# Systemic polyfunctionality and morphology-syntax interdependencies

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Defaults in Morphological Theory
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# The basic problem: Systemic Polyfunctionality

- Cross-linguistically person/number markers (PNMs) in verbal paradigms often exhibit similarities (up to identity) with person/number markers in nominal possessive constructions (Allen 1964, Radics 1980, Siewierska 1998, 2004, among others):
- When a language has distinct PNM paradigms for verbal subject (S/A) and object (O) indexing, a question arises: Which paradigm does the possessive paradigm align with?

(1) Retuarã (Tucanoan) — S/A alignment

bĩre yi-hãã-aʔsi yi-behoa-pi
2SG 1SG-kill-NEG.IMP 1SG-spear-INSTR

'(Be careful), lest I kill you with my spear' (Strom 1992:63)

(2) Kilivila (Central-Eastern Malayo-Polynesian) — O alignment

lube-gu ku-sake-gu buva
friend-1SG 2SG-give-1SG betel_nut

'My friend, do you give me betel nuts?' (Senft 1986:53)

# The basic problem: Systemic Polyfunctionality

- Among the 130 relevant languages in Sierwieska's (1998) sample she observes that,

> *We see that [...], among the languages in the sample the affinities in form between the possessor affixes and the verbal person markers of the O (41%) are just marginally more common than those with the S/A (39%).* *(Siewierska 1998:2)*

- There are, by hypothesis, systemic properties of specific grammars, rather than language independent universals, that explain the alignments observed.
- The languages compared by Siewierska appear to have distinct markers for S/A and O, and the question asked is which paradigm appears in possessive marking.

# The basic problem: Systemic Polyfunctionality

- The empirical question for Tundra Nenets is different: given (as shown below) that it has a verbal paradigm which indexes only SUBJ person/number properties and another that indexes the person/number of the SUBJ and the number of the OBJ, which paradigm does the Possessive paradigm align with?

1. The same PNM formatives are deployed in different parts of an inflectional system.
2. They serve different functions depending on the lexical category of word construction or syntactic construction they appear in:
   - 2.1 Variation with respect to what they index:
     - both arguments in a two-place relation, i.e., verbal object agreement, possessive marking, prenominal relative;
     - one argument in a two place relation, i.e., postpositions, predestinatives; or
     - one argument in a one place relation, i.e., subject agreement in nonfinite verbs.
   - 2.2 Variation with respect to the type associated with the PNM, i.e., pronominal versus agreement.
3. Each form invariantly specifies person/number properties across all uses.

# The basic problem: Systemic Polyfunctionality

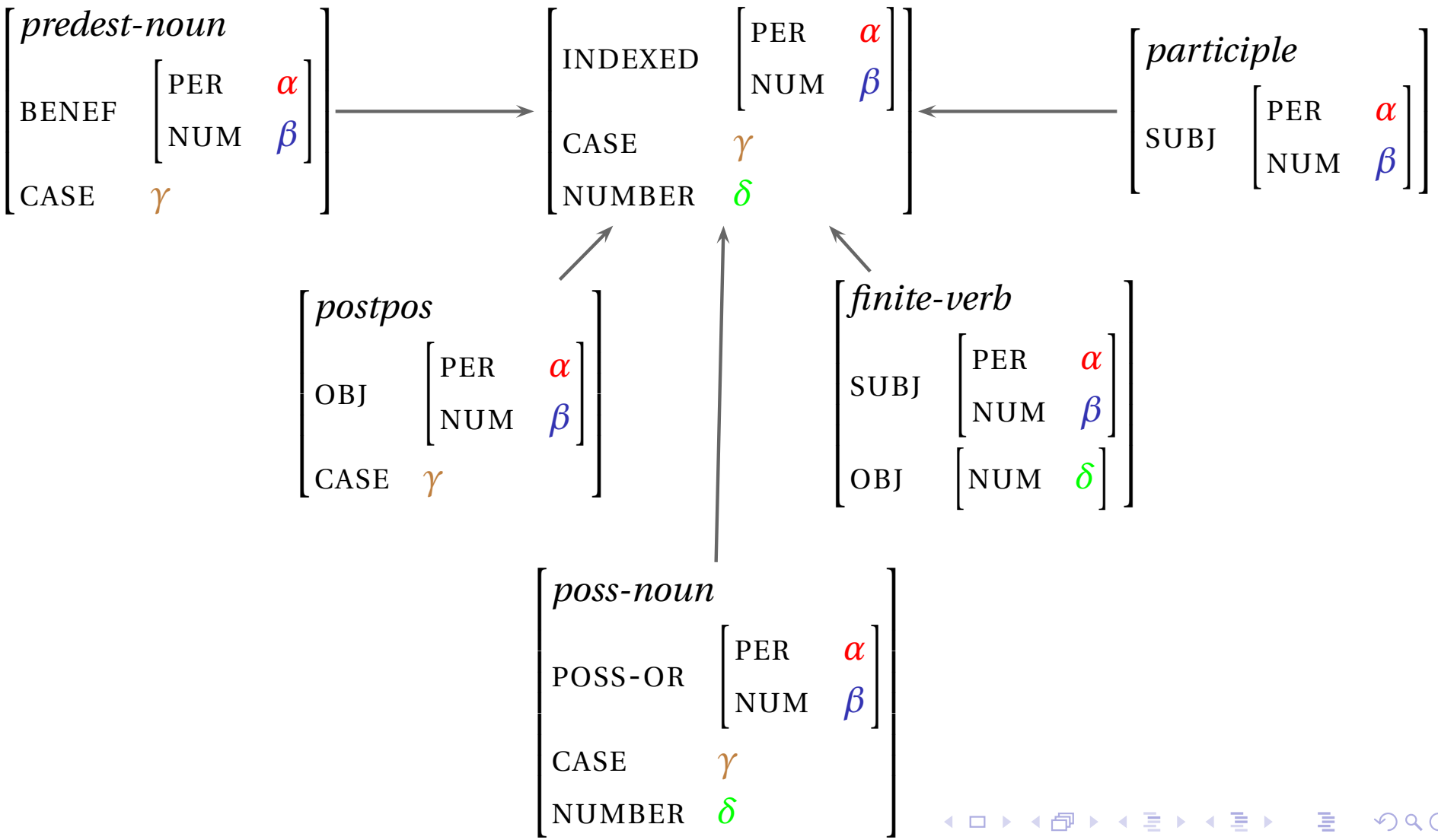
Question 1 How does one account for similarities and differences, i.e., variation, among (classes of) words with shared formatives?

☞ Tundra Nenets is a fascinating testing ground, because it combines polyfunctionality with cumulative exponence: single paradigm indexing two sets of features.

- There are different ways of addressing this question, in terms of different types of formal frameworks.

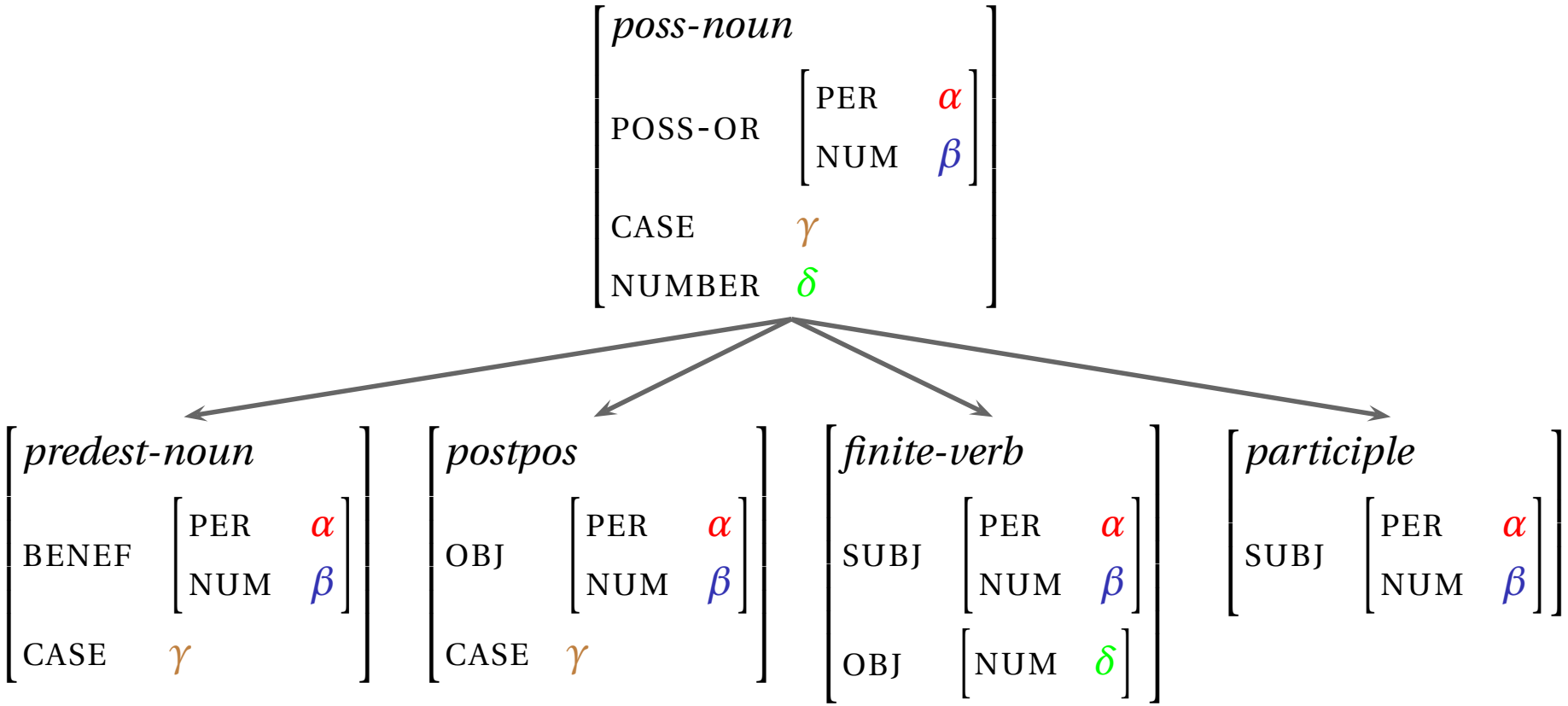
# The abstractive view

- Basic strategy: Identify unifying generalizations across particular word patterns in a way that allows for abstracting away a common feature



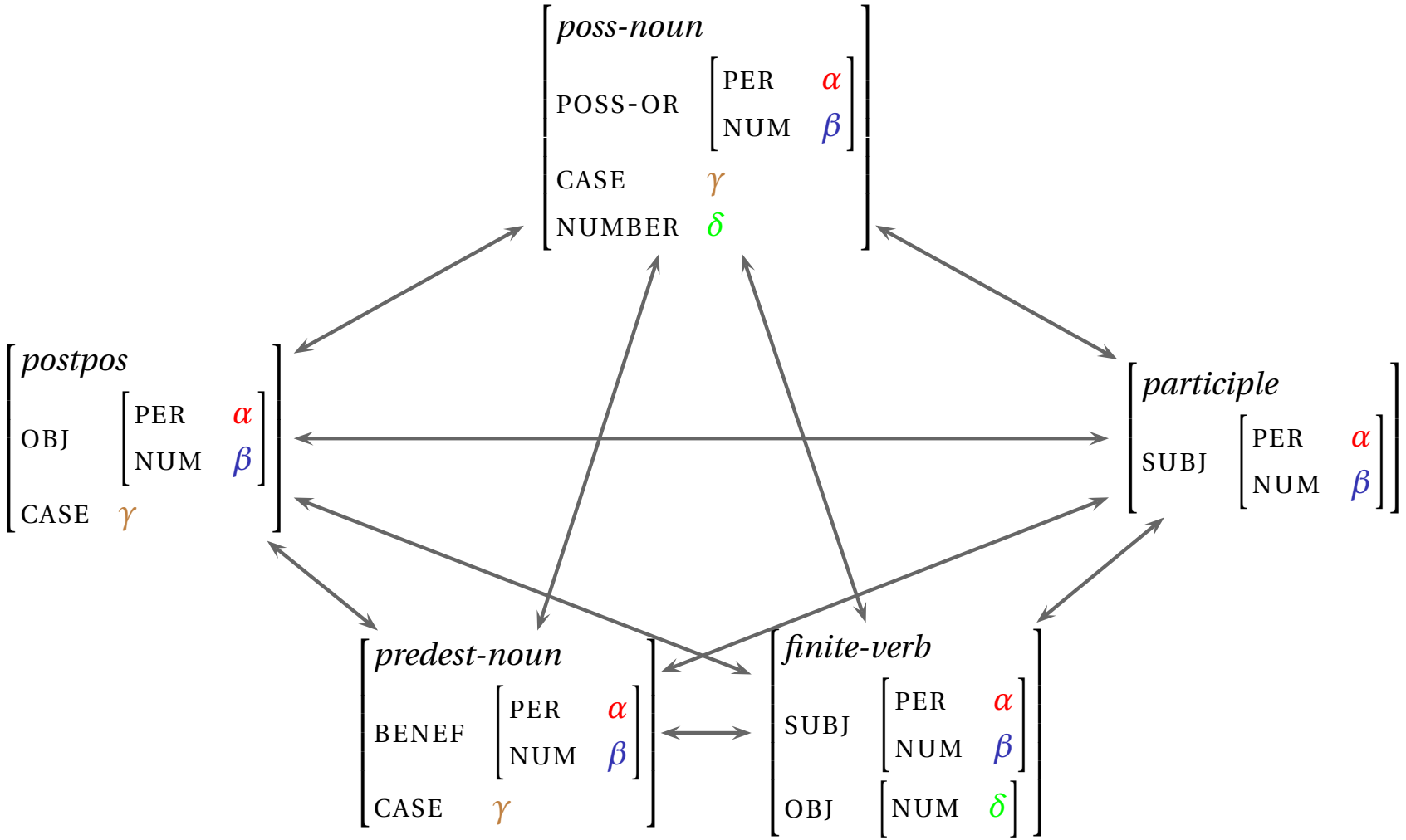
# A default inheritance based view

- Basic strategy: One feature template is exemplary, specific values are over-ridden in individual word patterns.



# A pattern-theoretic view

- Word pattern network: each individual word pattern is directly related to all other patterns with similarity and difference calculated with respect to relations (Malouf's presentation)



# Goals of this talk

Question 2 How does systemic polyfunctionality bear on the nature of morphological organization?

☞ On the assumption that both of these frameworks allow for a comprehensive description, does either of them address the question of motivation for the structure of the system?

- We will:
  - Provide an abstractive formal description of this dataset in terms of PFM and SBCG.
  - Compare it to a pattern-based alternative.
  - Discuss to what extent these alternative bear on the issue of motivation.
  - Outline informally a possible systemic motivation.

# Outline

1. The problem exemplified in Tundra Nenets: the paradigm and the constructions it appears in.
2. A theoretical, abstractive proposal, combining ideas from Paradigm Function Morphology (Stump, 2001) and Sign-Based Construction Grammar (Sag, 2010).
3. Towards a Word and Paradigm, Pattern-theoretic analysis

# The problem exemplified: Tundra Nenets

# Tundra Nenets

- Along with Forest Nenets, belongs to the Nenets sub-branch of the Samoyedic branch of the Uralic language family.
- Spoken in the Arctic part of European Russia and northwestern Siberia between the Kanin Peninsula in the west and the Yenisei river delta in the east.
- Currently about 25,000 speakers.

Primary reseach on Tundra Nenets was generously supported by a Hans Rausing Language Documentation Grant 2003-2006 with Irina Nikolaeva and Tapani Salminen, and continues under Irina Nikolaeva who is writing a descriptive morphosyntax of the language. Elicitation was primarily in Russian and sometimes Nenets, since the Nenets are generally bi-lingual. We thank our primary consultants Galina Koreneva and Amda Lambdo, also Maria Barmič.

# Relevant grammatical features

- Morphological:
  1. Largely agglutinative with some cumulative markers
  2. 3 nominal declension types: ABSOLUTE, POSSESSED and PREDESTINATIVE
  3. 3 nominal stem types ending in V, C, or a glottal stop, either -q or -h.
  4. Polyfunctional person markers realising person and number.
  5. 3 persons: 1, 2, 3
  6. 3 numbers: SINGULAR, DUAL, PLURAL
  7. 7 nominal cases: grammatical (NOMINATIVE, ACCUSATIVE, GENITIVE, local (DATIVE, LOCATIVE, ABLATIVE, PROSECUTIVE)
  8. 3 verbal conjugations: SUBJECTIVE, OBJECTIVE and REFLEXIVE
  9. Many non-finite forms, most of which inflect for pronominal subject
  10. Postpositions inflect for pronominal object
- Syntactic:
  1. SOP, where P = V, N, A
  2. Numerous nonfinite clauses
  3. Prenominal externally headed relative clauses

# Absolute and possessed nouns

- Nominal inflection distinguishes two subparadigms
  - The absolute paradigm is used when there is no possessor or the possessor is pronominal; it indexes case and number.

| NOM | ACC | GEN | DAT | LOC | ABL | PROS |
|---|---|---|---|---|---|---|
| ti | tim | tih | ten°h | tex°na | texød | tew°na |
| tex°h | tex°h | tex°h | | periphrastic | | |
| tíq | tí | tíq | tex°q | tex°qna | texøt° | teqm°na |

  - The possessed paradigm is used when there is a pronominal possessor; indexes case, number, and possessor person and number.

(3) a. Werah-h ti
wera-GEN.SG reindeer[NOM.SG]
'Wera's reindeer'

b. te-da
reindeer[NOM.SG]-3SG
'his/her reindeer'

# The paradigm of possessed nouns

| | | POSSESSOR | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | SINGULAR | | | DUAL | | | PLURAL | | |
| | | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| SG | NOM | -m° | -r° | -da | -m'ih | -r'ih | -d'ih | -maq | -raq | -doh |
| | ACC | -m° | -mt | -mta | -m'ih | -mt'ih | -mt'ih | -maq | -mtaq | -mtoh |
| | GEN | -n° | -nt° | -nta | -n'ih | -nt'ih | -nt'ih | -naq | -ntaq | -ntoh |
| | DAT | -xøn° | -xønt° | -x°nta | -x°n'ih | -x°nt'ih | -x°nt'ih | -x°naq | -x°ntaq | -x°ntoh |
| | LOC | -x°nan° | -x°nant° | -x°nanta | -x°nan'ih | -x°nant'ih | -x°nant'ih | -x°nanaq | -x°nantaq | -x°nantoh |
| | ABL | -x°døn° | -x°dønt° | -x°dønta | -x°døn'ih | -x°dønt'ih | -x°dønt'ih | -x°dønaq | -x°døntaq | -x°døntoh |
| | PROS | -m°nan° | -m°nant° | -m°nanta | -m°nan'ih | -m°nant'ih | -m°nant'ih | -m°nanaq | -m°nantaq | -m°nantoh |
| DU | NOM | -x°yun° | -x°yud° | -x°yuda | -x°yun'ih | -x°yud'ih | -x°yud'ih | -x°yunaq | -x°yudaq | -x°yudoh |
| | ACC | -x°yun° | -x°yud° | -x°yuda | -x°yun'ih | -x°yud'ih | -x°yud'ih | -x°yunaq | -x°yudaq | -x°yudoh |
| | GEN | -x°yun° | -x°yut° | -x°yuta | -x°yun'ih | -x°yut'ih | -x°yut'ih | -x°yunaq | -x°yutaq | -x°yutoh |
| PL | NOM | -n° | -d° | -da | -n'ih | -d'ih | -d'ih | -naq | -daq | -doh |
| | ACC | -n° | -d° | -da | -n'ih | -d'ih | -d'ih | -naq | -daq | -doh |
| | GEN | -qn° | -t° | -ta | -qn'ih | -t'ih | -t'ih | -qnaq | -taq | -toh |
| | DAT | -xøqn° | -xøt° | -x°ta | -x°qn'ih | -x°t'ih | -x°t'ih | -x°qnaq | -x°taq | -x°toh |
| | LOC | -x°qnan° | -x°qnant° | -x°qnata | -x°qnan'ih | -x°qnat'ih | -x°qnat'ih | -x°qnanaq | -x°qnataq | -x°qnatoh |
| | ABL | -x°tøn° | -x°tøt° | -x°tøta | -x°tøn'ih | -x°tøt'ih | -x°tøt'ih | -x°tønaq | -x°tøtaq | -x°tøtoh |
| | PROS | -qm°nan° | -qm°nat° | -qm°nata | -qm°nan'ih | -qm°nat'ih | -qm°nat'ih | -qm°nanaq | -qm°nataq | -qm°natoh |

# Subjective and objective finite verbs

- Finite verbs have three conjugations: subjective, objective and reflexive
- The subjective and reflexive conjugations index just one argument
- The objective conjugation:
  - is used for transitive verbs with a topical third person objects
  - indexes subject person and number and object number

(4) a. 'What happened?'

xasawa ti-m xada°
man reindeer-ACC kill[SUBJ.3SG]

'A man killed a reindeer.'

b. 'What did the man do to the reindeer?'

i. xasawa ti-m xada°-da
man reindeer-ACC kill-OBJ.SG.3SG
'The man killed the reindeer.'

ii. xasawa xada°-da
man kill-OBJ.SG.3SG
'The man killed it.'

(Dalrymple & Nikolaeva 2011: 128)

# Reusable exponents: finite verbs

- The exponents for finite verbs in the objective conjugation coincide with the nominative exponents for possessed nouns.

| SUBJECT ~NOM \ OBJECT ~ POSSESSOR | SINGULAR | | | DUAL | | | PLURAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| SG | -m° | -r° | -da | -m'ih | -r'ih | -d'ih | -maq | -raq | -doh |
| DU | -x°yun° | -x°yud° | -x°yuda | -x°yun'ih | -x°yud'ih | -x°yud'ih | -x°yunaq | -x°yudaq | -x°yudoh |
| PL | -n° | -d° | -da | -n'ih | -d'ih | -d'ih | -naq | -daq | -doh |

☞ possessed nouns: ⟨ case/number of self, possessor ⟩
finite verbs: ⟨ object number , subject ⟩

# Simple and pronominal local postpositions

- Local postpositions inflect for local case

| DAT | LOC | ABL | PROS |
|---|---|---|---|
| nyah | nyana | nyad° | nyamna |

- Pronominal objects of local postpositions are expressed morphologically as suffixes

(5) a. Wera-h nya-h wəsadey°q
Wera-GEN at-DAT turn-REFL.3SG
'He turned to Wera.'

b. nya-øn° wəsadey°q
at-DAT.1SG turn-REFL.3SG
'He turned to me.'

# Reusable exponents: local postpositions

- Strong overlap between the exponents of pronominal objects of postpositions and the exponents for singular possessed nouns.

| | | SINGULAR | | | DUAL | | | PLURAL | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| SG | DAT | -xøn° | -xønt° | -x°nta | -x°n'ih | -x°nt'ih | -x°nt'ih | -x°naq | -x°ntaq | -x°ntoh |
| | LOC | -x°nan° | -x°nant° | -x°nanta | -x°nan'ih | -x°nant'ih | -x°nant'ih | -x°nanaq | -x°nantaq | -x°nantoh |
| | ABL | -x°døn° | -x°dønt° | -x°dønta | -x°døn'ih | -x°dønt'ih | -x°dønt'ih | -x°dønaq | -x°døntaq | -x°døntoh |
| | PROS | -m°nan° | -m°nant° | -m°nanta | -m°nan'ih | -m°nant'ih | -m°nant'ih | -m°nanaq | -m°nantaq | -m°nantoh |

Paradigm of singular possessed nouns

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | DAT | -øn° | -ønt° | -°nta | -°n'ih | -°nt'ih | -°nt'ih | -°naq | -°ntaq | -°ntoh |
| | LOC | -nan° | -nant° | -nanta | -nan'ih | -nant'ih | -nant'ih | -nanaq | -nantaq | -nantoh |
| | ABL | -døn° | -dønt° | -dønta | -døn'ih | -dønt'ih | -dønt'ih | -dønaq | -døntaq | -døntoh |
| | PROS | -mnan° | -mnant° | -mnanta | -mnan'ih | -mnant'ih | -mnant'ih | -mnanaq | -mnantaq | -mnantoh |

Paradigm of postpositions

☞ possessed nouns: ⟨ case/number of self, possessor ⟩
local postpositions: ⟨ case , object ⟩

# Predestinative nouns

- In addition to their absolute and possessed forms, nouns have predestinative forms indexing the presence of a beneficiary or future possessor:

(6) Masha-n° (pidər°) kniga-da-mt° m'iŋa-d°m
Masha-DAT (you) book-PRED-ACC.2SG give-1SG
'I gave Masha a book for you.'

- Marked by suffix dø
- Predestinatives inflect for grammatical case and beneficiary person and number, but not for number.

(7) a. Wata-h ŋəno-d°
Wata-GEN boat-PRED
'boat/boats for Wata'

b. ŋəno-də-r°
boat-PRED-NOM.2SG
'your boat/boats'

# Reusable exponents: predestinatives

- Predestinatives and possessed nouns rely on precisely the same person-number markers

| | SINGULAR | | | DUAL | | | PLURAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| NOM | -m° | -r° | -da | -m'ih | -r'ih | -d'ih | -maq | -raq | -doh |
| ACC | -m° | -mt | -mta | -m'ih | -mt'ih | -mt'ih | -maq | -mtaq | -mtoh |
| GEN | -n° | -nt° | -nta | -n'ih | -nt'ih | -nt'ih | -naq | -ntaq | -ntoh |

Paradigm of singular possessed nouns

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| NOM | -dømº | -dørº | -dºda | -dºm'ih | -dºr'ih | -dºd'ih | -dºmaq | -dºraq | -dºdoh |
| ACC | -dømº | -dømt | -dºmta | -dºm'ih | -dºmt'ih | -dºmt'ih | -dºmaq | -dºmtaq | -dºmtoh |
| GEN | -dønº | -dønt° | -dºnta | -dºn'ih | -dºnt'ih | -dºnt'ih | -dºnaq | -dºntaq | -dºntoh |

Paradigm of predestinative nouns

☞ possessed nouns: ⟨ case/number of self, possessor ⟩
predestinatives: ⟨ case , beneficiary ⟩

# Nonfinite forms

- Verbs have numerous nonfinite forms which head various types of embedded clauses (including relative clauses)
- Nonfinite forms may take a local subject. If the subject is pronominal, it is realized affixally on the nonfinite head verb.

(8) a. [ xad°-nta wəyarəy°bt'e-b°q] ŋædalaŋku-naq
snowstorm-GEN.3SG stop-SUBORD travel-FUT-REFL.1PL
'We will travel when the snowstorm stops.'

b. [ yəxa-m mədabə-b°q-nantoh] pane-n-ta wæs°-q
river-ACC cross-SUBORD-3PL cloth-GEN-3SG edge-PL
səqn'e-wi°-q
become_wet-NARR-3PL
'When they cross the river, her clothe's edges became wet.'

# Reusable exponents: participles

- The exponents for pronominal subjects on participles coincide with the genitive singular exponents for pronominal possessors on possessed nouns.

SUBJECT ~ POSSESSOR

| – ~ GEN.SG | SINGULAR | | | DUAL | | | PLURAL | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| | -n° | -nt° | -nta | -n'ih | -nt'ih | -nt'ih | -xønaq | -xøntaq | -xøntoh |

☞ possessed nouns: ⟨ case/number of self, possessor ⟩
participles: ⟨ — , subject ⟩

# Possessive relative constructions

- The possessed noun construction and the nonfinite construction are redeployed within a prenominal relative construction:

☞ Ackerman & Nikolaeva (to appear), Descriptive typology and linguistic theory

(9) a. [ Wera-h ta-wi°] ti
Wera-GEN ta-PART.PERF reindeer
'the reindeer Wera gave'

b. [ (pida) ta-wi°] te-da
he/she.NOM ta-PART.PERF reindeer-3SG
'the reindeer Wera gave'

☞ The PNM marker on the noun is expressing the pronominal subject of the embedded verb.

- Higher order polyfunctionality

# Reusable exponents: summary

| | | |
|---|---|---|
| possessed nouns: | ⟨ case/number of self, | possessor ⟩ |
| finite verbs: | ⟨ object number, | subject ⟩ |
| local postpositions: | ⟨ case, | pron. object ⟩ |
| predestinatives: | ⟨ case, | beneficiary ⟩ |
| participles: | ⟨ —, | subject ⟩ |

- Conclusion
  - There are systematic analogies between exponents occurring on different categories
  - However there are systematic differences in the syntactic features that are expressed by these exponents

# An abstractive analysis

# Goals of this section

- Provide a first pass at a thorough analysis of the data, in the form of
  1. A PFM analysis of the morphotactics
  2. An analysis of the morphology-syntax interface that combines PFM with Sign-Based Construction Grammar

# Morphotactics

- Exponence of CASE.NUMBER and possessor PERSON.NUMBER is mostly agglutinative.

☞ Contrast accusative and genitive, singular and plural:

| | | ACCUSATIVE | | GENITIVE | |
|---|---|---|---|---|---|
| | | SG | PL | SG | PL |
| ABSOLUTE | | ti-m | tí | ti-h | tí-q |
| | 1 | te-w-° | tí-n-° | te-n-° | tí-q-n-° |
| SG | 2 | te-m-t° | tí-d° | te-n-t° | tí-(q)-t° |
| | 3 | te-m-ta | tí-da | te-n-ta | tí-(q)-ta |
| | 1 | te-m-yih | tí-n-yih | te-n-yih | tí-q-n-yih |
| DU | 2 | te-m-tyih | tí-dyih | te-n-tyih | tí-(q)-tyih |
| | 3 | te-m-tyih | tí-dyih | te-n-tyih | tí-(q)-tyih |
| | 1 | te-w-aq | tí-n-aq | te-n-aq | tí-q-n-aq |
| PL | 2 | te-m-taq | tí-daq | te-n-taq | tí-(q)-taq |
| | 3 | te-m-toh | tí-doh | te-n-toh | tí-(q)-toh |

# Morphotactics

- Some CASE.NUMBER values have different exponents in the absolute and possessed forms.

☞ Dative singular:

| | | SG | pl |
|---|---|---|---|
| ABSOLUTE | | te-n°-h | te-x°-q |
| | 1 | te-x°-n-° | te-x°-q-n-° |
| SG | 2 | te-x°-n-t° | te-x°-q-t° |
| | 3 | te-x°-n-ta | te-x°-q-ta |
| | 1 | te-x°-n-yih | te-x°-q-n-yih |
| DU | 2 | te-x°-n-tyih | te-x°-q-tyih |
| | 3 | te-x°-n-tyih | te-x°-q-tyih |
| | 1 | te-x°-n-aq | te-x°-q-n-aq |
| PL | 2 | te-x°-n-taq | te-x°-q-taq |
| | 3 | te-x°-n-toh | te-x°-q-toh |

# Morphotactics

- Local cases are mostly parasitic on the genitive.
- ☞ Contrast genitive and locative, singular and plural:

| | | GENITIVE | | LOCATIVE | |
|---|---|---|---|---|---|
| | | SG | PL | SG | PL |
| ABSOLUTE | | ti-h | tí-q | te-x°na | te-x°-q-na |
| | 1 | te-n-° | tí-q-[n]-° | te-x°na-n-° | te-x°-q-na-[n]-° |
| SG | 2 | te-n-t° | tí-(q)-t° | te-x°na-n-t° | te-x°-q-na-t° |
| | 3 | te-n-ta | tí-(q)-ta | te-x°na-n-ta | te-x°-q-na-ta |
| | 1 | te-n-yih | tí-q-[n]-yih | te-x°na-n-yih | te-x°-q-na-[n]-yih |
| DU | 2 | te-n-tyih | tí-(q)-tyih | te-x°na-n-tyih | te-x°-q-na-tyih |
| | 3 | te-n-tyih | tí-(q)-tyih | te-x°na-n-tyih | te-x°-q-na-tyih |
| | 1 | te-n-aq | tí-q-[n]-aq | te-x°na-n-aq | te-x°-q-na-[n]-aq |
| PL | 2 | te-n-taq | tí-(q)-taq | te-x°na-n-taq | te-x°-q-na-taq |
| | 3 | te-n-toh | tí-(q)-toh | te-x°na-n-toh | te-x°-q-na-toh |

# Morphotactics

- Some amount of cumulative exponence between CASE.NUMBER and possessor PERSON.NUMBER

☞ Contrast nominative and accusative, singular and plural:

| | | NOMINATIVE | | ACCUSATIVE | |
|---|---|---|---|---|---|
| | | SG | PL | SG | PL |
| ABSOLUTE | | ti | ti-q | ti-m | tí |
| | 1 | te-[w]-° | tí-[n]-° | te-w-° | tí-[n]-° |
| SG | 2 | te-[r]-° | tí-d° | te-m-t° | tí-d° |
| | 3 | te-da | tí-da | te-m-ta | tí-da |
| | 1 | te-[w]-yih | tí-[n]-yih | te-m-yih | tí-[n]-yih |
| DU | 2 | te-[r]-yih | tí-dyih | te-m-tyih | tí-dyih |
| | 3 | te-dyih | tí-dyih | te-m-tyih | tí-dyih |
| | 1 | te-[w]-aq | tí-[n]-aq | te-w-aq | tí-[n]-aq |
| PL | 2 | te-[r]-aq | tí-daq | te-m-taq | tí-daq |
| | 3 | te-doh | tí-doh | te-m-toh | tí-doh |

# A simple position class analysis

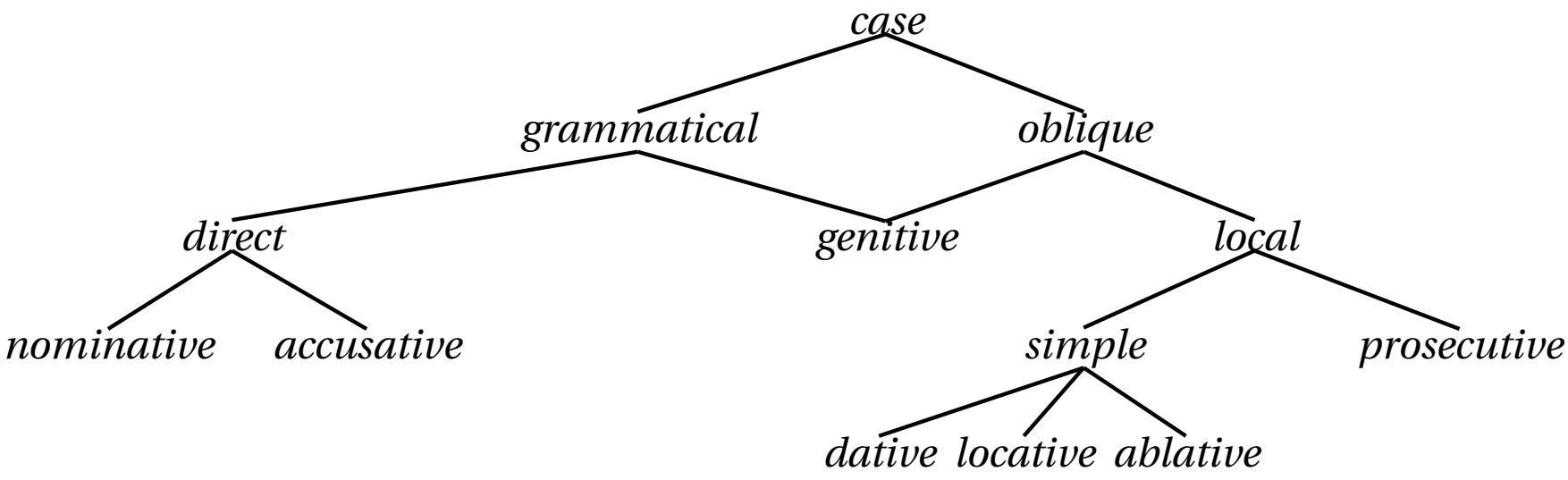
- Position class analysis, mostly following Salminen (1997)

| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | CASE | CASE.N.NUM | CASE.NUM | CASE.NB.POSS | CASE.NB.POSS | POSS |
| stem | xø | q | na | m | t | ø |
| | | xøyu | tø | n | r | a |
| | | | møna | q | m | yih |
| | | | | | n | aq |
| | | | | | | oh |

- Stem alternations, mainly setting appart plural grammatical cases
- Presupposes numerous sandhi rules, among which
  - m→w intervocally
  - q→ ∅ before obstruents
  - n→h word finally

# A PFM analysis of the position class system

- Hierarchically organized feature values, à la HPSG/SBCG.




- 7 rule blocks:

Block 0 Stem selection

$X_N, \sigma : \{\text{CASE } \textit{grammatical}, \text{NB } \textit{pl}\} \longrightarrow$ X's special stem

Block 1 $X_N, \sigma : \{\text{CASE } \textit{simple}, \} \longrightarrow$ Xxø

Block 2 $X_N, \sigma : \{\text{CASE } \textit{oblique}, \text{NB } \textit{pl}\} \longrightarrow$ Xq

$X_N, \sigma : \{\text{NB } \textit{du}\} \longrightarrow$ Xxøyu

# A PFM analysis of the position class system

Block 3
$X_N, \sigma$ : {CASE *locative*} ⟶ Xna
$X_N, \sigma$ : {CASE *ablative*} ⟶ Xtø
$X_N, \sigma$ : {CASE *prosecutive*} ⟶ Xmøna

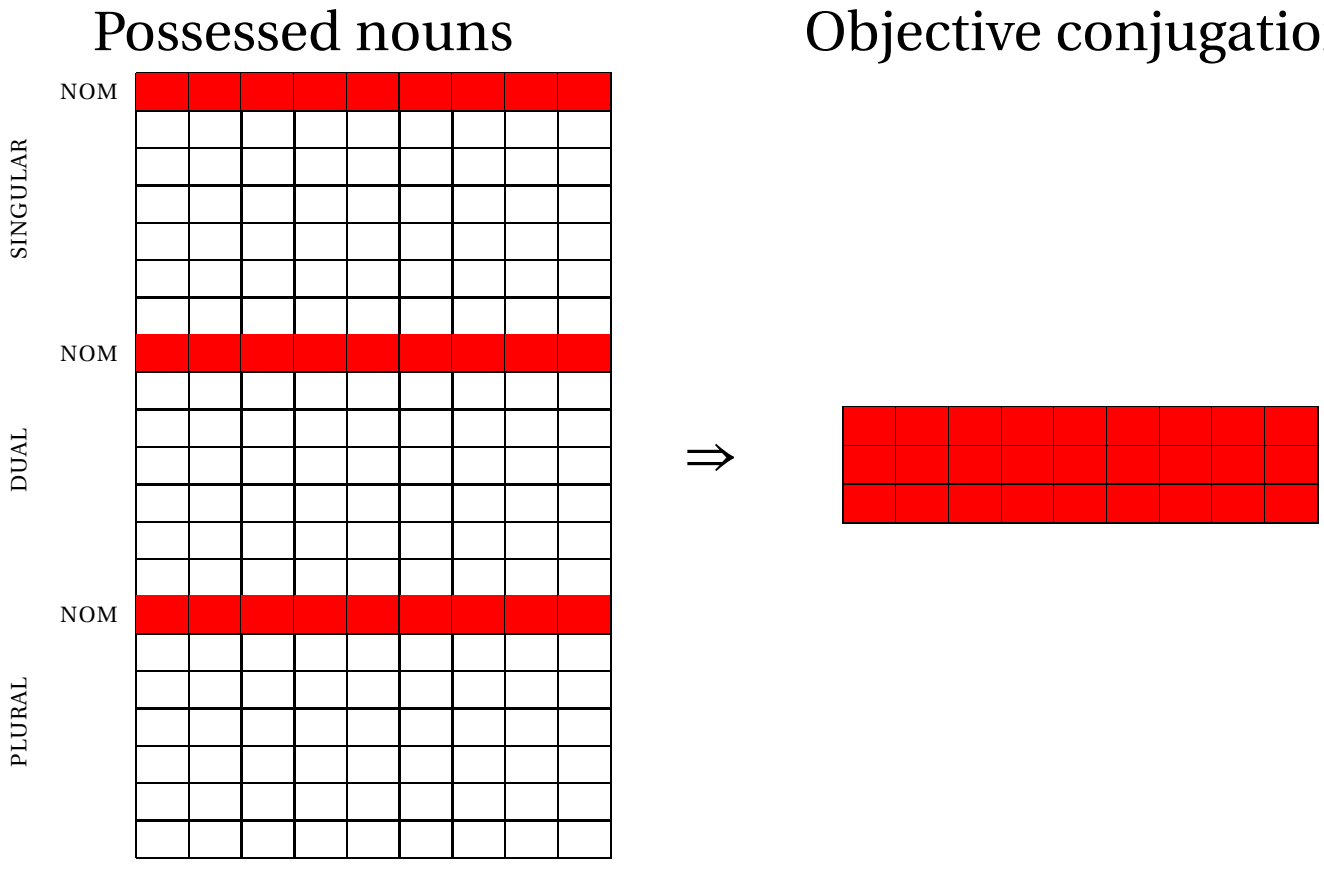
Block 4
$X_N, \sigma$ : {CASE *acc*, NB *sg*} ⟶ Xm
$X_N, \sigma$ : {CASE *oblique*, NB *sg*} ⟶ Xn
$X_N, \sigma$ : {CASE *oblique*, NB *nonsg*, POSS {PER *nonfirst*}} ⟶ Xq

Block 5
$X_N, \sigma$ : {POSS {PER *nonfirst*}} ⟶ Xt
$X_N, \sigma$ : {CASE *nom*, NB *sg*, POSS {PER *2*}} ⟶ Xr
$X_N, \sigma$ : {CASE *nom*, NB *sg*, POSS {PER *1*}} ⟶ Xm
$X_N, \sigma$ : {NB *nonsg*, POSS {PER *1*}} ⟶ Xn

Block 6
$X_N, \sigma$ : {POSS {NB *sg*}} ⟶ Xø
$X_N, \sigma$ : {POSS {NB *sg*, PER *3*}} ⟶ Xa
$X_N, \sigma$ : {POSS {NB *du*}} ⟶ Xyih
$X_N, \sigma$ : {POSS {NB *pl*}} ⟶ Xaq
$X_N, \sigma$ : {POSS {NB *pl*, PER *3*}} ⟶ Xoh

# The main empirical point

- All double indexing paradigms use bits of the possessed noun paradigm



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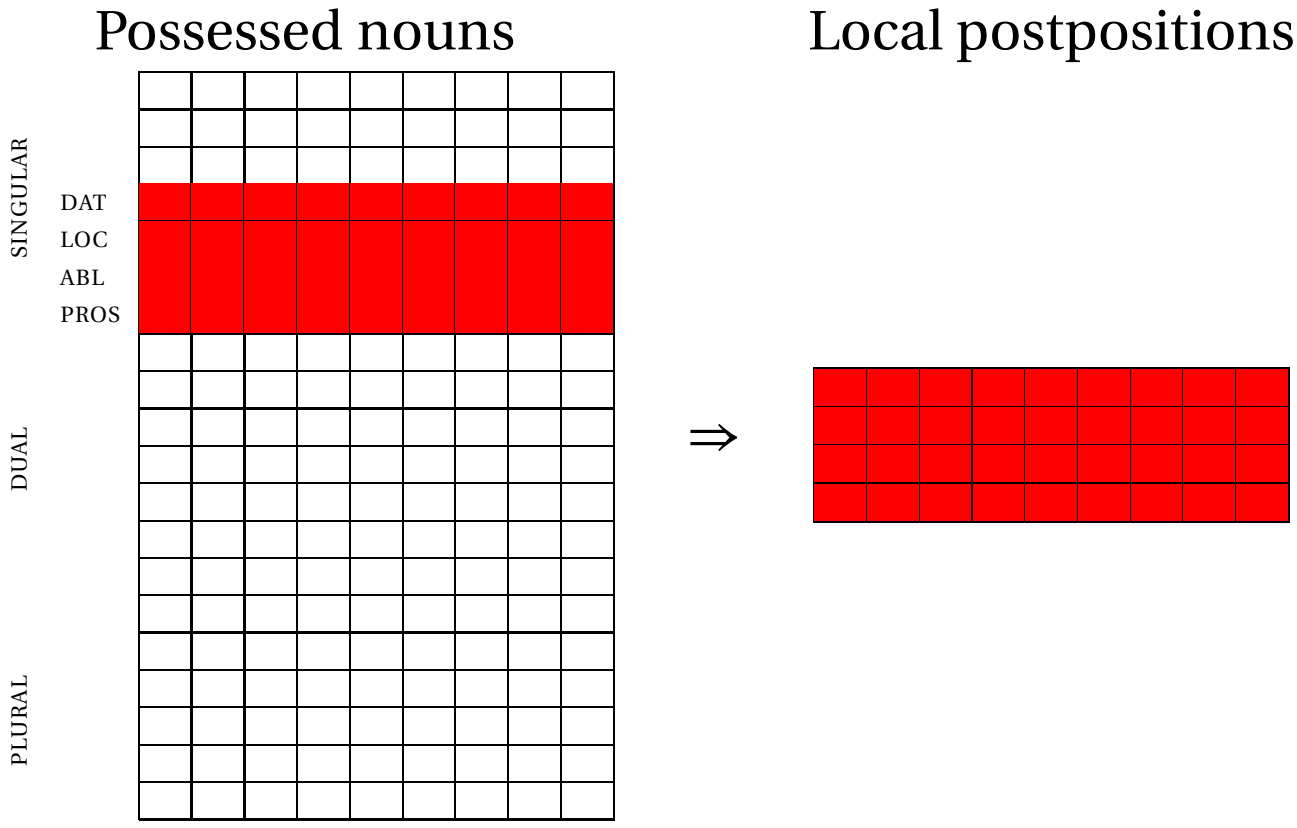

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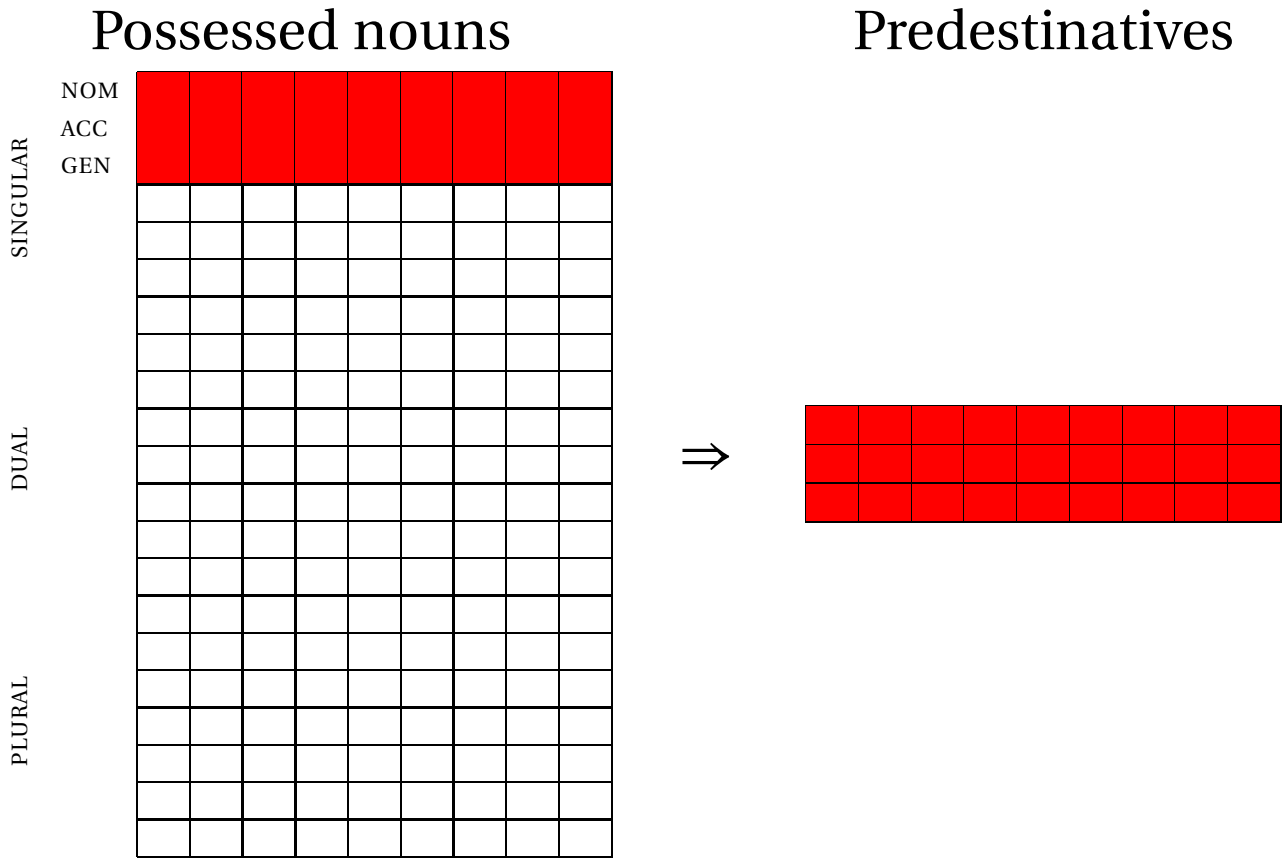
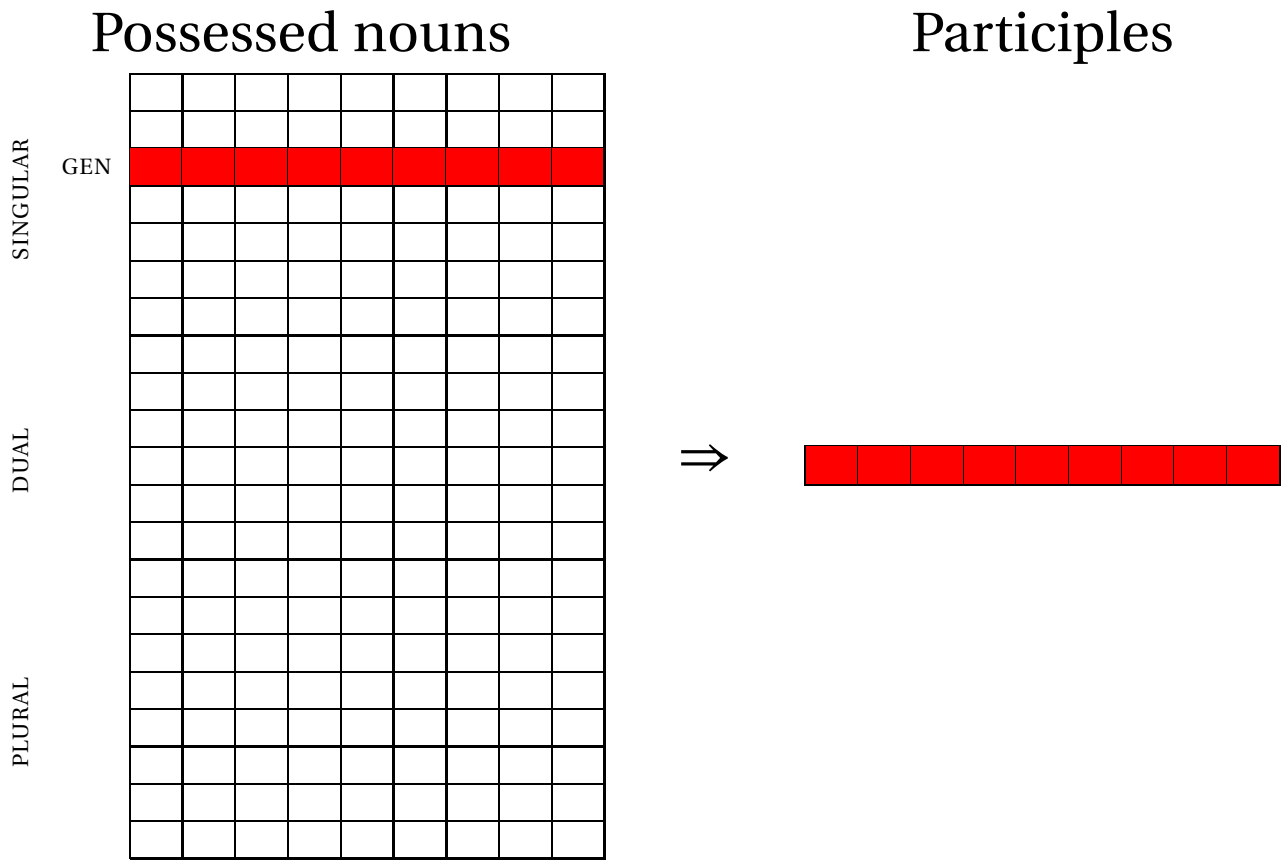


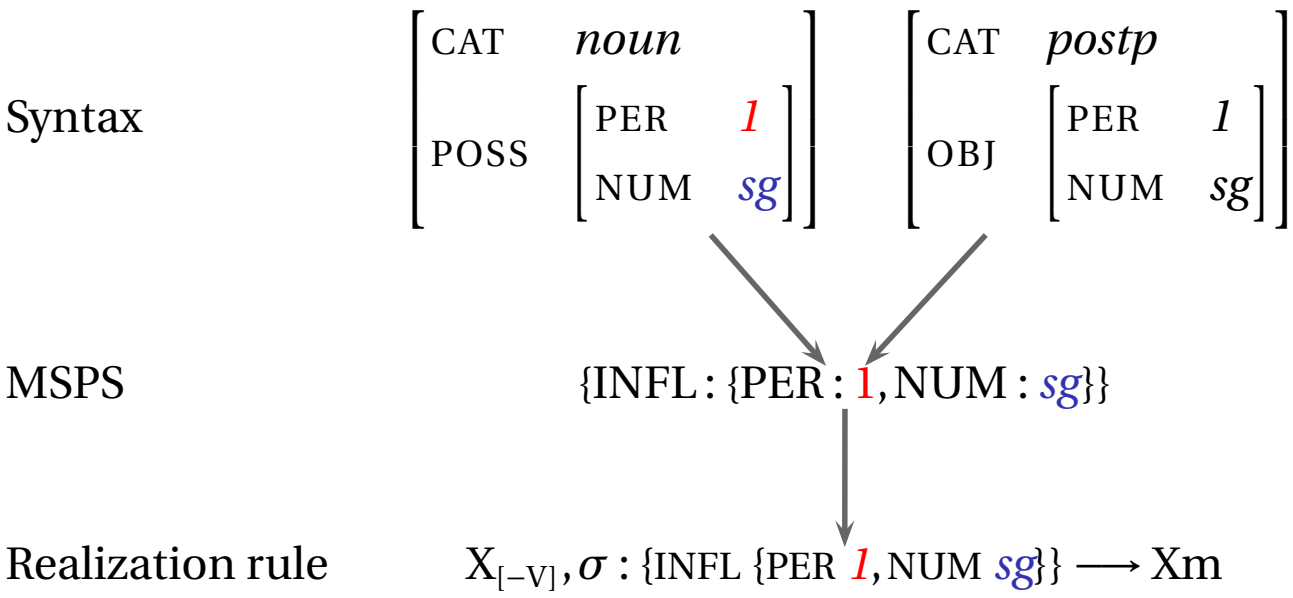
# The main empirical point

- All double indexing paradigms use bits of the possessed noun paradigm
- ☞ Even participles do this, despite the fact that only one argument is truly indexed.



# Polyfunctionality: The analytic strategy

- Spencer & Stump (to appear) on Hungarian nouns and postpositions:
  - "We assume that both nouns and postpositions may be specified for a feature INFL, whose value is a person/number specification (represented as a set $\{\text{PER}:\alpha,\text{NUM}:\beta\}$ [...]"
  - "As a property of a postposition, $\text{INFL}:\{\text{PER}:\alpha,\text{NUM}:\beta\}$ encodes the person and number of the postposition's object;"
  - "as a property of a possessee noun, $\text{INFL}:\{\text{PER}:\alpha,\text{NUM}:\beta\}$ encodes the person and number of the corresponding possessor."

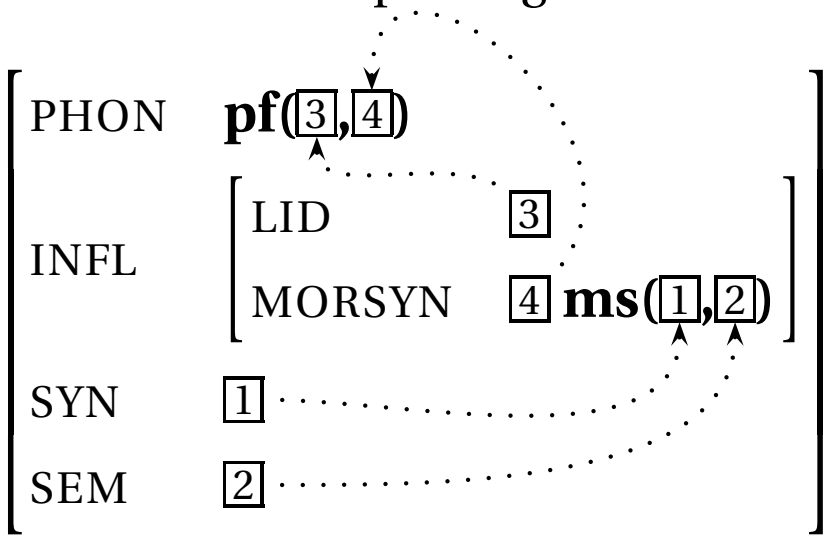



☞ We extend this strategy, using SBCG to make the syntax explicit

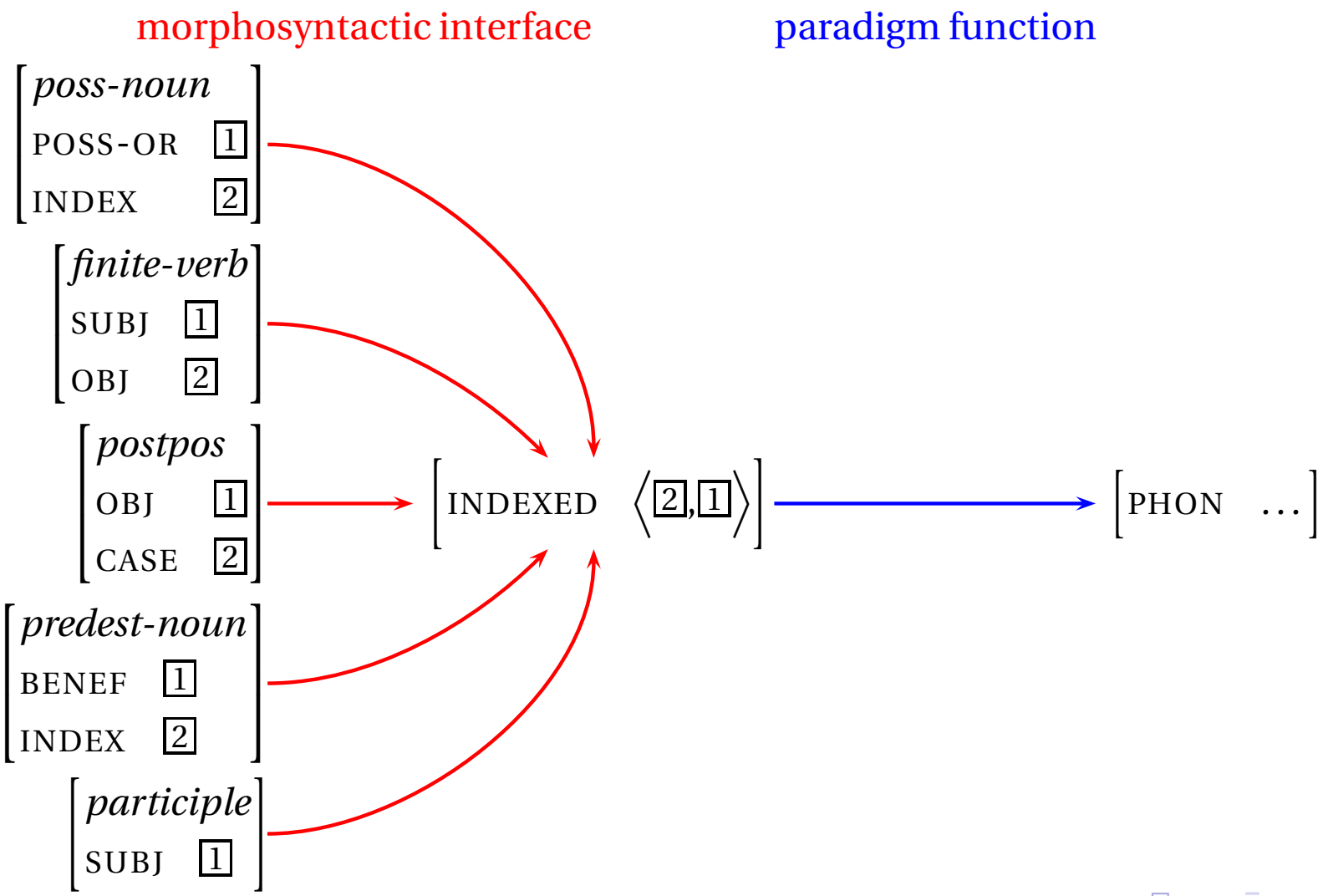
# SBCG/PFM

- Bonami & Webelhuth (in press): embed Paradigm Function Morphology as the morphological component of a Sign-Based Construction Grammar
- Bonami (2011): introduction of a MORSYN feature on words in order to make room for morphosyntactic mismatches
  - ☞ Can be seens as a direct analogue of Anderson's (1992) morphosyntactic representations
  - ☞ Related to, but different from, Ackerman & Stump's (2004) distinction between content and form paradigms

(10) For all words,



- Different categories map different features to the same MORSYN representation.
- Realization rules can then apply cross-categorially to this abstract MORSYN



# Interface constraint for possessed nouns

- For possessed nouns with pronominal possessor, mapping of case, number, and pronominal possessor index.

$$
\textit{possessed-noun-wd}\rightarrow
\begin{bmatrix}
\text{SYN} & \begin{bmatrix}
\text{CAT} & \begin{bmatrix} \textit{noun} \\ \text{CASE} \quad \boxed{1} \end{bmatrix} \\
\text{ARG-ST} & \left\langle \boxed{2} \begin{bmatrix} \textit{pronominal} \\ \text{INDEX} \quad \boxed{3} \end{bmatrix}, \ldots \right\rangle \\
\text{XARG} & \boxed{2}
\end{bmatrix} \\
\text{SEM} & \begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{NUM} & \boxed{4} \end{bmatrix} \end{bmatrix} \\
\text{MORSYN} & \begin{bmatrix} \text{INDEXED} & \left\langle \begin{bmatrix} \text{CASE} & \boxed{1} \\ \text{NUM} & \boxed{4} \end{bmatrix}, \boxed{3} \right\rangle \end{bmatrix}
\end{bmatrix}
$$

# Interface constraint for finite verbs

- For transitive finite verbs in the objective conjugation, mapping of object number and subject index.

☞ Stipulation of the use of the nominative subparadigm

$$\textit{obj-conj-vb-wd}\rightarrow \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{l} \textit{verb} \\ \text{VFORM}\quad \textit{finite} \end{array}\right] \\ \text{ARG-ST} & \left\langle \left[\text{INDEX}\quad \boxed{3}\right], \left[\text{INDEX}\quad \boxed{5}\left[\text{NUM}\quad \boxed{4}\right]\right], \ldots \right\rangle \end{array}\right] \\ \text{CTXT} & \left[\text{TOPIC}\quad \boxed{5}\right] \\ \text{MORSYN} & \left[\text{INDEXED}\quad \left\langle \left[\begin{array}{ll} \text{CASE} & \textit{nom} \\ \text{NUM} & \boxed{4} \end{array}\right], \boxed{3} \right\rangle\right] \end{array}\right]$$

# Interface constraint for local postpositions

- For local postposition with a pronominal object, mapping of case of the postposition and object index.

☞ Stipulation of the use of the singular subparadigm.

$$\textit{pron-postp-wd}\rightarrow \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{ll} \textit{postp} & \\ \text{CASE} & \boxed{1} \end{array}\right] \\ \text{ARG-ST} & \left\langle \left[\begin{array}{ll} \textit{pronominal} & \\ \text{INDEX} & \boxed{3} \end{array}\right] \right\rangle \end{array}\right] \\ \text{MORSYN} & \left[\text{INDEXED} \quad \left\langle \left[\begin{array}{ll} \text{CASE} & \boxed{1} \\ \text{NUM} & \textit{sg} \end{array}\right], \boxed{3} \right\rangle\right] \end{array}\right]$$

# Interface constraint for participles

- For participles with a pronominal subject, mapping of subject index.
- ☞ Stipulation of the use of the genitive singular subparadigm.

$$\textit{infl-ptcpl-wd}\rightarrow \left[\begin{array}{ll} \text{SYN} & \left[\begin{array}{ll} \text{CAT} & \left[\begin{array}{ll} \textit{verb} & \\ \text{VFORM} & \textit{ptcp} \end{array}\right] \\ \text{ARG-ST} & \left\langle \left[\begin{array}{ll} \textit{pronominal} & \\ \text{INDEX} & \boxed{3} \end{array}\right], \ldots \right\rangle \end{array}\right] \\ \text{MORSYN} & \left[\text{INDEXED} \quad \left\langle \left[\begin{array}{ll} \text{CASE} & \textit{gen} \\ \text{NUM} & \textit{sg} \end{array}\right], \boxed{3} \right\rangle\right] \end{array}\right]$$

# Single vs. double indexing paradigms

- Realization rules realize the INDEXED feature.
- The length of the INDEXED feature differentiates subparadigms across categories:

| category | $\left[\text{INDEXED} \quad \langle X \rangle\right]$ | $\left[\text{INDEXED} \quad \langle X, Y \rangle\right]$ |
|---|---|---|
| noun | absolute | possessed |
| finite verb | subjective/reflexive conjugation | objective conjugation |
| adjective | case & num concord | total concord |
| postposition | absolute | pronominal |

  - The situation of participles is unexpected: use of the double indexing paradigm when really indexing only one argument:

| category | $\left[\text{INDEXED} \quad \langle\rangle\right]$ | $\left[\text{INDEXED} \quad \langle X, Y \rangle\right]$ |
|---|---|---|
| participle | — | subj agreement |

# Realization rules

- Rules may realize:
  - $\left[\text{INDEXED} \quad \langle X, Y \rangle\right]$: specific to the double indexing paradigms
  - $\left[\text{INDEXED} \quad \langle X \rangle\right]$: specific to the single indexing paradigms
  - $\left[\text{INDEXED} \quad \langle X, \ldots \rangle\right]$: common to the single and double indexing paradigms
- All rule blocks common to N, V, A, P.
- Some rules are category-specific, others are not.

# Sample realization rules

Block 3 $X_{Cat}, \sigma : \left[ \text{INDEXED} \left\langle \left[ \text{CASE} \quad loc \right], \ldots \right\rangle \right] \longrightarrow$ Xna (cross-categorial, both indexings)

Block 2 $X_{Cat}, \sigma : \left[ \text{INDEXED} \left\langle \begin{bmatrix} \text{CASE} & nom \\ \text{NUM} & pl \end{bmatrix} \right\rangle \right] \longrightarrow$ Xq (cross-categorial, single indexing)

Block 5 $X_{Cat}, \sigma : \left[ \text{INDXD} \left\langle \begin{bmatrix} \text{CASE} & nom \\ \text{NUM} & sg \end{bmatrix}, \begin{bmatrix} \text{PER} & 2 \\ \text{NUM} & sg \end{bmatrix} \right\rangle \right] \longrightarrow$ Xr (cross-categorial, double indexing)

Block 1 $X_{N}, \sigma : \left[ \text{INDEXED} \left\langle \left[ \text{CASE} \quad simple \right], \ldots \right\rangle \right] \longrightarrow$ Xxø (category specific, both indexings)

Block 1 $X_{N}, \sigma : \left[ \text{INDEXED} \left\langle \begin{bmatrix} \text{CASE} & dat \\ \text{NUM} & sg \end{bmatrix} \right\rangle \right] \longrightarrow$ Xnø (category specific, single indexing)

Block 3 $X_{N}, \sigma : \left[ \text{INDEXED} \left\langle \begin{bmatrix} \text{CASE} & acc \\ \text{NUM} & sg \end{bmatrix}, [\,] \right\rangle \right] \longrightarrow$ Xm (category specific, double indexing)

# How parochial is INDEXED?

- It is tempting to interpret the analogies between paradigms captured by INDEXED as corresponding to natural analogies between grammatical functions across categories.
- ☞ Spencer & Stump (to appear) on the 'natural class' formed by postpositions and possessed nouns
- However other languages clearly rely on different alignments:

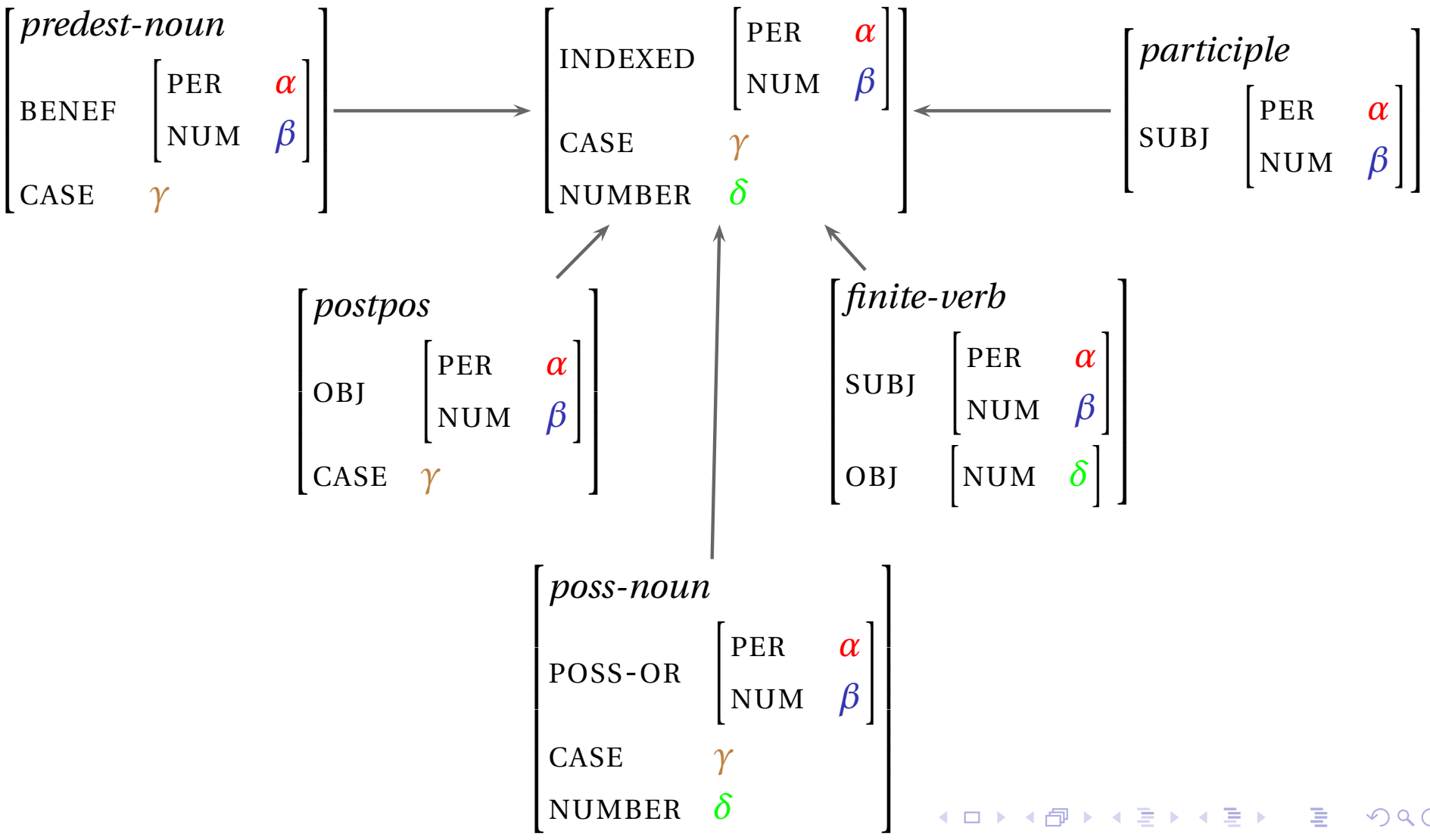
| | Tundra Nenets | Coll. Persian | Sorani Kurdish |
|---|---|---|---|
| noun | possessor | possessor | possessor |
| trans. verb | subject | object | past: subject<br>present: object |
| adposition | object | object | object |

- ☞ Although the alignments make sense systemically within the history of a particular language, there should be no presumption that a particular alignment is more natural.

# Toward a WP, Pattern-theoretic analysis

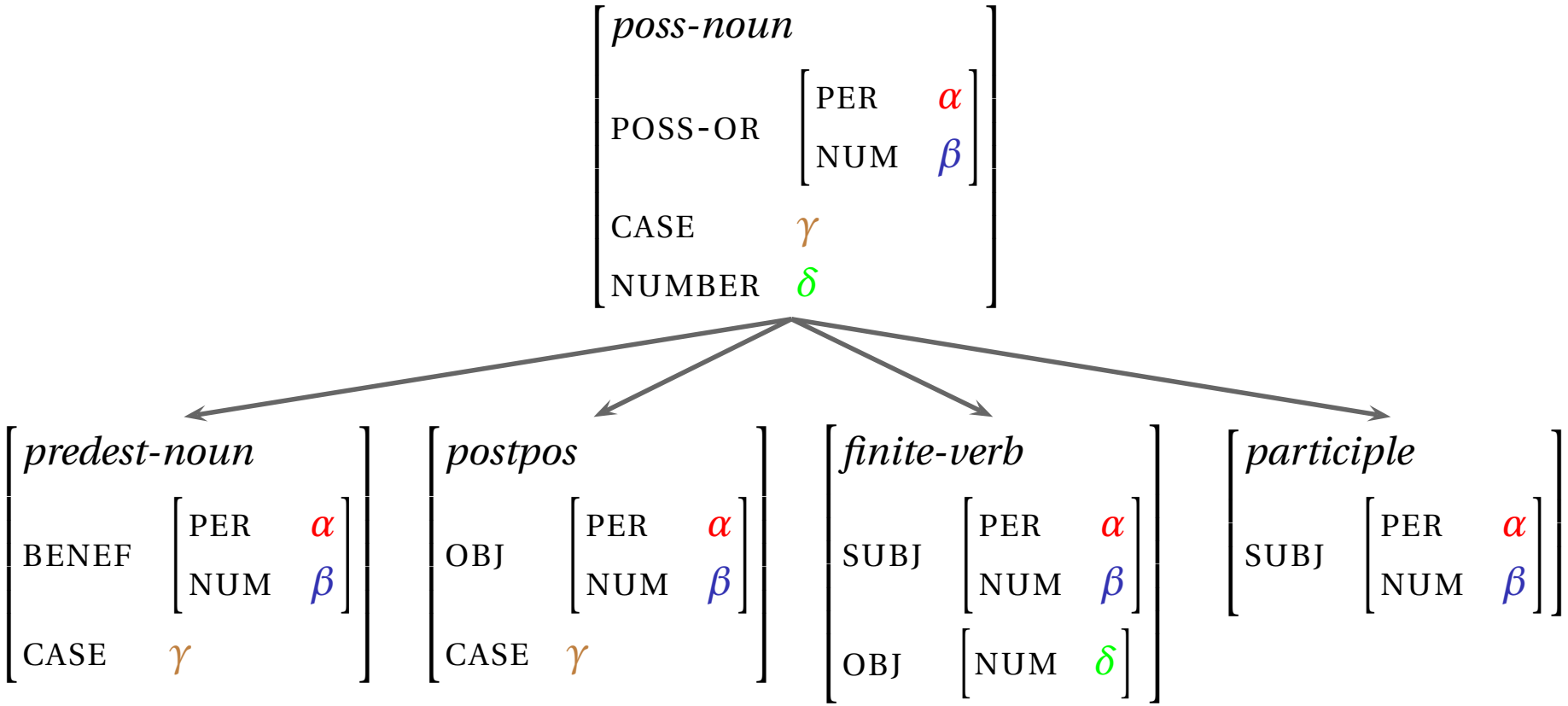
# The abstractive view

- Basic strategy: Identify unifying generalizations across particular word patterns in a way that allow for abstracting away a common feature



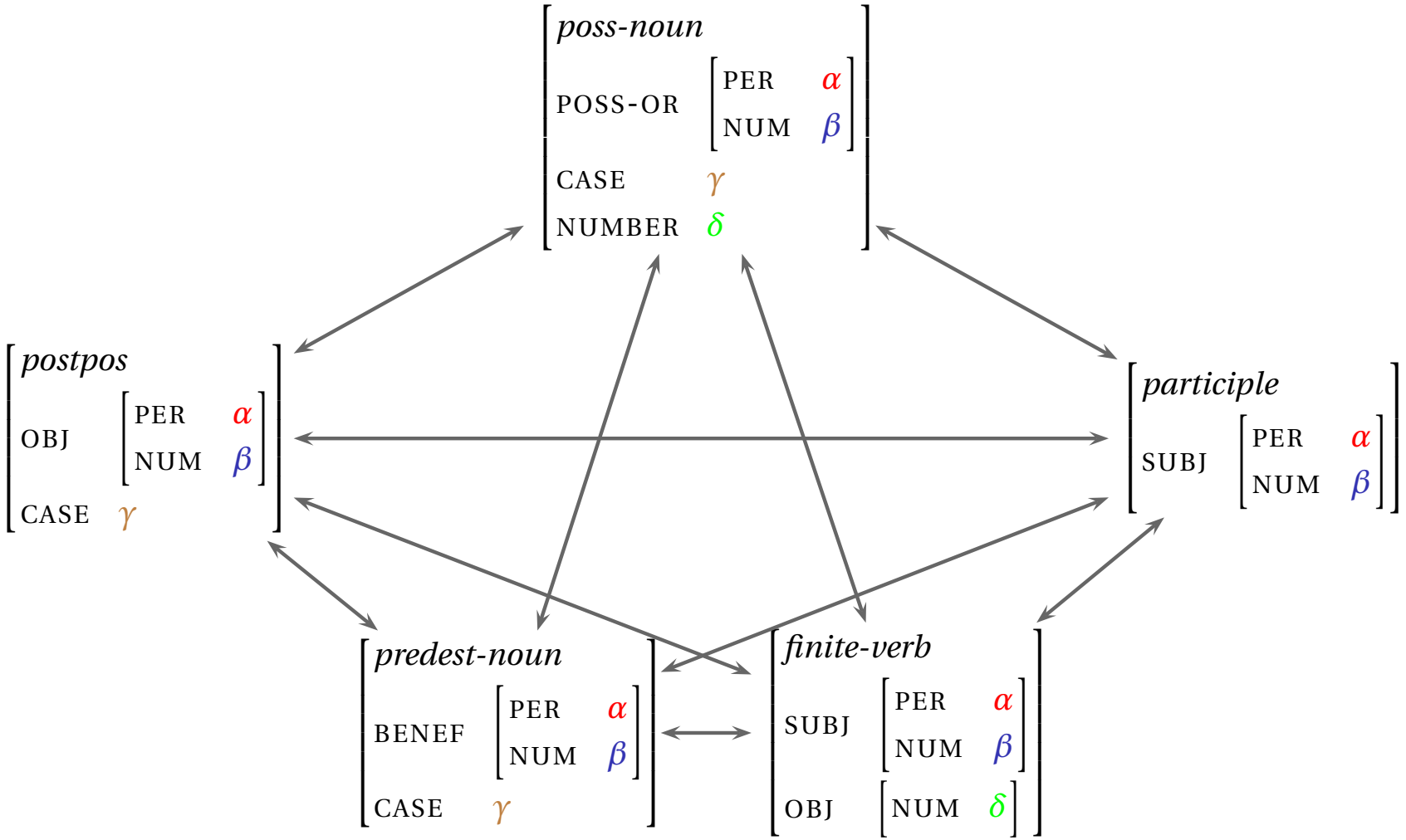
# A default inheritance based view

- Basic strategy: One feature template is exemplary, specific values are over-ridden in individual word patterns.



# A pattern-theoretic view

- Word pattern network: each individual word pattern is directly related to all other patterns with similarity and difference calculated with respect to relations (Malouf's presentation)



# Toward a Word and Paradigm, Pattern-theoretic analysis

- Instead of positing a feature structure general enough to comprehend particular patterns or a single pattern that needs to be overridden when required, we assume that:
  - Similarities and differences can be directly measured as relations among variants (cf. Malouf, and earlier Bochner/Bybee/Baayen & Hay/Booij)
  - Spanning trees, hiearchies, or defaults are neither helpful nor necessary to produce such measures.
- Still, providing such measures still amounts to describing the data but doesn't provide motivation for the data that is being described.

☞ Does not address our second question: How does systemic polyfunctionality bear on the nature of morphological organization?

# Speculation on systemic motivation

- Two kinds of systemic motivation
  - Diachronic motivation: how does the previous shape of the system condition its current shape
  - Synchronic motivation: why is the current system stable (to the extent that it is)
- We will focus on the second issue

# Why is there systemic polyfunctionality?

- The alternative to systemic polyfunctionality is to have separate sets of exponents for different person marking morphological constructions.
- Such a system makes more distinctions, and therefore has comparatively high entropy.
- By reducing the number of alternatives, the existence of systemic polyfunctionality reduces the overall entropy of the morphological system.

☞ The constructions do not have to form a natural class for this entropy reduction to occur. Thus it should come as no surprise that different strategies of alignment can result in the same lowered entropy state.

# A surprise

- Despite the evidently complex paradigm structure and morphotactics, polyfunctionality in Nenets yields a surprisingly simple system when looked at from the perspective of entropy.

# Appendix

# Reusable exponents: adjectives

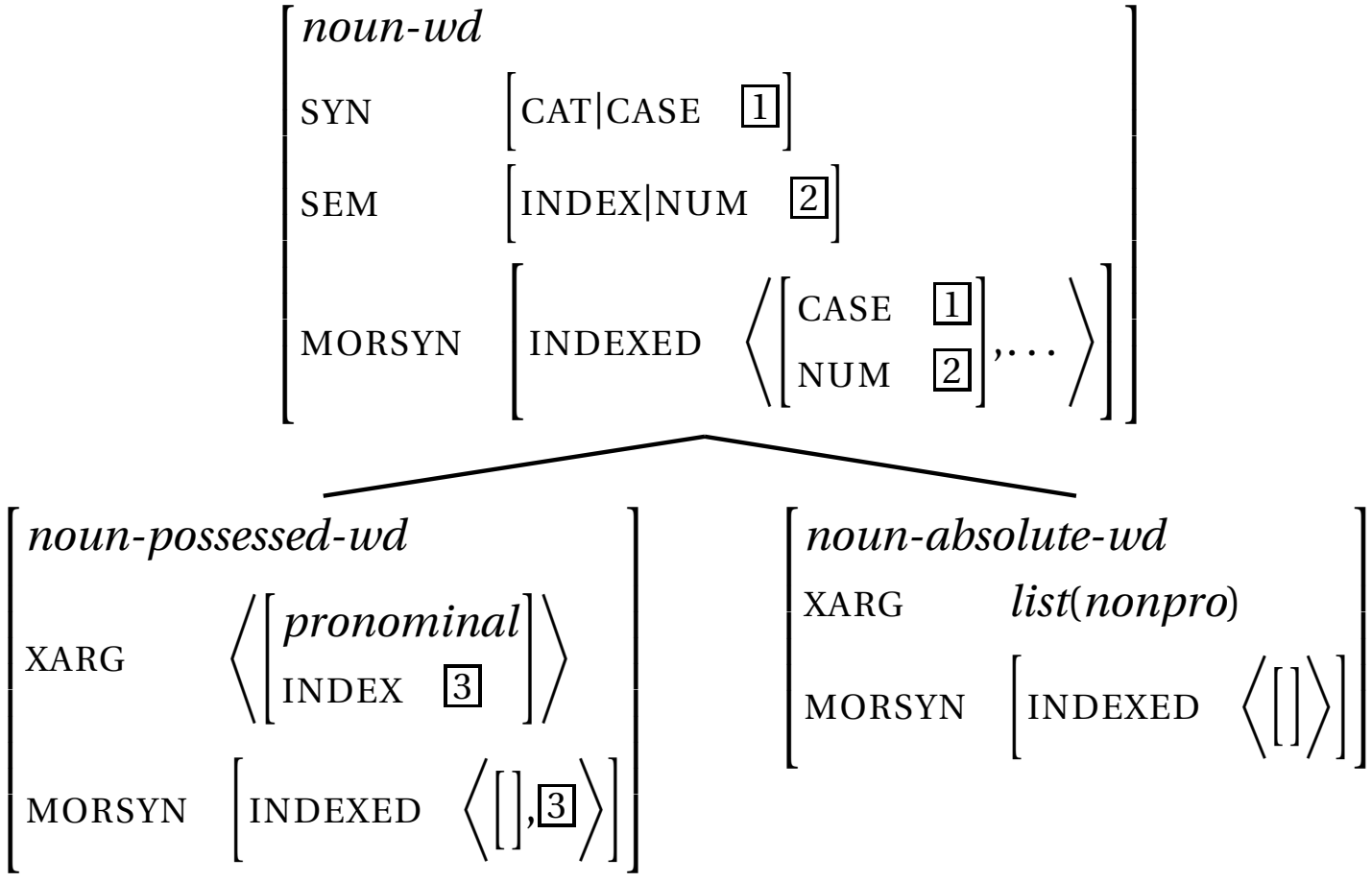
- Adjectives use the same exponents to express concord.
- Concord with the head noun in CASE and NUMBER is almost obligatory, while concord with the head noun's possessor in PERSON and NUMBER is optional.
- In practice, this means that adjectives modifying a possessed nouns can choose exponents from two separate paradigms: the paradigm of absolute nouns or the paradigm of possessed nouns.

(11) a. serako-x°nta te-x°nta
white-DAT.SG.POSS:3SG reindeer-DAT.SG.POSS:3SG
'to the white reindeer'

b. serako-n°h te-x°nta
white-DAT.SG reindeer-DAT.SG.POSS:3SG

# Single vs. double indexing paradigms

- Commonalities and differences between single vs. double indexing paradigms are captured by positing subtypes of each category




- ☞ The previously stated constraint is really the conjunction of the general constraint on nouns and the specific constraint on possessed nouns.