{unbounded}\\ \text{POLARITY} & -\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & \mathtt{ne}X\end{bmatrix}$

c. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{MOOD} & \textit{irrealis}\\ \text{POLARITY} & +\end{bmatrix} \longrightarrow \begin{bmatrix}\mathtt{be}X\end{bmatrix}$

A.3.4 Block IV: form, aspect

(38) a. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{FORM} & \textit{participle}\\ \text{PERFECT} & +\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\mathtt{e}\end{bmatrix}$

b. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{FORM} & \textit{participle}\\ \text{PERFECT} & -\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\mathtt{ande}\end{bmatrix}$

c. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{FORM} & \textit{infinitive}\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\mathtt{an}\end{bmatrix}$

d. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{EVIDENCE} & \textit{indirect}\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\mathtt{e}\end{bmatrix}$

A.3.5 Block V: agreement

Note that the nonperfect past indirect evidence forms are generated directly via the standard block system.

(39) a. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{PER} & \textit{1}\\ \text{NB} & \textit{sg}\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\mathtt{am}\end{bmatrix}$

b. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{PER} & \textit{2}\\ \text{NB} & \textit{sg}\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\mathtt{i}\end{bmatrix}$

c. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{PER} & \textit{2}\\ \text{NB} & \textit{sg}\\ \text{IMPERATIVE} & +\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\end{bmatrix}$

d. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{PER} & \textit{3}\\ \text{NB} & \textit{sg}\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\mathtt{ad}\end{bmatrix}$

e. $\begin{bmatrix}\text{PHON} & X\end{bmatrix},\sigma:\begin{bmatrix}\text{PER} & \textit{3}\\ \text{NB} & \textit{sg}\\ \text{TENSE} & \textit{past}\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & X\end{bmatrix}$

f. $\begin{bmatrix}\textsc{phon} & X\end{bmatrix}, \sigma{:}\begin{bmatrix}\textsc{per} & \mathit{3} \\ \textsc{nb} & \mathit{sg} \\ \textsc{evidence} & \mathit{indirect}\end{bmatrix} \longrightarrow \begin{bmatrix}\textsc{phon} & X\mathsf{ast}\end{bmatrix}$

g. $\begin{bmatrix}\textsc{phon} & X\end{bmatrix}, \sigma{:}\begin{bmatrix}\textsc{per} & \mathit{1} \\ \textsc{nb} & \mathit{pl}\end{bmatrix} \longrightarrow \begin{bmatrix}\textsc{phon} & X\mathsf{im}\end{bmatrix}$

h. $\begin{bmatrix}\textsc{phon} & X\end{bmatrix}, \sigma{:}\begin{bmatrix}\textsc{per} & \mathit{2} \\ \textsc{nb} & \mathit{pl}\end{bmatrix} \longrightarrow \begin{bmatrix}\textsc{phon} & X\mathsf{id}\end{bmatrix}$

i. $\begin{bmatrix}\textsc{phon} & X\end{bmatrix}, \sigma{:}\begin{bmatrix}\textsc{per} & \mathit{3} \\ \textsc{nb} & \mathit{pl}\end{bmatrix} \longrightarrow \begin{bmatrix}\textsc{phon} & X\mathsf{and}\end{bmatrix}$

A.3.6 Portmanteau rules

The present perfect is identified with the indirect bounded past by a pormanteau I-V rule:

(40) $$\begin{bmatrix}\textsc{phon} & X \\ \textsc{lxm} & Y \\ \textsc{val} & Z\end{bmatrix}, \sigma{:}\begin{bmatrix}\textsc{tense} & \mathit{present} \\ \textsc{perfect} & +\end{bmatrix} \longrightarrow \begin{bmatrix}\textsc{phon} & \mathsf{refer}\left(\begin{bmatrix}\textsc{phon} & \mathrm{X} \\ \textsc{lxm} & Y \\ \textsc{val} & Z\end{bmatrix}, \sigma\backslash\begin{bmatrix}\textsc{aspect} & \mathit{bounded} \\ \textsc{perfect} & - \\ \textsc{evidence} & \mathit{indirect}\end{bmatrix}, \text{I-V}\right) \\ \textsc{lxm} & Y \\ \textsc{val} & Z\end{bmatrix}$$

The other perfect forms are generated by a periphrastic rule which is also a portmanteau I-V rule:

(41) $$\begin{bmatrix}\textsc{phon} & X \\ \textsc{lxm} & Y \\ \textsc{val} & Z\end{bmatrix}, \sigma{:}\begin{bmatrix}\textsc{perfect} & +\end{bmatrix} \longrightarrow \begin{bmatrix}\textsc{phon} & \mathsf{refer}\left(\begin{bmatrix}\textsc{lxm} & \mathit{budan}\end{bmatrix}, \sigma\backslash\begin{bmatrix}\textsc{perfect} & - \\ \textsc{aspect} & \mathit{bounded} \\ \textsc{polarity} & +\end{bmatrix}, \text{I-V}\right) \\ \textsc{lxm} & Y \\ \textsc{val} & Z \oplus \left\langle \begin{bmatrix}\textsc{lex} & + \\ \textsc{head} & \begin{bmatrix}\textsc{lxm} & Y \\ \textsc{morsyn} & \sigma\backslash\begin{bmatrix}\textsc{form} & \mathit{participle}\end{bmatrix}\end{bmatrix}\end{bmatrix} \right\rangle\end{bmatrix}$$

The future is generated by a portmanteau I-II rule which:

- Specifies its phonological realization to being *xâh*.
- Subcategorizes for a base form of the lexeme under inflection.

(42) $$\begin{bmatrix}\text{PHON} & X\\ \text{LXM} & Y\\ \text{VAL} & Z\end{bmatrix}, \sigma{:}\begin{bmatrix}\text{TENSE} & \textit{future}\end{bmatrix} \longrightarrow \begin{bmatrix}\text{PHON} & \text{xâh}\\ \text{LXM} & Y\\ \text{V VAL} & Z \oplus \left\langle \begin{bmatrix}\text{LEX} & +\\ \text{HEAD} & \begin{bmatrix}\text{LXM} & Y\\ \text{MORSYN} & \sigma\backslash\begin{bmatrix}\text{FORM} & \textit{base}\end{bmatrix}\end{bmatrix}\end{bmatrix}\right\rangle\end{bmatrix}$$

Negation and agreement endings are realized normally on the head through blocks III-V.

B Conjugation tables

	POS	NEG
1.SG	*mixaram*	*nemixaram*
2.SG	*mixari*	*nemixari*
3.SG	*mixarad*	*nemixarad*
1.PL	*mixarim*	*nemixarim*
2.PL	*mixarid*	*nemixarid*
3.PL	*mixarand*	*nemixarand*

Simple present

	POS	NEG
1.SG	*xaride am*	*naxaride am*
2.SG	*xaride i*	*naxaride i*
3.SG	*xaride ast*	*naxaride ast*
1.PL	*xaride im*	*naxaride im*
2.PL	*xaride id*	*naxaride id*
3.PL	*xaride and*	*naxaride and*

Complex present

	POS	NEG
1.SG	*bexaram*	*naxaram*
2.SG	*bexari*	*naxari*
3.SG	*bexarad*	*naxarad*
1.PL	*bexarim*	*naxarim*
2.PL	*bexarid*	*naxarid*
3.PL	*bexarand*	*naxarand*

Simple subjunctive

	POS	NEG
1.SG	*xaride bâšam*	*naxaride bâšam*
2.SG	*xaride bâši*	*naxaride bâši*
3.SG	*xaride bâšad*	*naxaride bâšad*
1.PL	*xaride bâšim*	*naxaride bâšim*
2.PL	*xaride bâšid*	*naxaride bâšid*
3.PL	*xaride bâšand*	*naxaride bâšand*

Complex subjunctive

	POS	NEG
1.SG	*xaridam*	*naxaridam*
2.SG	*xaridi*	*naxaridi*
3.SG	*xarid*	*naxarid*
1.PL	*xaridim*	*naxaridim*
2.PL	*xaridid*	*naxaridid*
3.PL	*xaridand*	*naxaridand*

Simple bounded past

	POS	NEG
1.SG	*xaride budam*	*naxaride budam*
2.SG	*xaride budi*	*naxaride budi*
3.SG	*xaride bud*	*naxaride bud*
1.PL	*xaride budim*	*naxaride budim*
2.PL	*xaride budid*	*naxaride budid*
3.PL	*xaride budand*	*naxaride budand*

Complex bounded past

	POS	NEG
1.SG	*mixaridam*	*nemixaridam*
2.SG	*mixaridi*	*nemixaridi*
3.SG	*mixarid*	*nemixarid*
1.PL	*mixaridim*	*nemixaridim*
2.PL	*mixaridid*	*nemixaridid*
3.PL	*mixaridand*	*nemixaridand*

Simple unbounded past

	POS	NEG
1.SG	*mixaride am*	*nemixaride am*
2.SG	*mixaride i*	*nemixaride i*
3.SG	*mixaride ast*	*nemixaride ast*
1.PL	*mixaride im*	*nemixaride im*
2.PL	*mixaride id*	*nemixaride id*
3.PL	*mixaride and*	*nemixaride and*

Complex unbounded past

	POS	NEG
1.SG	*xaride bude am*	*naxaride bude am*
2.SG	*xaride bude i*	*naxaride bude i*
3.SG	*xaride bude ast*	*naxaride bude ast*
1.PL	*xaride bude im*	*naxaride bude im*
2.PL	*xaride bude id*	*naxaride bude id*
3.PL	*xaride bude and*	*naxaride bude and*

Complex perfect

	POS	NEG
1.SG	*xâham xarid*	*naxâham xarid*
2.SG	*xâhi xarid*	*naxâhi xarid*
3.SG	*xâhad xarid*	*naxâhad xarid*
1.PL	*xâhim xarid*	*naxâhim xarid*
2.PL	*xâhid xarid*	*naxâhid xarid*
3.PL	*xâhand xarid*	*naxâhand xarid*

Future

	POS	NEG
IMPERATIVE (2.SG)	*bexar*	*naxar*
BARE FORM	*xarid*	naxarid
INFINITIVE	*xaridan*	*naxaridan*
PRST PART.	*xarande*	—
PERFECT PART.	*xaride*	*naxaride*
GERUNDIVE	*xarân*	—

Other forms

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