Morphotactic competition in Murrinh-Patha: Rule composition and rule interaction in Information-based Morphology

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Abstract

Murrinh-Patha, a polysynthetic Non-Pama-Nyungan language of Australia features competition of subject and object agreement markers for a particular position (i.e. slot 2), meaning that certain subject agreement markers are realised in this position, unless already occupied by overt object agreement markers. In their typology of variable morphotactics, Crysmann & Bonami (2016) cite the case of Murrinh-Patha as an instance of misaligned, conditioned placement. I shall propose a formal account of this positional competition in Murrinh-Patha within Information-based Morphology. To this end, I shall generalise the "pivot" features previously proposed for placement relative to the stem (Italian; Crysmann & Bonami, 2016) or the edge (Soranî Kurdish; Bonami & Crysmann, 2013; Salehi & Koenig, 2023) and show how this will facilitate the treatment of conditioned placement in Murrinh-Patha.

1 Introduction

In this paper[1], I shall discuss cases of positional competition between different exponents of subject and object agreement in Murrinh-Patha, a polysynthetic Non-Pama-Nyungan language of Australia. The data discussed here are taken from Nordlinger (2010, 2015) and Nordlinger & Mansfield (2021). The language features competition of subject and object agreement markers for a particular position (i.e. slot 2), meaning that certain subject agreement markers are realised in this position, unless already occupied by overt object agreement markers. According to Nordlinger (2010), this competition provides evidence for a templatic organisation of the language's morphology.

In their typology of variable morphotactics, Crysmann & Bonami (2016) cite the case of Murrinh-Patha as an instance of misaligned, conditioned placement, which they schematically represent as shown in Figure 1.

I shall propose a formal account of this positional competition in Murrinh-Patha, making explicit how "if available" can be implemented within Information-based Morphology. To this end, I shall generalise the "pivot" features previously proposed for placement relative to the stem (Italian; Crysmann & Bonami, 2016) or the edge (Sorani Kurdish; Bonami & Crysmann, 2013; Salehi & Koenig, 2023) and show how this will facilitate the treatment of conditioned placement in Murrinh-Patha.

[1]I would like to thank the audience at HPSG 2023 for their comments and discussion, in particular Jean-Pierre Koenig and Jakob Maché. A previous version of this paper had been presented at the International Symposium of Morphology (ISMo) 2021. Furthermore, I am also indebted to Olivier Bonami, Gilles Boyé and Baptiste Loreau Unger for discussion of several aspects of the issues discussed here. A great many thanks also go to Rachel Nordlinger for answering my questions on the intricate data discussed here. The research reported here has partially benefited from a public grant overseen by the French National Research Agency (ANR) as part of the program "Investissements d'Avenir" (reference: ANR-10-LABX-0083). It contributes to the IdEx Université Paris Cité (reference: ANR-18-IDEX-0001).

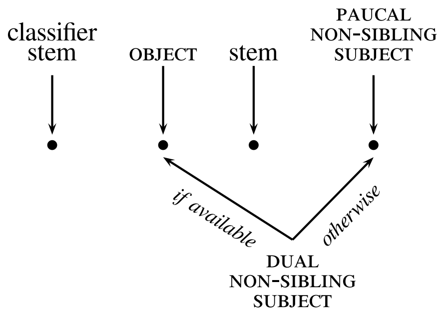

Figure 1: Schematic representation of Murrinh-Patha misaligned/conditioned placement (Crysmann & Bonami, 2016)

2 Murrinh-Patha

Verbs in Murrinh-Patha minimally consist of a lexical stem (open class) and a classifier stem (CS) from a set of 38 classifier stem paradigms. Together, these two stems express basic lexical meaning. While the lexical stem (in slot 5) is uninflected, the classifier stem (in slot 1) differentiates TAM as well as subject agreement.

1	2	3	4	5	6	7	8	9
CS.SUBJ.TAM	SUBJ NUM/OBJ	RR	IBP	**LEX-STEM**	TAM	ADV	SUBJ/OBJ NUM	ADV

Figure 2: Murrinh-Patha position classes (Nordlinger, 2015)

In addition to inflection by means of the classifier stem (CS), Murrinh-Patha verbs are inflected with a number of discrete markers, organised into a positional template, as shown in Figure 2. Of particular interest for this paper are slots 2 and 8, where exponents of subject and object agreement can be found.

			1		2	3
			INCL	EXCL		
SG			N/A	-ngi	-nhi	∅
DU	NSIB	M	-nhi	-nganku+nintha	-nanku+nintha	-nku+nintha
		F	-nhi	-nganku+ngintha	-nanku+ngintha	-nku+ngintha
	SIB		-nhi	-nganku	-nanku	-nku
PC	NSIB	M	-nhi+neme	-nganku+neme	-nanku+neme	-nku+neme
		F	-nhi+ngime	-nganku+ngime	-nanku+ngime	-nku+ngime
	SIB		-nhi	-ngan	-nan	-n
PL			-nhi	-ngan	-nan	-n

Table 1: Object agreement markers (Nordlinger, 2015, 505)

Agreement marking operates along up to four inflectional dimensions (illustrated by the paradigm of object agreement markers in Table 1): the language distinguishes four numbers (singular, dual, paucal, plural) and three persons, including a distinction between inclusive and exclusive for first person non-singular cells. Additionally, Murrinh-Patha marks a rather unique category of non-sibling in the dual and the paucal. Exponents of this category are differentiated for gender, which is otherwise not marked in the verb. Furthermore, the paucal is only distinguished for non-siblings. With siblings, paucal and plural are non-distinct. Another peculiarity of the non-sibling marker pertains to its morphotactics: while all other exponents of object agreement surface in slot two, the dual and paucal non-sibling markers are realised discontinuously in slot 8 (in the case of direct object agreement).

Subject agreement (cf. Table 2) is quite similar to object agreement, despite the difference in exponence: while object agreement is realised by discrete markers in slots 2 (person/number) and 8 (non-sibling number/gender), subject agreement is realised fusionally as part of the classifier stem (slot 1) plus discrete markers for non-sibling (slot 2/8) and for the non-future dual/paucal marker *ka* (slot 2). Recall that classifier stems cumulate expression of subject agreement with expression of TAM and lexical identity. See Mansfield (2020) for a detailed analysis of the classifier stem system. Another difference pertains to dual non-sibling marking: with direct object markers, the person/number exponent (slot 2) is syncretic with the person/number exponent of the sibling dual, whereas for subjects the classifier stem is syncretic with the singular.[2]

			1		2	3
			INCL	EXCL		
SG			N/A	bam	dam	bam
DU	NSIB	M	thubam	(ngu)bam+nintha	(nu)dam+nintha	(pu)bam+nintha
		F	thubam	(ngu)bam+ngintha	(nu)dam+ngintha	(pu)bam+ngintha
	SIB		thubam	ngubam+ka	nubam+ka	pubam+ka
PC	NSIB	M	thubam+neme	ngubam+ka+neme	nubam+ka+neme	pubam+ka+neme
		F	thubam+ngime	ngubam+ka+ngime	nubam+ka+ngime	pubam+ka+ngime
	SIB		thubam	ngubam	nubam	pubam
PL			thubam	ngubam	nubam	pubam

Table 2: Subject agreement (non-future sub-paradigm for classifier stem 'SEE(13)') (Nordlinger, 2015, 504)

As discussed above (cf. also Figure 2), the positions for the affixal markers of subject agreement overlap with those for object marking, so the central question is how conflict is actually resolved. Murrinh-Patha witnesses two strategies: displacement of the subject marker, and omission.

The first case of positional competition relates to the subject non-sibling markers *nintha/ngintha*. When marking subject agreement, these markers surface in slot

[2]See below for sensitivity of stem selection to the position of the non-sibling markers.

2, if available, i.e. before the lexical stem.[3]

(1) bam- **ngintha**- ngkardu
3sgS.see(13).nfut du.f see
'They (dual non-sibling) saw him/her.' (Nordlinger, 2010, 334)

However, if object agreement is overtly realised (any cell other than 3rd singular), slot 2 receives the object person/number marker and the subject non-sibling dual marker must surface in slot 8 instead, i.e. after the lexical stem, cf. (2).

(2) [pu]bam- ngi- ngkardu **-ngintha**
3sg/duS.see(13).nfut 1sgO see du.f
'They (dual non-sibling) saw me.' (Nordlinger, 2010, 334)[4]

Given the fact that subject and object non-sibling markers are syncretic, and that object non-sibling markers are also realised in slot 8, non-sibling marking may end up ambiguous as to whether it refers to the subject or the object, cf. the examples from Nordlinger (2015) below.

(3) ma- nanku- rdarri- purl -nu **-ngintha**
1sgS.hands(8).fut 2du/pcO back wash fut du.f
'I will wash your (female dual non-sibling) backs.' *or*
'We (two exclusive female non-sibling) will wash your (dual sibling) backs.'
(Nordlinger, 2015, 506)

In (3), *ngintha* may either refer to the object, leaving subject agreement solely marked by the singular classifier stem, yielding singular. Alternatively, singular stem and dual non-sibling marker jointly express first person exclusive female non-sibling dual, leaving the object marker in slot 2 to express sibling dual.

What is important about realisation of the subject dual non-sibling markers is that realisation in slot 8 is only ever licit when slot 2 is blocked by another exponent. If slot 2 is free, subject *ngintha/nintha* must surface there.

The second case relates to the dual/paucal number marker *ka* which appears in slot 2 in the non-future, as shown in (4a,b) from Nordlinger (2010). Note that in the non-future, as opposed to other TAM categories, the dual and plural stems are syncretic.

(4) a. pubam- **ka-** ngkardu
3duS.see(13).nfut du/pc.nfut see
'They (dual sibling) saw him/her.'

[3] The paucal non-sibling marker *-neme/-ngime* are always realised in slot 8.

[4] The original example in Nordlinger (2010) provides a singular stem. However, as stated in Nordlinger & Mansfield (2021, Table 3), use of this stem instead of the dual stem is marginal, unless the non-sibling is found adjacent in slot 2. See also the discussion at the end of this section.

b. pubam- **ka-** ngkardu -ngime
3DUS.SEE(13).NFUT DU/PC.NFUT see PC.NON-SIB.F
'They (paucal, female, non-sibling) saw him/her.'

c. pubam- ngi- ngkardu
3DU/PLS.SEE(13).NFUT 1SGO see
'They (two siblings/plural) saw me.'

d. pubam- ngkardu
3PLS.SEE(13).NFUT see
'They (plural) saw him/her.' Nordlinger (2010, 333)

Again, in the case of overt object marking (4c), subject marking in slot 2 becomes unavailable. In contrast to the dual non-sibling markers, there is no alternate realisation for *ka*, even if a suitable position (like slot 8) happens to be unoccupied. Instead *ka* is simply dropped, possibly leading to ambiguity between dual and plural, as shown in (4c). Note that without a competitor in slot 2, only a non-dual interpretation is possible (4d).

The last morphotactic complication I shall discuss pertains to the choice of classifier stem for dual non-sibling: if the dual non-sibling marker is found in slot 2, the singular classifier stem is used, however, when the non-sibling marker is displaced by competition with an object marker, the dual stem must be used instead.

(5) a. ba- ngintha- ngkardu -nu
1SGS.SEE(13).FUT DU.F see FUT
'We two (non-siblings) will see it/him/her.' (Nordlinger & Mansfield, 2021, 8)

b. nguba- nhi- ngkardu -nu -ngintha
1DUS.SEE(13).FUT 2SGO see FUT DU.F
'We two (non-siblings) will see you (sg.).' (Nordlinger & Mansfield, 2021, 8)

Taking stock of the discussion of empirical patterns, we have found three challenges in the morphotactics of Murrinh-Patha agreement morphology, all of which revolve around slot 2, the templatic position right-adjacent to the classifier stem, and which is the only position available to object person/number markers, a fact responsible for a good deal of competition.

1. Subject non-sibling dual markers obligatorily surface in this position, unless already occupied. The alternate realisation is slot 8.

2. Classifier stems display allomorphic variation depending on slot 2.

3. The subject agreement marker *ka* (dual sibling, paucal nonsibling) obligatorily surfaces in slot 2, if possible, but is dropped otherwise.

As argued by Nordlinger (2010) and Nordlinger & Mansfield (2021), the high degree of overlapping exponence, involving discontinuous surface positions provides evidence against a morpheme-based view, favouring instead a templatic realisational perspective.

In the next section, I shall present an analysis in IbM, a formal theory of the morphological template.

3 IbM

The analysis I am going to propose will be cast within Information-based Morphology (=IbM; (Crysmann & Bonami, 2016)), a theory of inflectional morphology closely inspired by HPSG (Pollard & Sag, 1987, 1994). From its inception, IbM was developed to address cases of variable morphotactics, such as the ones addressed in this paper, essentially advocating a neo-templatic view of affix order. The framework has since been applied to a number of complex morphotactic systems, including Oneida verbal morphology (Diaz et al., 2019), dependent multiple exponence in Batsbi (Crysmann, 2021a), and morphotactic competition in Yimas (Crysmann, 2020).

As discussed in detail in Crysmann (2021b), IbM assumes a set of realisation rules, organised in a Koenig/Jurafsky-style type hierarchy (Koenig & Jurafsky, 1994; Koenig, 1999): this means that in addition to vertical abstraction (=underspecification), dimensions permit horizontal abstraction by means of cross-classification of rule types in different dimensions. Rules are minimally pairings of morphosyntactic properties to be expressed (MUD) and the list of morphs (MPH) that serve as exponents.

In order to ensure that rules of exponence are actually applied (completeness) and do not over-apply (coherence), IbM imposes a very general well-formedness constraint that dictates that the set of rules being applied must "consume" the entire morphosyntactic property set (MS): in essence, non trivial set union of the MUD values to yield the entire MS set ensures completeness and coherence. Similarly, the sequence union or "shuffle" of the rules' morph contributions MPH must yield the word's morphs list MPS, respecting the order implied by the position class (PC) indices (see Bonami & Crysmann, 2013, for details). The particular choice of non-trivial ($\uplus$) over ordinary ($\cup$) set union ensures that no rule can be applied twice, which may otherwise result in unwarranted repetition of morphs.

(6)
$$word \rightarrow \begin{bmatrix} \text{MPS} & \boxed{e_1} \bigcirc \ldots \bigcirc \boxed{e_n} \\ \text{MS} & \boxed{0}\ (\boxed{m_1} \uplus \cdots \uplus \boxed{m_n}) \\ \text{RR} & \left\{ \begin{bmatrix} \text{MPH} & \boxed{e_1} \\ \text{MUD} & \boxed{m_1} \\ \text{MS} & \boxed{0} \end{bmatrix}, \ldots, \begin{bmatrix} \text{MPH} & \boxed{e_n} \\ \text{MUD} & \boxed{m_n} \\ \text{MS} & \boxed{0} \end{bmatrix} \right\} \end{bmatrix}$$

Furthermore, the well-formedness constraint exposes the entire MS set to every rule, such that rules can be (allomorphically) conditioned on properties they do not express themselves.

However, there is an asymmetry between form features and function features, in the context of rules: for morphosyntactic function, rules have access to both local (MUD) and global properties (MS). For form, however, there is only access to local properties (MPH). Incidentally, the early work on IbM (Crysmann & Bonami, 2016; Bonami & Crysmann, 2013) already made use of "pivot" features in order to capture placement relative to the edge, or to a designated element, such as the stem.

Entirely analogous to the MUD/MS distinction, we can easily expose the global morphotactic structure of the word (MPS) to the individual rules, for conditioning:

(7)

$$
\textit{word} \rightarrow \begin{bmatrix} \text{MPS} & \boxed{1}\ (\boxed{e_1} \bigcirc \ldots \bigcirc \boxed{e_n}) \\ \text{MS} & \boxed{0}\ (\boxed{m_1} \cup \cdots \cup \boxed{m_n}) \\ \text{RR} & \left\{ \begin{bmatrix} \text{MPH} & \boxed{e_1} \\ \text{MPS} & \boxed{1} \\ \text{MUD} & \boxed{m_1} \\ \text{MS} & \boxed{0} \end{bmatrix}, \ldots, \begin{bmatrix} \text{MPH} & \boxed{e_n} \\ \text{MPS} & \boxed{1} \\ \text{MUD} & \boxed{m_n} \\ \text{MS} & \boxed{0} \end{bmatrix} \right\} \end{bmatrix}
$$

This provides a general mechanism for morphotactic conditioning: in addition to referring to the edge (8) or the stem (9), it will be possible to insist that some other morphotactic position be filled.

(8) Second position placement

$$
\begin{bmatrix} \text{MPH} & \left\langle \boxed{1} \right\rangle \\ \text{MPS} & \left\langle \begin{bmatrix} \text{PC} & \boxed{i} \end{bmatrix}, \boxed{1} \begin{bmatrix} \text{PC} & \boxed{i}+1 \end{bmatrix}, \ldots \right\rangle \end{bmatrix}
$$

(9) Stem-relative placement

$$
\begin{bmatrix} \text{MPH} & \left\langle \boxed{1} \right\rangle \\ \text{MPS} & \left\langle \ldots, \begin{bmatrix} \textit{stem} \\ \text{PC} & \boxed{i} \end{bmatrix}, \ldots, \boxed{1} \begin{bmatrix} \text{PC} & \boxed{i}+2 \end{bmatrix}, \ldots \right\rangle \end{bmatrix}
$$

This possibility will be explored in the following analysis, crucially making reference to slot 2, the locus of morphotactic competition in Murrinh-Patha.

4 Analysis

In the first section, we have seen several morphological dependencies that hold in the Murrinh-Patha verbal template, pertaining to both exponence and morphotactics.

First, marking of non-siblings is jointly achieved by a classifier stem or object marker expressing person/number and a non-sibling marker expressing number/gender. Second, placement of dual non-sibling gender markers is morphotactically dependent on position 2 being filled, either by an object marker, or by the dual non-sibling gender marker itself. Third, placement of the dual non-sibling gender marker has an impact on the choice of classifier stem (singular vs. dual stem). Fourth, the dual/paucal marker *ka* is in positional competition with the object markers.

4.1 Non-sibling marking

In a non-revised version of IbM, each of these dependencies would have been captured by cross-classifying underspecified rule descriptions to yield rather complex rules that simultaneously talk about up to three morphotactic positions. However, the system of Murrinh-Patha non-sibling marking is quite self-contained, so it will be worthwhile experimenting with potential ways to reduce complexity by separating the treatment of the gender markers from that of the classifier stems (and object markers, respectively).

To this end, I shall propose a slightly refined representation of agreement information, that systematically separates gender/number and person/number information. As shown by the type hierarchies in Figure 3, person/number features are appropriate of the general *agr* type, its subtypes distinguishing between subject and object agreement. Values for sibling-status distinguish between *sib* and *nsib*, with only the latter having GEND(ER) as an appropriate feature.

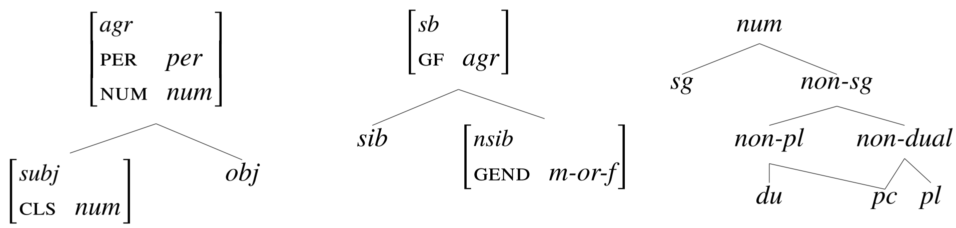

Figure 3: Agreement values

In order to link person/number and gender information, I shall propose to use the GF feature that embeds person/number agreement within sibling/nonsibling agreement[5] A sample MS representation for non-sibling dual 3rd person feminine subject is given in Figure 4:

Once a suitable MS representation is in place, like the one given in Figures 3 and 4, the rules for non-sibling gender marking are essentially quite straightforward, as shown in Figure 5. Note that the reentrancy between GF and person/number agreement makes it possible to refer to NUM information quite directly.

At the top, we find a most general statement about the morphotactics of the entire class of non-sibling gender markers (PC $2\vee8$), which is in turn narrowed down

[5]Other formalisations are of course conceivable. Minimally, ending grammatical function as type information would suffice. Maximally, one may even consider cyclic feature structures, such that sibling information embeds grammatical function and number and person/number information embeds sibling status.

$$\left[\textsc{ms}\ \left\{ \boxed{1}\begin{bmatrix} \textit{subj} & \\ \textsc{per} & \mathit{3} \\ \textsc{num} & \mathit{du} \end{bmatrix}, \begin{bmatrix} \textit{nsib} & \\ \textsc{gend} & \mathit{f} \\ \textsc{gf} & \boxed{1} \end{bmatrix}, \ldots \right\}\right]$$

Figure 4: Sample MS representation for non-sibling dual 3rd person feminine subject

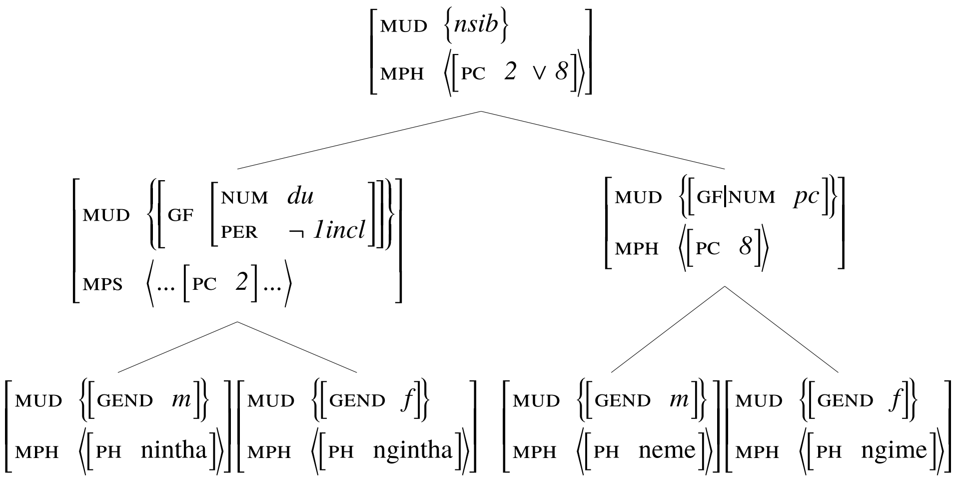

Figure 5: Non-sibling marking

for paucal and dual by its two immediate subtypes. While paucal markers are always in slot 8, dual markers retain the positional flexibility, yet require slot 2 to be filled, by way of the global morphotactic feature MPS. If there is some marker in slot 2, the dual marker will surface in slot 8, given that no two morphs can be assigned to the same positional index within a well-formed word. If, however there is not, placement of *nintha/ngintha* in slot 2 will be the only way to satisfy the constraint on the global morphs list MPS.[6] Note further that the rules are underspecified for grammatical function such that rule application can serve to narrow down to non-sibling referents the interpretation for either subject or object function.

A final remark is due regarding 1st person inclusive. As given by the paradigms in Tables 1 and 2, there is no overt marking of non-sibling dual in these cells, neither for object agreement nor for subject agreement. Nordlinger (2015) observes that the first person inclusive is characterised by a reduced paradigm, only distinguishing paucal non-sibling from all other cells. In the present analysis, the conspicuous absence of overt non-sibling marking is captured by a constraint regarding the person on the non-sibling dual rule types in Figure 5, thereby leaving zero exponence as the only option. Note that the rule type that is used for this is the same that serves

[6]Note that the analysis proposed here differs quite crucially from that in Stump (2022): here, placement of the non-sibling marker is directly conditioned on morphotactics, i.e. on slot 2 being filled. Stump, by contrasts conditions on the absence of object agreement properties, which he achieves by mapping third singular object agreement to the same representation as intransitives.

systematic zero exponence for dual sibling.[7]

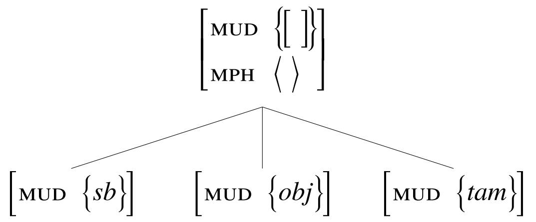

Figure 6: Rule types for zero exponence

4.2 Person/number marking

I shall now turn to the admittedly more complex hierarchy of rule types for person/number marking of core functions given in Figure 7. This hierarchy is organised into three orthogonal dimensions. As it is standard for IbM, fully expanded rules are obtained from this hierarchy by intersecting each leaf type from one dimension with each leaf type of every other dimension (Koenig & Jurafsky, 1994). Despite the complexity of the hierarchy, most of the properties postulated for the exponence rule types should be rather straightforward. E.g. the rule types in the STEM and SLOT-2 dimensions, which account for the bulk of rules in these dimensions, mostly pair the relevant morphosyntactic property with an exponent and its positional index.

Having laid out the overall shape of the hierarchy, I shall now zoom in to pairwise combinations of dimensions, focusing first on issues of stem selection, and then on properties expressed in the pivotal slot 2.

4.2.1 Classifier stems

The most straightforward dimension is STEMS: essentially, the rule types capture the expression of subject person number marking by specific forms of a classifier stem. Morphotactically, classifier stems are restricted to PC 1. Choice of stem form is further conditioned on TAM properties and, of course, lexical specification of the classifier stem (CS). Note that, with respect to subject marking, rule types in this dimension only restrict person in a direct fashion, while number is specified as a stem class property (CLS). This is necessary, given that stem selection and number do not always match up, thereby displaying the kind of morphomic properties we observed with singular stems being used for non-sibling duals.

Accordingly, the MORPHOMIX dimension associates morphomic CLS properties with actual number (NUM): while the general rule type just equates the two,

[7] As is standard in IbM, the denotation of the very general rules of zero exponence will be narrowed down under Paninian competition with more specific rules. See Crysmann (2021b) for in-depth discussion.

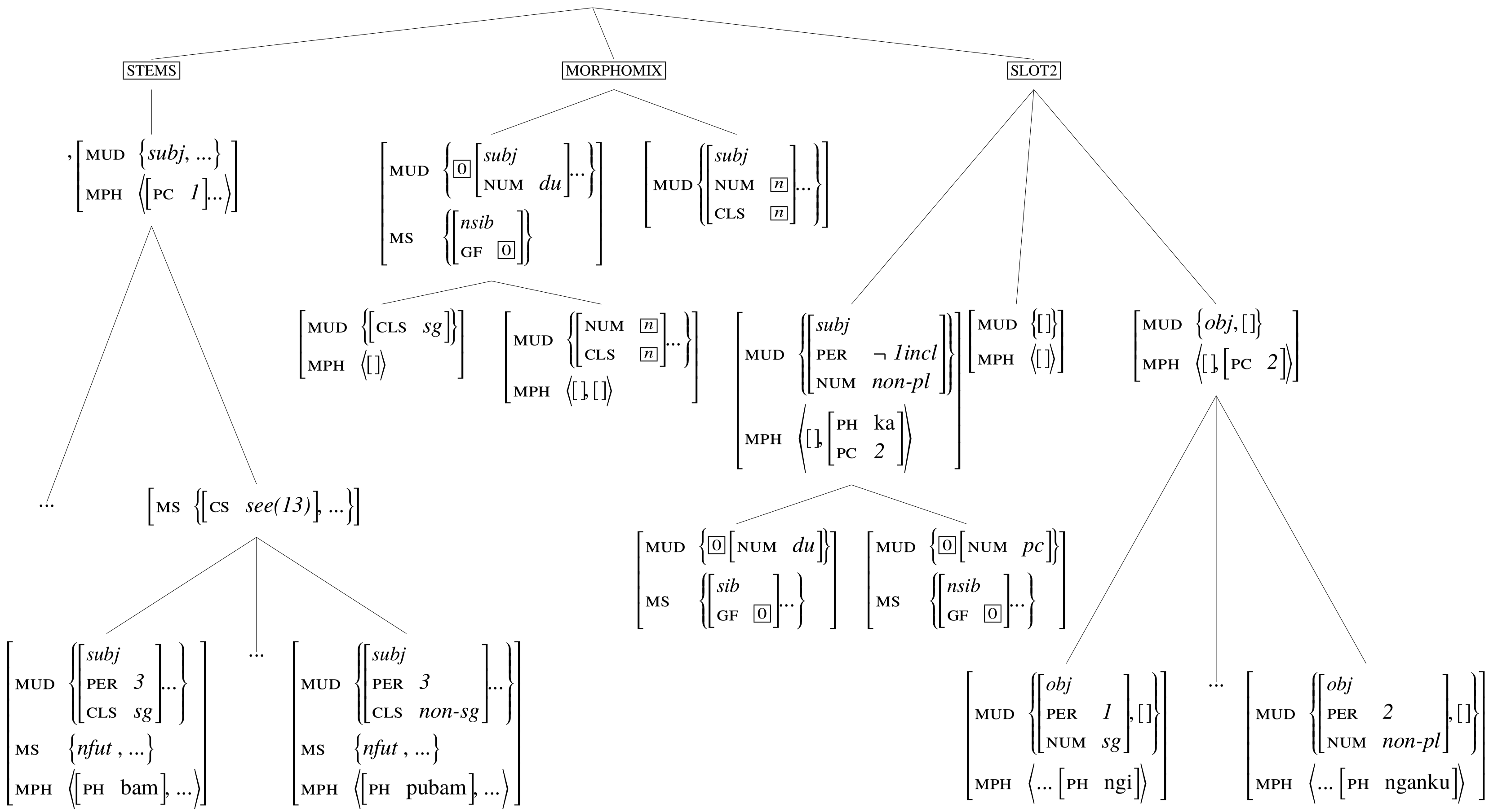

Figure 7: Person/number marking

there are specific rule types for non-sibling dual stems which also capture the morphotactic side effects: the rule type for choosing a singular stem is constrained to be mono-morphic, which means it will never unify with any rule types introducing another marker (in slot 2). As a consequence, slot 2 will be left free to host the non-sibling gender marker (cf. Figure 5). Conversely, the rule type for the more regular dual stem is bi-morphic, so it will only unify with rule types that are also bi-morphic, such as the ones for object markers. Since the object markers occupy slot 2, this means that the non-sibling gender marker will only be able to surface in slot 8. These two rule types thus account for the interaction between morphotactics and stem choice shown in (5).[8]

4.2.2 Slot 2

The SLOT-2 dimension on the right finally provides constraints on exponents in slot 2. On the very right, we find rules of exponence for object agreement. Crucially, these rules introduce a marker in slot 2, for every cell in the paradigm, except for third singular, which has zero exponence, cf. Figure 6.

On the left are the exponence rule for the *ka* marker, where the supertype fixes shape and position and the two subtypes specify the feature combinations being expressed, i.e. the specific cases of paucal non-sibling and dual sibling. Finally, in the centre of this dimension, we find a rule type that serves as a target for any stem rule used without any of the aforementioned markers. Most crucially, it constrains the open MUD set and MPH list to each be of size 1.

4.3 Sample analyses

Now we have all the ingredients, we can see how they play together to derive the empirical patterns. Two morphotactic patterns are of concern here: the placement alternation of the non-sibling gender markers and the presence vs. absence of the *ka* marker.

Non-sibling dual The morphotactics of non-sibling marking are almost entirely contained within the rule hierarchy of the gender markers (Figure 5): the paucal markers, with their fixed position in slot 8 are trivial, but the mobile dual markers are dependent on a marker in slot 2, which we capture using the MPS feature. This latter condition for dual non-sibling can be met by any of the exponents introduced by a rule type from the SLOT-2 dimension in Figure 7. Yet, if none of these markers is present, the positionally flexible dual non-sibling marker itself will be the only one that can satisfy the requirement. These two situations correlate with stem selection: an object marker in slot 2 satisfies the morphotactic requirement for a dual non-sibling marker to surface in slot 8 and, by being part of a bi-morphic person-number marking rule, it selects the dual stem. Conversely, if no object marker is

[8] If one wants to rule in the marginal acceptability of a singular stem with a dual non-sibling marker in slot 8, all it takes is to remove the constraint that MPH to be mono-morphic.

$$\left[\begin{array}{ll}
\text{MPS} & \boxed{mps}\left\langle \boxed{0}\begin{bmatrix}\text{PH} & \text{ba}\\ \text{PC} & \mathit{1}\end{bmatrix}, \boxed{1}\begin{bmatrix}\text{PH} & \text{ngintha}\\ \text{PC} & \mathit{2}\end{bmatrix}, \boxed{2}\begin{bmatrix}\text{PH} & \text{ngkardu}\\ \text{PC} & \mathit{5}\end{bmatrix}, \boxed{3}\begin{bmatrix}\text{PH} & \text{nu}\\ \text{PC} & \mathit{6}\end{bmatrix}\right\rangle \\
\text{RR} & \left\{\begin{array}{l}
\left\langle \begin{bmatrix} \text{MPH} & \langle\boxed{0}\rangle, \\ \text{MPS} & \boxed{mps}, \\ \text{MS} & \boxed{ms}\left\{\begin{bmatrix} \mathit{nsib} & \\ \text{GF} & \boxed{s}\end{bmatrix}, \begin{bmatrix}\text{CS} & \mathit{see(13)}\end{bmatrix}, \ldots\right\} \\ \text{MUD} & \left\{\boxed{s}\begin{bmatrix}\text{NUM} & \mathit{du}\\ \text{CLS} & \mathit{sg}\end{bmatrix}\right\}\end{bmatrix}, \begin{bmatrix}\text{MPH} & \langle\boxed{1}\rangle, \\ \text{MPS} & \boxed{mps}\langle\ldots\begin{bmatrix}\text{PC} & \mathit{2}\end{bmatrix}\ldots\rangle, \\ \text{MS} & \boxed{ms}, \\ \text{MUD} & \{\boxed{n}\}\end{bmatrix}\right\rangle, \\
\left\langle \begin{bmatrix} \text{MPH} & \boxed{2}\left\langle\begin{bmatrix}\text{PH} & \boxed{0}\end{bmatrix}\right\rangle, \\ \text{MPS} & \boxed{mps}, \\ \text{MS} & \boxed{ms}, \\ \text{MUD} & \left\{\boxed{l}\begin{bmatrix}\text{ST} & \boxed{0}\end{bmatrix}\right\}\end{bmatrix}, \begin{bmatrix}\text{MPH} & \langle\boxed{3}\rangle, \\ \text{MPS} & \boxed{mps}, \\ \text{MS} & \boxed{ms}, \\ \text{MUD} & \{\boxed{t}\}\end{bmatrix}, \begin{bmatrix}\text{MPH} & \langle\ \rangle \\ \text{MPS} & \boxed{mps}, \\ \text{MS} & \boxed{ms}, \\ \text{MUD} & \{\boxed{o}\}\end{bmatrix}\right\rangle
\end{array}\right\} \\
\text{MS} & \boxed{ms}\left\{\boxed{s}\begin{bmatrix}\mathit{subj} & \\ \text{PER} & \mathit{1} \\ \text{NUM} & \mathit{du}\end{bmatrix}, \begin{bmatrix}\mathit{nsib} & \\ \text{GF} & \boxed{s} \\ \text{GEND} & \mathit{f}\end{bmatrix}, \boxed{o}\begin{bmatrix}\mathit{obj} & \\ \text{PER} & \mathit{3} \\ \text{NUM} & \mathit{sg}\end{bmatrix}, \boxed{l}\begin{bmatrix}\mathit{lid} & \\ \text{ST} & \text{ngkardu} \\ \text{CS} & \mathit{see(13)}\end{bmatrix}, \boxed{t}\begin{bmatrix}\mathit{fut}\end{bmatrix}\right\}
\end{array}\right]$$

(a) with 3sg object (zero exponence)

$$\left[\begin{array}{ll}
\text{MPS} & \boxed{mps}\left\langle \boxed{0}\begin{bmatrix}\text{PH} & \text{nguba}\\ \text{PC} & \mathit{1}\end{bmatrix}, \boxed{1}\begin{bmatrix}\text{PH} & \text{nhi}\\ \text{PC} & \mathit{2}\end{bmatrix}, \boxed{2}\begin{bmatrix}\text{PH} & \text{ngkardu}\\ \text{PC} & \mathit{5}\end{bmatrix}, \boxed{3}\begin{bmatrix}\text{PH} & \text{nu}\\ \text{PC} & \mathit{6}\end{bmatrix}, \boxed{4}\begin{bmatrix}\text{PH} & \text{ngintha}\\ \text{PC} & \mathit{8}\end{bmatrix}\right\rangle \\
\text{RR} & \left\{\begin{array}{l}
\left\langle \begin{bmatrix} \text{MPH} & \langle\boxed{0}, \boxed{1}\rangle, \\ \text{MPS} & \boxed{mps}, \\ \text{MS} & \boxed{ms}\left\{\begin{bmatrix} \mathit{nsib} & \\ \text{GF} & \boxed{s}\end{bmatrix}, \begin{bmatrix}\text{CS} & \mathit{see(13)}\end{bmatrix}, \ldots\right\} \\ \text{MUD} & \left\{\boxed{s}\begin{bmatrix}\text{NUM} & \boxed{d}\\ \text{CLS} & \boxed{d}\end{bmatrix}, \boxed{o}\right\}\end{bmatrix}, \begin{bmatrix}\text{MPH} & \langle\boxed{4}\rangle, \\ \text{MPS} & \boxed{mps}\langle\ldots\begin{bmatrix}\text{PC} & \mathit{2}\end{bmatrix}\ldots\rangle, \\ \text{MS} & \boxed{ms}, \\ \text{MUD} & \{\boxed{n}\}\end{bmatrix}\right\rangle, \\
\left\langle \begin{bmatrix} \text{MPH} & \boxed{2}\left\langle\begin{bmatrix}\text{PH} & \boxed{0}\end{bmatrix}\right\rangle, \\ \text{MPS} & \boxed{mps}, \\ \text{MS} & \boxed{ms}, \\ \text{MUD} & \left\{\boxed{l}\begin{bmatrix}\text{ST} & \boxed{0}\end{bmatrix}\right\}\end{bmatrix}, \begin{bmatrix}\text{MPH} & \langle\boxed{3}\rangle, \\ \text{MPS} & \boxed{mps}, \\ \text{MS} & \boxed{ms}, \\ \text{MUD} & \{\boxed{t}\}\end{bmatrix}\right\rangle
\end{array}\right\} \\
\text{MS} & \boxed{ms}\left\{\boxed{s}\begin{bmatrix}\mathit{subj} & \\ \text{PER} & \mathit{1} \\ \text{NUM} & \mathit{du}\end{bmatrix}, \boxed{n}\begin{bmatrix}\mathit{nsib} & \\ \text{GF} & \boxed{g} \\ \text{GEND} & \mathit{f}\end{bmatrix}, \boxed{o}\begin{bmatrix}\mathit{obj} & \\ \text{PER} & \mathit{2} \\ \text{NUM} & \mathit{sg}\end{bmatrix}, \boxed{l}\begin{bmatrix}\mathit{lid} & \\ \text{ST} & \text{ngkardu} \\ \text{CS} & \mathit{see(13)}\end{bmatrix}, \boxed{t}\begin{bmatrix}\mathit{fut}\end{bmatrix}\right\}
\end{array}\right]$$

(b) with 2sg object (overt)

Figure 8: Derivations for non-sibling dual

present, only the mono-morphic dual non-sibling person/number rule can be selected, introducing the singular stem. And, as already stated above, slot 2 can and must be filled by the non-sibling gender marker in this case.

Figure 8 provides sample derivations of the contrasts given in (5) above.[9] I.e. Figure 8a provides the analysis for dual non-sibling subject acting on a third singular object, whereas Figure 8b provides the one with a second singular object, the crucial difference being that third singular object agreement has zero exponence, whereas second singular is expressed overtly in slot 2.

Recall from our discussion of Figure 7 above that we distinguished two rules for (non-sibling) dual classifier stem: one choosing the expected dual classifier stem, but requiring to combine with an object marker, and the exceptional mono-morphic rule, pairing dual number with a singular stem. Since there is no specific morphous rule for third singular objects, but only a zero exponence default, we get the exceptional singular classifier, as shown in Figure 8a. Furthermore, since zero exponence does not contribute any morphs (see the empty MPH list for object agreement in Figures 8a and 6), the non-sibling marker will be the only exponent that can fill its own requirement that position 2 be filled.

Conversely, second singular object agreement has a specific rule type, which will preempt default zero exponence by way of Panini's principle. Since rule types for object agreement in Figure 7 obligatorily combine with rule types for subject agreement, combination with mono-morphic rules is not viable. Therefore, we get a rule type that combines a first person dual classifier stem with a second singular object exponent. Since the exponent of object agreement occupies position 2, the global morphotactic requirement of the non-sibling marker is fulfilled. However, since position 2 is occupied now, the non-sibling marker must go into position 8.

Sibling dual *ka* The other morphotactically interesting case pertains to the *ka* marker. If no object marker is present, position 2 is available and the marker is obligatory in the sibling dual and the non-sibling paucal.

As can be verified from Figure 7, the combination of a non-singular stem rule type with any of the *ka*-rule types will be more specific, with respect to MUD and MS properties, than the mono-morphic classifier stem rule: as a result, Paninian competition will select the *ka*-inflected classifier stem over the bare one. The competing rules, both derived by cross-classification of leaf types in Figure 7 are given in Figure 9a,b. Thus, since the MUD and MS descriptions of the rule for the *ka*-marked classifier stem in Figure 9b are more specific than those for the bare classifier stem in Figure 9a, application of the more general bare rule is preempted by Paninian competition in exactly the cases described by the narrower *ka*-marked rule.

With a direct object marker in slot 2, the situation changes: since object markers equally combine with classifier stems into complex rules with equally complex

[9]The boxed coreference tags between the words' MS set and MPS list with the MUD, MPH, MS and MPS values of the rules (on RR) follow from the general well-formedness principle in (7). To ease readability, I use boxed letters for the morphosyntactic property set (corresponding to the property being realised), and boxed numbers for morphs (in consecutive order of appearance).

$$\begin{bmatrix} \text{MUD} & \left\{\begin{bmatrix} \textit{subj} & \\ \text{PER} & \textit{3} \\ \text{NUM} & \boxed{n}\ \textit{non-sg} \\ \text{CLS} & \boxed{n}\end{bmatrix}\right\} \\ \text{MS} & \left\{\begin{bmatrix}\text{CS} & \textit{see(13)}\end{bmatrix}, [\textit{nfut}], \ldots\right\}, \\ \text{MPH} & \left\langle \begin{bmatrix}\text{PH} & \text{pubam}\\ \text{PC} & \textit{1}\end{bmatrix}\right\rangle \end{bmatrix}$$

(a) Bare non-singular classifier stem (cf. (4d))

$$\begin{bmatrix} \text{MUD} & \left\{\boxed{s}\begin{bmatrix} \textit{subj} & \\ \text{PER} & \textit{3} \\ \text{NUM} & \boxed{n}\ \textit{du} \\ \text{CLS} & \boxed{n}\end{bmatrix}\right\} \\ \text{MS} & \left\{\begin{bmatrix}\text{CS} & \textit{see(13)}\end{bmatrix}, [\textit{nfut}], \begin{bmatrix}\textit{sib} & \\ \text{GF} & \boxed{s}\end{bmatrix} \ldots\right\}, \\ \text{MPH} & \left\langle \begin{bmatrix}\text{PH} & \text{pubam}\\ \text{PC} & \textit{1}\end{bmatrix}, \begin{bmatrix}\text{PH} & \text{ka}\\ \text{PC} & \textit{2}\end{bmatrix}\right\rangle \end{bmatrix}$$

(b) *ka*-marked dual classifier stem (cf. (4a))

$$\begin{bmatrix} \text{MUD} & \left\{\begin{bmatrix} \textit{subj} & \\ \text{PER} & \textit{3} \\ \text{NUM} & \boxed{n}\ \textit{non-sg} \\ \text{CLS} & \boxed{n}\end{bmatrix}, \begin{bmatrix} \textit{obj} & \\ \text{PER} & \textit{1} \\ \text{NUM} & \textit{sg}\end{bmatrix}\right\} \\ \text{MS} & \left\{\begin{bmatrix}\text{CS} & \textit{see(13)}\end{bmatrix}, [\textit{nfut}], \ldots\right\}, \\ \text{MPH} & \left\langle \begin{bmatrix}\text{PH} & \text{pubam}\\ \text{PC} & \textit{1}\end{bmatrix}, \begin{bmatrix}\text{PH} & \text{ngi}\\ \text{PC} & \textit{2}\end{bmatrix}\right\rangle \end{bmatrix}$$

(c) Non-singular classifier stem with object agreement (cf. (4c))

Figure 9: Dual/paucal ka and rule competition

MUD values specifying both subject and object properties, they are not preempted by the *ka*-rule types via Paninian competition. As can be easily verified by comparing Figures 9b,c, neither rule's MUD and MS descriptions are more general or more specific than the other.

To summarise, rule combination by cross-classification achieves the correct behaviour with respect to Panini's principle here.

5 Conclusion

We have discussed complex morphotactic dependencies in Murrinh-Patha and shown how these can be modelled in IbM, a formal neo-templatic approach to morphology built on multiple inheritance hierarchies of type feature structures. The analysis of Murrinh-Patha has prompted me to revise the way relative placement can be addressed within IbM: in essence, specialised pivot features, as used in earlier work (Crysmann & Bonami, 2016; Bonami & Crysmann, 2013) have been generalised into a distinction between rule-local contributions of morphs and constraints on the word's global morphs list, a distinction that mirrors the one between properties a rule expresses (MUD value) and conditioning on the word's entire morphosyntactic property set MS. The intricacy of morphotactic interactions in Murrinh-Patha have also helped to highlight that two different cases of morphotactic competition may require different answers: independent rules in case of pure morphotactic dependency on some slot being filled and complex rules built by cross-classification, to capture cases where morphotactic dependency interacts with Paninian competition.

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