The Contours of nGY

Nazarré Merchant
May 2018

SOTA: 1.3
Memoirs of the Society for Typological Analysis 1.3

Abstract

The nGY system is an OT system that extends the nGX system with the addition of marking a single foot as the head of the prosodic word and with the addition of two constraints that target the head of the prosodic word (Main-foot-left and Main-foot-right). These additions yield a quantity insensitive footing system containing 36 languages. This paper provides a property analysis of the system delimiting a set of extensional traits and associated properties, meaning that each languages's extensional traits are derived from property values that encode the ranking requirements of the language's grammar.

The goal here is not merely to provide a complete accounting of the languages of nGY, but to understand the structure of more complex typologies and how they relate to simplified versions of themselves. This paper shows how the density classes of nGX (sparse, weakly dense, and strongly dense) lift into the more articulated nGY system and provide the central organizing framework for understanding the patterns of nGY.

TOC

Acknowledgments. Thanks to Alan Prince for a fine-grained scepsis of this work and to Natalie DelBusso for initial exploratory discussions.

The Contours of nGY

Nazarré Merchant

1 Overview and Naming Conventions

This paper provides an analysis and accounting of the languages of the nGY system – an extension of the nGX system (Alber & Prince 2017, Alber, DelBusso, and Prince 2016) – in which one foot receives primary stress, acting as the head of the prosodic word. A property analysis (Alber & Prince ms.) is given of the 36 languages of nGY which reveals that the patterns of the languages in the nGY system are properly understood through the lens of the density classes of the nGX system. The three density classes of nGX (sparse, weakly dense, and strongly dense) manifest in nGY as identical properties, sharing virtually identical extensional traits. The patterns of each of the density classes in nGY are only disturbed from the underlying nGX patterns by the placement of the head of the prosodic word, and only in some of the languages in each of the density classes. The goal here, in addition to providing a complete accounting of nGY, is to understand the structure of more complex typologies and how they relate to simplified versions of themselves.

A word on the presentational choices made in this report: some familiarity with property analysis is assumed as is a passing acquantaince with the analysis of nGX presented in Alber and Prince 2017. For a more leisurely path into the nGY system including an explication of property theory and nGX, see Merchant (in prep). The property analysis and the factorial typology of nGY presented here have been computed and verified using OTWorkplace (Prince, Merchant, and Tesar 2017); see Merchant 2018a for a workbook containing the nGY factorial typology.

1.1 Definition of nGY

The nGY system is a quantity insensitive footing system in which one foot is marked as the head of the prosodic word. The inputs of Gen.nGY are undifferentiated strings of syllables (exactly as they are in nGX). Outputs are licit parses of the input syllables. A licit parse, like nGX, consists of at least one foot, which may be monosyllabic or bisyllabic. Each bisyllabic foot is either iambic or trochaic. Differing from nGX, nGY requires that exactly one foot in every output be designated the head of the prosodic word.

A candidate in the nGY system, consists of an input, which is a string of *n* syllables, and an output, which is a licit parse of those *n* syllables. A candidate set for a single input is the set of candidates one gets by pairing the input with each licit parse of the input.

In representing the outputs, a single ‘o’ will stand for an unparsed syllable, an ‘X’ will represent the head of a foot that is not the prosodic word head, a ‘Y’ will represent the head of the foot that is the prosodic word head, and a ‘u’ will represent the non-head syllable in a binary foot, and dash, ‘-’, will represent the foot boundaries and unparsed syllable boundaries. So, for example, -Yu-Xu-o-, represents two, left-aligned trochaic feet, the first of which is the head of the prosodic word, followed by a single unparsed syllable. These conventions are given in (1).

(1) Notational conventions for outputs of nGY
- X = head of a foot, non-prosodic word head
- Y= head of a foot, prosodic word head
- u = non-head of a binary foot
- o = unparsed syllable
- - = foot boundary

The constraint set of nGY is exactly the constraints of nGX (Parse-Syllable, Iamb, Trochee, All-feet-left, All-feet-right) plus two main stress constraints: Main-foot-left and Main-foot-right (MFL, MFR) (based on Hyde 2012). The full constraint list of nGY is given in (2).

The * operator signifies the configuration that triggers a single violation. The Parse-syllable constraint is violated by every unparsed syllable in an output. The Iamb constraint is violated for every foot head adjacent to the left edge of the foot, so in feet -Xu-, -X-, -Yu-, and -Y-. Trochee follows a symmetric pattern. AFL incurs a violation for every syllable, foot pair in which the syllable is to the left of the foot. AFR incurs a violation for every syllable, foot pair in which the syllable is to the right of the foot. The MFL constraint incurs a violation for every syllable to the left of the foot that heads the prosodic word; the MFR constraints incurs a violation for every syllable to the right of the prosodic word head.

The alignment constraints (AFL, AFR, MFL, MFR) are represented by the pattern *A:Q[A], where *A:Q[A] returns the number of A that satisfy the pattern Q[A]. For example, *($\mathcal{F}$, σ): σ…$\mathcal{F}$ returns the number of syllables that preceed $\mathcal{F}$, where $\mathcal{F}$ is a foot; and the pattern *($\mathcal{P}$, σ): $\mathcal{P}$…σ returns the number of syllables that preceed $\mathcal{P}$, where $\mathcal{P}$ is the head foot of the prosodic word. .

(2) Con.nGY

Name	*Abbreviation*	*Violation*	*Comment*
Parse-Syllable	P-s	*o	
Iamb	Ia	*-X, *-Y	
Trochee	Tr	*X-, *Y-	
All-feet-left	AFL	*($\mathcal{F}$, σ): σ…$\mathcal{F}$	$\mathcal{F}$ = a foot, σ = a syllable
All-feet-right	AFR	*($\mathcal{F}$, σ): $\mathcal{F}$…σ	$\mathcal{F}$ = a foot, σ = a syllable
Main-foot-left	MFL	*($\mathcal{P}$, σ): σ…$\mathcal{P}$	$\mathcal{P}$ = a foot heading the prosodic word
Main-foot-right	MFR	*($\mathcal{P}$, σ): $\mathcal{P}$…σ	$\mathcal{P}$ = a foot heading the prosodic word

1.2 Review of the patterns of nGX and their relation to nGY

Like nGY, the nGX system is a quantity insensitive footing system in which inputs are undifferentiated strings of syllables and outputs are parses of the input syllables into feet. These feet are either monosyllablic or bisyllabic, and the bisyllabic feet fall into two forms: iambic or troachic. Each output form must have, minimally, a single foot. No two feet are distinguished in prominence. A candidate for an input is the input and a parse of the input, as stated above. The candidate set for an input is comprised of a candidate for each possible parses of the input. The constraint set consists of Parse-syllable, Iamb, Trochee, All-feet-left, and All-feet-right. See (2) for a definition of these constraints (and also the constraints of nGY).

The nGX system produces twelve languages that can be classified by the three density classes: sparse (**sp**), weakly dense (**wD**) and strongly dense (**SD**). Sparse languages, in all forms, in all lengths, have exactly one foot. This foot will be uniformly iambic or trochaic in forms with more than one syllable, and will either be left-aligned or right-aligned. Weakly dense languages parse all syllables into binary feet, except in odd-length forms where a single syllable is left unparsed. These feet are either all iambic or trochaic, and are either left-aligned or right-aligned. The strongly dense languages parse all syllables into feet in all forms. These feet are all binary in even-length forms or exactly one foot is monosyllabic in odd-length forms. They are either all left-aligned or right, and are either all iambic or trochaic.

We can schematize these patterns by density class. Adopting the notation in (3), the patterns of the density classes of nGX are given (4).

(3) Notation for density patterns of nGX

F = bisyllabic foot
X = monosyllabic foot
o = unparsed syllable

F^k = sequence of *k* bisyllabic feet
o^k = sequence of *k* unparsed syllables
(o) = unparsed syllable, inclusion depending on parity of input string
(X) = monosyllabic foot, inclusion depending on parity of input string

(4) Patterns of nGX by density class (forms with two or more syllables)

Density class	*Pattern for left-aligned*	*Pattern for right-aligned*
Sparse	Fo^k	o^kF
Weakly dense	$F^k(o)$	$(o)F^k$
Strongly dense	$(X)F^k$	$F^k(X)$

The six patterns in (4) yield the twelve languages of nGX – each pattern shown has two variants, one with iambic feet and one with trochaic. These provide the frame for understanding the patterns of nGY.

Turning to nGY, before delving into the patterns of nGY at the micro-level, we can view them at a macro-level by ignoring the distinction between a foot that is the head of the prosodic word and a foot that is not. By doing so, two broad classes of patterns emerge: those languages whose footing pattern is identical to an nGX language and those languages whose footing pattern differs from an nGX language by the placement of exactly one foot (which is always the primary-stressed foot). These two patterns are shown in (5) below for left-aligned languages, organized by density class, for forms with four or more syllables. The languages of nGY are symmetric with respect to left and right-alignment, so these two classes of languages obtain also in the right-aligned languages.

(5) Patterns of nGY for left-aligned languages, prosodic-word prominence not represented

Density class	*Identical to nGX*	*Single foot difference to nGX*
Sparse	Fo^k	Fo^kF
Weakly dense	$F^k(o)$	$F^k(o)F$
Strongly dense	$(X)F^k$	$F(X)F^k$

The patterns that differ from the nGX languages (the right-most column in (5)) arise when the default foot-placement alignment edge differs from the prosodic word head alignment edge. This places the single, deviating foot on the opposite edge from the default-alignment edge. This comes about, as one would expect, when AFL ≫ AFR and MFR ≫ MFL – and vice versa for default right-aligned languages (not schematized above). Languages in which the default-alignment edge is the opposite edge of the main-stress alignment edge are called *discordant* and when the two alignment edges agree the language is called *concordant*.[1] Necessarily, languages from the right column in (5) above are discordant languages.

Once one reimposes the distinction between the foot that is the head of the prosodic word and feet that are not, all of these language classes further subdivide by placement of the head of the prosodic word – not just those languages that differ from the nGX patterns. So, for example, there are two types of weakly dense, left-aligned, iambic languages: one in which the main foot is left-aligned and one in which it is right-aligned. These have the footing patterns of $PF^k(o)$ and $F^kP(o)$, respectively, where P is the foot marked as the head of the prosodic word.

The sparse languages not identical to nGX further subdivide on footing in three-syllable words by whether they place a mono-syllabic foot or not (as discussed in the sparse section below). Even so, at this macro-level, organized by density class, all languages of nGY fall neatly into these two categories: nGX-identical and single-foot dissimilar. In a sense, we are projecting the languages and their patterns into the nGX system and seeing whether their images match languages in nGX – this is similar to the approach that

[1] Thanks to Alan Prince for the suggestion of the terms concordant/discordant.

Merchant and Krämer 2018 use for understanding stringency systems and how they embed in more rich environments.

1.3 Naming convention and trait discussion of nGY

Turning now to the micro-level of nGY, this section discusses the full set of wide-scope traits of nGY and the naming conventions that are used for the languages of nGY.

Each form in each language in nGY has a foot that is designated the head of the prosodic word. Each language has a default alignment for the prosodic word head, either the left edge of the prosodic word or the right edge. Each language also has a default alignment for feet that are not the prosodic word head. The default alignment may differ from the prosodic word head alignment for a given language. In such a case the language is termed a discordant language. If the two alignments (foot and prosodic word head) agree then the language is said to be a concordant language. Each language of nGY is either concordant or discordant.

Languages are further distinguished by their foot type: either all binary feet are iambic or they are trochaic.

The final wide-scope trait is the density class: each language is either sparse (sp), weakly dense (wD), or strongly dense (SD). Sparse languages have one or two feet in all forms. Weakly dense languages parse even-length forms exhaustively and leave a single syllable unparsed in odd-length forms. Strongly dense forms parse all syllables into feet in all forms. The wide-scope traits are summarized in (6) and their patterns are given in (7).

(6) Wide-scope traits of nGY

Trait	*Values*	*Abbrev.*
Density	sparse	sp
	weakly dense	wD
	strongly dense	SD
Foot type	iambic	ia
	trochaic	tr
Default alignment	left-aligned	L
	right-aligned	R
Concordancy	concordant	con
	discordant	dis

(7) Patterns of wide-scope traits

Trait	*Value*	*Pattern*
Density	sp	All forms have one or two feet.
	wD	Exhaustive parsing in even-length forms, one σ unparsed in odd.
	SD	Exhaustive parsing in all forms.
Foot type	ia	All binary feet are iambic.
	tr	All binary feet are trochaic.
Def. alignment	L	Feet are left-aligned.
	R	Feet are right-aligned.
Concordancy	con	The main foot is aligned with the default-alignment edge.
	dis	The main foot is aligned oppositely from the default-alignment.

Languages are named after these traits, so that a sparse, iambic, left-aligned, discordant language (which has the footing pattern: Fo^{k}P) will have the sequence ‘sp.ia.L.dis’ in its name. All languages have one value from each of these four traits. For some languages, these four traits completely determine their extensional patterns and their grammars. Some languages require further traits to distinguish them from other languages. These languages will have these further traits specified in their name, but demarcated by

brackets, '[' and ']'. These non-global traits are discussed in the sections devoted to each of the three density classes.

The chart in (8) provides a count of the languages of nGY and organizes the languages by density class. Each of the nine language classes listed in (8) has four instantiating languages – these four instantiations arise from the free combination of the two traits FootType and DefaultAlignment (which may, at times, be abbreviated to DefAlign). So, each language class has an iambic, left-aligned language; an iambic, right-aligned language; a trochaic light-aligned language; and a trochaic right-aligned language. The precise extensional patterns of each of the nine classes are given in the sections below.

(8) Language classes of nGY

	Language class	***Count***
sparse	sp.FootType.DefAlign.con	4
	sp.FootType.DefAlign.dis.[o]	4
	sp.FootType.DefAlign.dis.[X]	4
wD	wD.FootType.DefAlign.con	4
	wD.FootType.DefAlign.dis.[e]	4
	wD.FootType.DefAlign.dis.[d]	4
SD	SD.FootType.DefAlign.con.[e]	4
	SD.FootType.DefAlign.con.[d]	4
	SD.FootType.DefAlign.dis	4
	Total	36

Throughout the remainder of this paper, I adopt the following notation. Binary feet (either iambic or trochaic) that are not the head of the prosodic word are represented as F. A binary foot (iambic or trochaic) that is the head of the prosodic word is denoted by P. A monosyllabic foot, non-prosodic word head is rendered by X. A monosyllabic foot, prosodic word head is Y. An unparsed syllable is given by 'o'. To denote a sequence of k feet or k unparsed syllables, superscripting will be used like F^k or o^k. These facts are summarized in (9). In the examples below k may take on the values 0, 1, 2, … and so may represent no feet or no unparsed syllables.

(9) Notational conventions

F = binary foot, non-prosodic word head
X = unary foot, non-prosodic word head
P = binary foot, prosodic word head
Y= unary foot, prosodic word head
o = unparsed syllable

F^k = sequence of k binary feet
o^k = sequence of k unparsed syllables
(o) = unparsed syllable, inclusion depending on parity of input string
(X) = unary foot, inclusion depending on parity of input string
[P|Y] = obligatory P or Y, choice depending on parity of input string

So, for example, PF^ko represents a prosodic word that is comprised of a left-aligned foot that is the head of the prosodic word, followed by k binary feet (possibly zero), followed by a single unparsed syllable.

See (38), (39), (40) in §5 for a factorial typology of the languages of nGY in which the patterns of each language are described using the conventions above. The patterns of the sparse languages are discussed in detail in §2, the weakly dense in §3, and the strongly dense in §4.

1.4 A note on traits and properties

As is often the case, a single trait may be the result of a combination of property values. The density traits arise from the values of the two properties Mult and Un, with sparse being the property values Mult.sp and Un.o; weakly dense the property values Mult.D and Un.o; and strongly dense the property values Mult.D and Un.X. The FootType trait is determined solely by the Ftyp property. To distinguish the trait from the property, the trait will always be referred to as FootType, or foot type, while the property will always be referred to as Ftyp. The default alignment trait (also referenced as DefaultAlignment or DefAlign), in the weakly dense and strongly dense languages, arises from the FPos property. The sparse languages also have a default alignment trait, though its value is determined by sparse-specific properties. The concordancy trait arises from density-specific properties, as discussed below.

All languages of nGY select property values from the wide-scope properties listed in (11). The complete list of constraint classes is given in (10). The constraint classes M, L, and R are only utilized in narrow-scope properties.

(10) Constraint classes of nGY

F = {Ia, Tr}
A = {AFL, AFR}
M = {MFL, MFR}
L = {AFL, MFL}
R = {AFR, MFR}

(11) Wide-scope properties of nGY

Property	*Antagonists*
Ftyp.ia/tr	Ia <> Tr
Mult.D/sp	P-s <> {F.sub, A.dom}.dom
Un.X/o	P-s <> {F.dom, A.dom}.dom

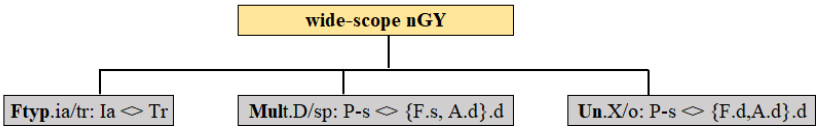
These three properties are directly imported from the identically named properties of nGX. nGX has one further property, Pos which takes the form Pos.L/R: AFL<>AFR. The nGY system also utilizes this property, (but calls is FPos, *foot* position, distinguishing it from main foot position) but it is not wide-scope – it only applies to weakly and strongly dense languages, not sparse languages. Concordant sparse languages do not rank AFL and AFR with respect to each other – default alignment is determined by the placement of the main-stress foot, as this is only foot in the word. Main stress placement in sparse languages is determined by the MPos[sp]: L.dom <> R.dom property. Sparse languages acquire foot alignment from the sparse-specific properties, MPos[sp] and either Mult[sp.L] or Mult[sp.R]. See §2 for explanation and definitions of these properties.

The relation between density traits and property values is summarized in (12) and the wide-scope properties are given in treeoid form in (13).

(12) Density traits and property values

Density trait	*Property values*
sparse	Mult.sp & Un.o
weakly dense	Mult.D & Un.o
strongly dense	Mult.D & Un.X

(13) Wide-scope sub-treeoid



2 Sparse

All sparse languages of nGY admit either one foot or two feet, but no more. So, a left-aligned concordant language parses all forms with two or more syllables as Po^k and a discordant, left-aligned language parses forms with four or more syllables as Fo^kP. Languages that admit exactly one foot in all forms are labeled the ***sp.FootType.DefAlign.con*** languages. They are sparse, may have foot type either iambic or trochaic and have default alignment either left or right. They are concordant languages and so the main foot falls on the default alignment edge. So, concretizing again, the language *sp.ia.L.con*, in forms having more than one syllable, places a single binary foot aligned with the left edge. It has the footing pattern: Po^k.

Languages that admit two feet in some forms are referred to as 'hammock' languages (Elenbaas & Kager 1999). The hammock languages place one foot on the default alignment edge and place the main foot on the opposite edge. All intervening syllables are left unparsed. By necessity, they are discordant languages.

There are two variants of the discordant, hammock languages, denoted by ***sp.FootType.DefAlign.dis.[X]*** and ***sp.FootType.DefAlign.dis.[o]*** where FootType may be either iambic or trochaic and DefAlign may be either left or right. The two variantes are distinguished by whether they place a monosyllabic foot in a three-syllable form or leave the third syllable unparsed. The sp.FootType.DefAlign.dis.[X] do place a unary foot in a three-syllable while the sp.FootType.DefAlign.dis.[o] do not.

The patterns of the three sparse language classes are given in (14) and examples are given in (15). The foot type is left unspecified – in the examples all binary feet are either iambic or trochaic depending on the foot type of the language. The patterns shown are for both for left-edge and right-edge default alignment. Note the patterns are symmetric with respect to default alignment.

(14) Patterns of the sparse

Language class name	*Forms >3 syllables*	*3-syllable forms*
sp.FootType.L.con	Po^k	same pattern as >3 syllables
sp.FootType.L.dis.[o]	Fo^kP	oP
sp.FootType.L.dis.[X]	Fo^kP	XP
sp.FootType.R.con	o^kP	same pattern as >3 syllables
sp.FootType.R.dis.[o]	Po^kF	Po
sp.FootType.R.dis.[X]	Po^kF	PX

(15) Examples of sparse languages

Language	*Example*	*Comment*
sp.ia.L.con	.uY.o.o.o.	A single foot (the prosodic head) is left-aligned, all other syllables are left unparsed.
sp.ia.L.dis.[o]	.uX.o.o.uY.	Two feet are placed on opposite edges with unparsed syllables intervening
sp.ia.L.dis.[o]	.o.uY.	In three-syllable forms, the third syllable is left unparsed even though this is a hammock language that will place a second foot in longer forms.
sp.ia.L.dis.[X]	.uX.o.o.uY.	The basic pattern is the same as in the other hammock language class (sp.ia.L.dis.[o]): two feet on opposite edges are placed.
sp.ia.L.dis.[X]	.X.uY.	In three-syllable forms, the third syllable is parsed as a unary foot.

A language is determined by its traits. To see this reified, consider an iambic, left-aligned sparse language. A complete accounting of all forms of this language requires the setting of, at most, two further traits. First, the language is either concordant or discordant. Extensionally, because this is a left-aligned language, this is equivalent to asking: Is main stress left-aligned or right-aligned? If left-aligned, the language is concordant, and all forms are completely predictable: the foot heading the prosodic word is left-aligned,

and there are no other feet. If right-aligned, the language is discordant, and is a so-called 'hammock' language in which there are two binary feet in forms with four or more syllables on opposite sides of the word.

The second trait now pertains to these hammock languages and the extensional question is: In a three-syllable word does the language 'hammock' or not? Here, 'to hammock', means to place two feet on opposite sides of the word; of course, in three-syllable forms, to place two feet, one foot must be monosyllabic. So this question devolves into asking: Does the language foot the third syllable in a three-syllable form or is the third syllable left unparsed? The answers to this sequence of questions completely determines all forms in these languages, and because nothing crucial relies on the language being iambic or left-aligned, these are the determining trait questions for all sparse languages. This sequence is schematized in (16).

(16) Trait choices for an iambic, left-aligned sparse language

Extensional trait query	*Comment*
Is main stress left or right-aligned?	Determines concordancy or discordancy; discordant are hammock languages.
'Hammock' three-syllable forms or not?	Determines whether to parse third syllable in three-syllable forms.

Again, (16) works exactly the same for trochaic or right-aligned sparse languages, and so determines the patterns of all sparse languages.

2.1 Note on the properties of the sparse.

The sparse specific properties for left-aligned languages are listed in (18) with the constraint classes listed in (17). There are parallel properties Mult[sp.R] and Un[sp.R] for right-aligned languages in which AFL is replaced with AFR. Note that the properties of the sparse encode in their names their scopes: the portion of the name in brackets represents the scope of the property. So, for example, MPos[sp] is in the scope of sparse languages while Mult[sp.L] is in the scope of sparse, left-aligned languages. This convention holds for all sparse properties and is adopted for some narrow-scope weakly dense and strongly dense properties.

(17) Constraint classes relevant to sparse properties

L = {AFL, MFL}
R = {AFR, MFR}
F = {Iamb, Troch}

(18) Sparse-scope properties for left-aligned languages

Property	*Antagonists*	*Comment*
MPos[sp].L′/R′	L.dom<>R.dom	Determines edge of main foot, left or right
Mult[sp.L].h/sp	P-s<>{F.sub, AFL}.dom	Distinguish hammock from non-hammock languages
Un[sp.L].X/o	P-s<>{F.dom, AFL}.dom	Distinguishes whether a third syllable in a three-syllable form is parsed or not

All sparse languages determine placement of main stress by the narrow-scope property, MPos[sp] with Mpos[sp].L′ languages having left-aligned main stress and Mpos[sp].R′ languages having right-aligned main stress. This property has scope only over sparse languages.[2] Here, the prime, '′', in Mpos[sp].L′/R′ represents main stress on the left or right edge. Furthermore, the concordant/discordant trait is determined by the MPos[sp] property and the Mult[sp.L] property. This differs from the weakly dense and strongly dense languages – those density classes have the FPos property which, in conjunction with their MPos property, determines concordancy. See §2 and §3 for discussion of the weakly and strongly dense properties.

[2] Weakly dense and strongly dense languages determine placement of main stress by the MPos.L′/R′:MFL<>MFR property.

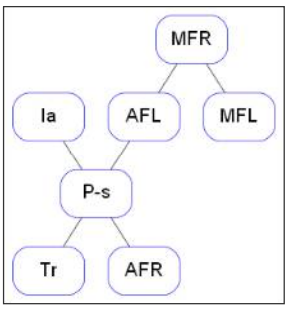
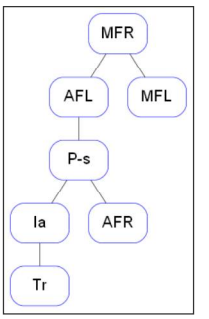
The hammock languages that have main stress left-aligned (and so have the MPos[sp].L′ value) are distinguished from the non-hammock languages by the narrow-scope property Mult[sp.L] with hammock languages having the value Mult[sp.L].h and non-hammock Mult[sp.L].sp. The 'sp' value in Mult[sp.L] represents that the languages are "true" sparse languages, having only one foot, while the Mult[sp.L].h languages have two feet in some forms (here the 'h' signifies 'h'ammock).

These hammock languages are further distinguished in the properties by the narrow-scope property Un[sp.L] with the hammock languages that parse a third syllable in a three-syllable form having the value Un[sp.L].X and the those that do not parse the third receive the value Un[sp.L].o.

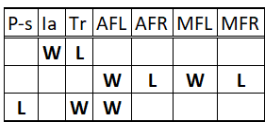
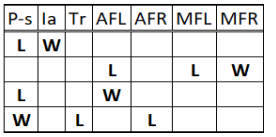
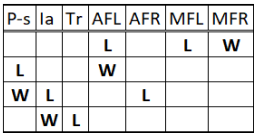
Of note is the direct reference to AFL in these properties and not to {AFL, AFR}.dom, as occurs in the other density classes. This is a required feature of the system as the sparse languages do not all rank AFL with respect to AFR and so it is not guaranteed that there is unique dominant constraint in the A = {AFL, AFR} class for any given language. The properties discussed here are for the MPos[sp].L′ languages – there is a mirror set for the MPos[sp].R′ languages in which AFL is replaced by AFR. See (45) in §4 for a complete list of the properties of nGY and Merchant (in prep) for further discussion.

The grammars of the sp.ia.L.con, sp.ia.L.dis[o], and sp.ia.L.dis[X] are given in (19) in Hasse form (if possible) and in (20) in ERC form. These three represent the twelve total total sparse languages, with each being an exemplar of four different languages (the foot type may be either iamb or trochee and the default alignment may be either left or right). To produce a trochaic variant of any of the three, simply swap the positions of the constraints Iamb and Trochee in the respective Hasse diagrams (or change the polarity of the Iamb, Troch constraints in the ERC representation so W → L and L → W). This is the same as changing the property value of Ftyp.ia to Ftyp.tr. To produce a right-aligned variant, swap the positions of AFL and AFR, and also swap the positions of MFL and MFR – swapping both is necessary to ensure that a concordant language stays concordant and a discordant stays discordant. This is the result of changing the property value of MPos.L′ to MPos.R′. The grammar of sp.ia.L.con is given only in ERC set form as it does not succumb to a Hasse representation. The constraint order on the ERCs is (P-s, Ia, Tr, AFL, AFR, MFL, MFR) with the constraint pairs Ia and Tr, AFL and AFR, and MFL and MFR, delimited by period, '.'.

(19) Grammars of sp.ia.L.con, sp.ia.L.dis[o], and sp.ia.L.dis[X] in Hasse form, if possible

sp.ia.L.con	sp.ia.L.dis[o]	sp.ia.L.dis[X]
Does not admit a Hasse representation.		

(20) Grammars of sp.ia.L.con, sp.ia.L.dis[o], and sp.ia.L.dis[X] in ERC form

sp.ia.L.con	sp.ia.L.dis[o]	sp.ia.L.dis[X]
		

P-s	Ia	Tr	AFL	AFR	MFL	MFR
	W	L				
			W	L	W	L
L		W	W			

P-s	Ia	Tr	AFL	AFR	MFL	MFR
L	W					
			L		L	W
L			W			
W		L		L		

P-s	Ia	Tr	AFL	AFR	MFL	MFR
			L		L	W
L			W			
W	L			L		
	W	L				

The three languages, sp.ia.L.con, sp.ia.L.dis[o], and sp.ia.L.dis.[X] only differ on the sparse-specific property values. The charts in (21), (22) show the shared and distinct properties of the three representative languages.

(21) Shared properties of sp.ia.L.con, sp.ia.L.dis[o], and sp.ia.L.dis.[X]

Property value	*Ranking requirement*
Mult.sp	{F.sub, A.dom}.dom ≫ P-s
Un.o	{F.dom, A.dom}.dom ≫ P-s
Ftyp.ia	Ia ≫ Troch

(22) Distinguishing properties of sp.ia.L.con, sp.ia.L.dis[o], and sp.ia.L.dis.[X]

sp.ia.L.con	sp.ia.L.dis[o]	sp.ia.L.dis[X]
MPos[sp].L′: L.d ≫ R.d	MPos[sp].R′: R.d ≫ L.d	MPos[sp].R′: R.d ≫ L.d
Mult[sp.L].sp: {F.s,A.d}.d≫P-s	Mult[sp.L].h: P-s ≫{F.s,A.d}.d	Mult[sp.L].h: P-s ≫{F.s,A.d}.d
Un[sp.L].o: {F.d,A.d}.d≫P-s	Un[sp.L].o: {F.s,A.d}.d≫P-s	Un[sp.L].X: P-s ≫{F.d,A.d}.d

It is worth noting that the sparse specific properties Mult[sp.L] and Un[sp.L] (and Mult[sp.R] and Mult[sp.R]), like their wide-scope breathren, permit a different scopal arrangement. The Un[sp.L] property could be a narrow-scope property under the Mult[sp.L].h value. Extensionally, choosing the Mult[sp.L].sp value determines the Un[sp.L] value: if a language only places a single foot in every form, then it also only places a single foot in a three-syllable form (the domain of effect of Un[sp.L]). Intensionally, choosing Mult[sp.L].sp has the same effect: one must choose Un[sp.L].o as the Mult[sp.L].sp value entails the Un[sp.L].o value.

Multiple scopal arrangements like those of Mult and Un, and Mult[sp.L] and Un[sp.L], always obtain when one property value's ranking requirements entails another values ranking requirements without changing the grammars obtained from a property analysis. So, if two properties, P and P′, are both wide-scope (or share the same scope) and P.a entails P′.a, then P′ can be placed in the scope of P.b, since a P.a valued language can only have the P′.a value. Also, because a property's two values always partition the total orders into two non-empty sets, if P.a entails P′.a, then P′.b entails P.b. Following the same logic, this means that P can be placed in the scope of P′.a. Of course, selection of a scopal configuration should be guided by extensional considerations, in addition to grammatical ones.

3 Weakly Dense

In nGY, in weakly dense languages, all feet (in forms having more than one syllable) are binary having foot type Ftyp. Even-length forms are exhaustively parsed in all languages. Odd-length forms (>1 syllable) leave exactly one syllable unparsed. Languages are either concordant or discordant (as all languages must be in nGY). In concordant weakly dense languages, in odd-length forms, the single unparsed syllable falls on the opposite edge from the default alignment edge (as it always does in nGX in weakly dense languages). These languages are referred to as ***wD.FootType.DefAlign.con***.

The nGY system distinguishes two types of discordant weakly dense languages based on the placement of the unparsed syllable in odd-length forms. The unparsed syllable may fall on the opposite edge from the default alignment edge (again, as is always the case in nGX in weakly dense languages) – these languages are referred to as ***wD.FootType.DefAlign.dis[e]*** and have the unparsed syllable aligned with the *edge* of the prosodic word. For example, the language *wD.tr.L.dis.[e]* (a weakly dense, trochaic, left-aligned, discordant language) will parse a seven-syllable input as -Xu-Xu-Yu-o-.

Alternatively, the unparsed syllable may be *displaced* from the opposite edge by the main foot – these languages are denoted ***wD.FootType.DefAlign.dis[d]***. In a left-aligned, discordant language a seven-

syllable form will be parsed as -Xu-Xu-o-Yu-. This displacement arises because the primary stress foot is misaligned with the default foot alignment. The configuration of constraints and properties leading to this are discussed below in the 'Note on the properties of the weakly dense' section.

The patterns of the three weakly dense language classes are given in (23). The foot type is left unspecified – in the examples all binary feet are of type FootType. The patterns are shown for both left-edge and right-edge default alignment. The footing patterns are symmetric with respect to default alignment.

(23) Patterns of the weakly dense language classes for >1 syllable forms

Language class name	*Pattern*
wD.FootType.L.con	$PF^{k}(o)$
wD.FootType.L.dis.[e]	$F^{k}P(o)$
wD.FootType.L.dis[d]	$F^{k}(o)P$
wD.FootType.R.con	$(o)F^{k}P$
wD.FootType.R.dis.[e]	$(o)PF^{k}$
wD.FootType.R.dis[d]	$P(o)F^{k}$

In the examples in (24) the unparsed syllable in the forms is underlined, like o, to increase readability.

(24) Examples of weakly dense languages

Language	*Example*	*Comment*
wD.ia.L.con	.uY.uX.o.	All feet are left-aligned and the single unparsed syllable is on the right-edge of the word. The prosodic word head along with the other feet are left-aligned.
wD.ia.L.con	.uY.uX.	Exhaustive parsing in even-length forms.
wD.ia.L.dis.[e]	.uX.uX.uY.o.	Feet are left-aligned while the prosodic word head is right-aligned. The single unparsed syllable is adjacent to the right edge of the prosodic word.
wD.ia.L.dis.[d]	.uX.uX.o.uY.	The single unparsed syllable is displaced by the prosodic word head which is adjacent to the right edge of the prosodic word.

3.1 Note on the properties of the weakly dense.

All weakly-dense languages determine default alignment by the FPos property – the weakly-dense specific properties are given in (26) below and the relevant constraint classes in (25). The left-aligned languages having the FPos.L value and right-aligned the FPos.R. Furthermore, weakly dense languages adjudicate placement of the main stress by the MPos property with main stress left-aligned with the MPos.L′ value and right-aligned with the MPos.R′. Concordancy and discordancy arise directly from the combination of these two properties (as they do in the strongly dense languages – though not in the sparse since sparse languages are not in the scope of the FPos property).

The odd-syllable placement in discordant languages is decided by the AM[wD] property. Languages that displace the odd syllable have the value AM[wD].m and those that do not have the value AM[wD].a. Note that the properties FPos and MPos also fall under the scope of the strongly dense languages – they fall under the scope of the Mult.D value of the Mult property which includes both weakly dense and strongly dense languages. The abbreviation 'dis' is for discordant languages.

The properties of the weakly dense are given in (26) and the constraint classes in (25).

(25) Constraint classes relevant to weakly dense languages

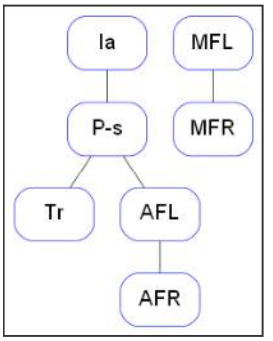
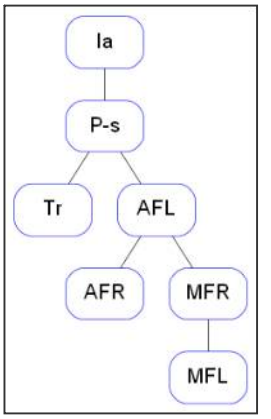
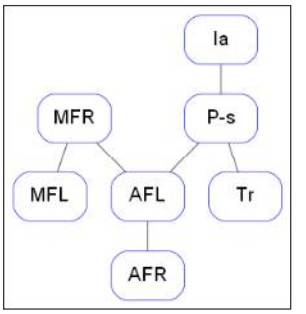
A = {AFL, AFR}
M = {MFL, MFR}

(26) Properties of the weakly dense languages

Property	*Antagonists*	*Scope*	*Comment*
FPos.L/R	AFL <> AFR	Mult.D	Determines default edge alignment
MPos.L′/R′	MFL <> MFR	Mult.D	Determines edge of main foot, left or right
AM[wD].a/m	A.dom <> M.dom	wD & dis[3]	Determines whether to place the unparsed syllable on the edge or displace it by the main foot.

The grammars of three representative languages of the weakly dense are given in (27). To produce trochaic versions swap the positions of Iamb and Trochee in the Hasse diagrams (this results from changing the property value of Ftyp.ia to Ftyp.tr). To produce right-aligned versions (while keeping the con/dis trait), swap the positions of AFL and AFR, and also swap the posistions of MFL and MFR (this results from changing the values of FPos and MPos for each language).

(27) Grammars of representative weakly dense languages

wD.ia.L.con	wD.ia.L.dis.[e]	wD.ia.L.dis[d]
		

The three languages, wD.ia.L.con, wD.ia.L.dis[e], and wD.ia.L.dis.[d] only differ on the weakly-dense specific property values. The charts in (28), (29) show the shared and distinct properties of the three representative languages.

(28) Shared properties of wD.ia.L.con, wD.ia.L.dis[e], and wD.ia.L.dis.[d]

Property value	*Ranking requirement*
Mult.D	P-s ≫ {F.sub, A.dom}.dom
Un.o	{F.dom, A.dom}.dom ≫ P-s
Ftyp.ia	Ia ≫ Troch
FPos.L	AFL ≫ AFR

(29) Distinguishing properties of wD.ia.L.con, wD.ia.L.dis[e], and wD.ia.L.dis.[d]

wD.ia.L.con	wD.ia.L.dis[e]	wD.ia.L.dis.[d]
MPos.L′: MFL.d ≫ MFR.d	MPos.R′: MFR.dom ≫ MFL.dom AM[wD].a: A.dom ≫ M.dom	MPos.R′: MFR.d ≫ MFL.d AM[wD].m: M.dom ≫ A.dom

[3] Discordant, so that either (1) FPos.L and MPos.R′ or (2) FPos.R and MPos.L′.

4 Strongly Dense

In nGY strongly dense languages all syllables are parsed into feet in all forms. In even forms all syllables are parsed into binary feet of foot type FootType. In odd-length forms a single syllable is parsed as a monosyllabic foot while all other syllables are parsed into binary feet. Each language has a default alignment and a default main stress alignment. If the default and main stress alignment are towards the same edge the language is described as *concordant.* If the edges are different the language is *discordant*.

Because forms are exhaustively parsed, the main stress foot will always be exactly aligned with the main stress edge regardless of whether the language is concordant or discordant. In discordant languages in odd-syllable forms the main stress foot is always binary and the single unary foot is aligned with the default alignment edge. These languages are termed ***SD.FootType.DefAlign.dis***. For example, the language SD.ia.L.dis parses a five-syllable input as -X-uX-uY-.

The nGY system distinguishes two types of strongly dense concordant languages by their placement of the unary foot in odd-syllable forms. The ***SD.FootType.DefAlign.con.[e]*** languages place the unary foot aligned perfectly with default alignment edge (which is also the main stress alignment edge). Because the main foot is always perfectly aligned with the main stress edge, the main foot is a monosyllabic foot in these languages. For example, SD.tr.R.con.[e] parses the seven-syllable input as -Y-Xu-Xu-Xu-.

The ***SD.FootType.DefAlign.con.[d]*** languages displace the unary foot from the default alignment edge by exactly one binary foot. The displacing foot is the main stress foot, and is perfectly aligned with the main stress edge. So, SD.tr.R.con.[d] has the form -Yu-X-Xu-Xu- in its language.

The patterns of the strongly dense and examples from various languages are given in (30) and (31).

(30) Patterns of the strongly dense for >1 syllable forms

Language class name	*Pattern*
SD.FootType.L.dis	$(X)F^kP$
SD.FootType.L.con.[e]	$[P\|Y]F^k$
SD.FootType.L.con.[d]	$P(X)F^k$
SD.FootType.R.dis	$PF^k(X)$
SD.FootType.R.con.[e]	$F^k[P\|Y]$
SD.FootType.R.con.[d]	$F^k(X)P$

(31) Examples of strongly dense languages

Language	*Example*	*Comment*
SD.ia.L.dis	X.uX.uX.uY	Exhaustive parsing. The single unary foot is left-aligned while the prosodic word head is right-aligned.
SD.ia.L.con.[e]	.uY.uX.uX.	Main stress is left-aligned, as are the feet.
SD.ia.L.con.[e]	.Y.uX.uX.uX.	Unary foot is left-aligned and is also the prosodic word head.
SD.ia.L.con.[d]	.uY.X.uX.uX.	Unary foot is displaced by the binary prosodic word head.

4.1 Note on the properties of the strongly dense.

The strongly-dense specific properties are given in (33) along with the constraint classes in (32). The strongly dense languages share two properties with the weakly dense languages: FPos and MPos. These two properties effect the same outcomes in the strongly dense languages as they do in the weakly dense: left-aligned languages have the FPos.L value and right-aligned the FPos.R, and main stress is left-aligned with the MPos.L′ value and right-aligned with the MPos.R′. Again, like in the weakly dense languages, concordancy and discordancy arise directly from the combination of the property values of these two properties.

The concordant languages are distinguished extensionally by the placement of the monosyllabic foot in odd-length forms: either the monosyllabic foot is main-edge aligned or is displaced by a binary main foot. This distinction is determined by the AM[SD] property, where AM[SD].a languages have the unary foot edge-aligned and the AM[SD].m have the unary foot displaced by the main foot. This pattern arises because of the interaction between the dominant alignment constraint (either AFL or AFR) and the subordinate main stress constraint (MFL or MFR).

The main stress constraint, M.dom, prefers the *edge* of the main stress foot to fall on the default alignment edge – it is moot on where the unary foot falls. The subordinate main stress constraint M.sub is decidedly not moot on where the unary foot falls – it prefers a *binary* main stress foot over a unary one, so to better align with the M.sub edge. So, when M.sub outranks A.dom, the M.sub constraint effectively stretches the main stress foot from a unary foot to a binary foot to better align with the M.sub edge. This results in the displacement of the unary foot from the dominant edge by a binary main foot.

The facts about the properties are summarized in (33) and constraint classes are given in (32).

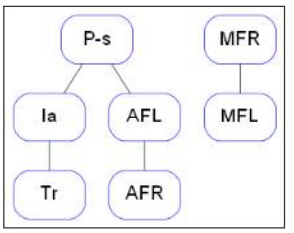
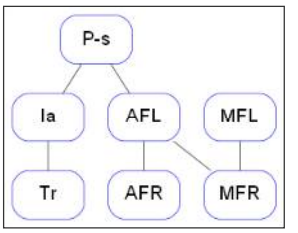
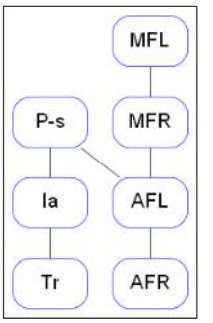
(32) Constraint classes relevant to the strongly dense languages
A = {AFL, AFR}
M = {MFL, MFR}

(33) Properties of the strongly dense languages

Property	*Antagonists*	*Scope*	*Comment*
FPos.L/R	AFL <> AFR	Mult.D	Determines default edge alignment
MPos.L′/R′	MFL <> MFR	Mult.D	Determines edge of main foot, left or right
AM[SD].a/m	A.dom <> M.sub	SD & con[4]	Determines whether to place a unary foot on the edge or displace it by a binary main foot.

Grammars from the three languages SD.ia.L.dis, SD.ia.L.con.[e], and SD.ia.L.con.[d] are shown in (34). These represent the full twelve languages of strongly dense. To produce a trochaic variant, transpose the positions of the Iamb and Trochee constraint. To produce a right-aligned variant (while keeping concordancy and discordancy unchanged), swap the positions of AFL and AFR, and also swap the positions of MFL and MFR.

(34) Representative grammars of the strongly dense

SD.ia.L.dis	SD.ia.L.con.[e]	SD.ia.L.con[d]
		

The three languages, SD.ia.L.dis, SD.ia.L.con.[e], and SD.ia.L.con.[d] only differ on the weakly-dense specific property values. The charts in (35), (36) show the shared and distinct properties of the three representative languages.

[4] Concordant, so either (1) FPos.L and MPos.L′ or (2) FPos.R and MPos.R′.

(35) Shared properties of SD.ia.L.dis, SD.ia.L.con.[e], and SD.ia.L.con.[d]

Property value	*Ranking requirement*
Mult.D	P-s ≫ {F.sub, A.dom}.dom
Un.X	P-s ≫{F.dom, A.dom}.dom
Ftyp.ia	Ia ≫ Troch
FPos.L	AFL ≫ AFR

(36) Distinguishing properties of SD.ia.L.dis, SD.ia.L.con.[e], and SD.ia.L.con.[d]

SD.ia.L.dis	SD.ia.L.con.[e],	SD.ia.L.con.[d]
MPos.L′: MFL.d ≫ MFR.d	MPos.R′: MFR.dom ≫ MFL.dom AM[SD].a: A.dom ≫ M.sub	MPos.R′: MFR.d ≫ MFL.d AM[SD].m: M.sub ≫ A.dom

5 Summary of Patterns

The patterns of all of the language classes for each of the density types (sparse, weakly dense, and strongly dense) are given in (38), (39), and (40) respectively. In each language class each P and F is a binary foot of type Ftyp. The notational conventions are repeated in (37).

(37) Notational conventions

F = binary foot, non-prosodic word head
X = unary foot, non-prosodic word head
P = binary foot, prosodic word head
Y = unary foot, prosodic word head
o = unparsed syllable

F^k = sequence of *k* binary feet
o^k = sequence of *k* unparsed syllables
(o) = unparsed syllable, inclusion depending on parity of input string
(X) = unary foot, inclusion depending on parity of input string
[P|Y] = obligatory P or Y, choice depending on parity of input string

(38) Patterns of the sparse for >1 syllable forms

Language class name	*Forms >3 syllables*	*3-syllable forms*
sp.FootType.L.con	Po^k	same as >3 syllables
sp.FootType.L.dis.[o]	Fo^kP	oP
sp.FootType.L.dis.[X]	Fo^kP	XP
sp.FootType.R.con	o^kP	same as >3 syllables
sp.FootType.R.dis.[o]	Po^kF	Po
sp.FootType.R.dis.[X]	Po^kF	PX

(39) Patterns of the weakly dense language classes for >1 syllable forms

Language class name	*Pattern*
wD.FootType.L.con	$PF^k(o)$
wD.FootType.L.dis.[e]	$F^kP(o)$
wD.FootType.L.dis[d]	$F^k(o)P$
wD.FootType.R.con	$(o)F^kP$
wD.FootType.R.dis.[e]	$(o)PF^k$
wD.FootType.R.dis[d]	$P(o)F^k$

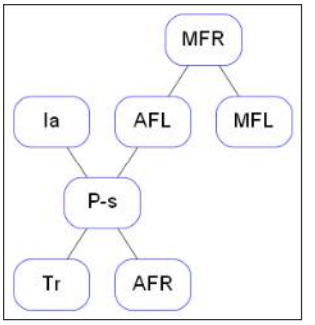
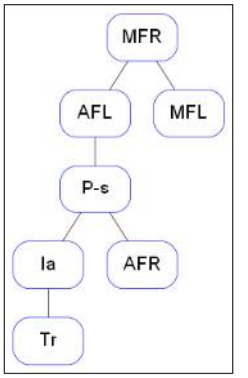
(40) Patterns of the strongly dense for >1 syllable forms

Language class name	*Pattern*
SD.FootType.L.dis	$(X)F^kP$
SD.FootType.L.con.[e]	$[P\|Y]F^k$
SD.FootType.L.con.[d]	$P(X)F^k$
SD.FootType.R.dis	$PF^k(X)$
SD.FootType.R.con.[e]	$F^k[P\|Y]$
SD.FootType.R.con.[d]	$F^k(X)P$

Appendix I. Representative Grammars of nGY

Constraint order in ERCs is (P-s, Ia, Tr, AFL, AFR, MFL, MFR).

(41) Grammars of iambic, left-aligned sparse languages

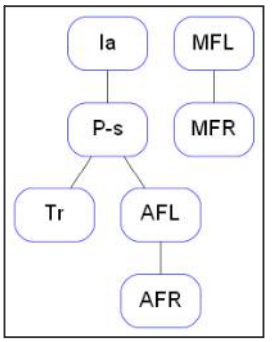
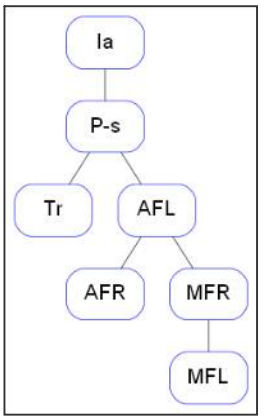
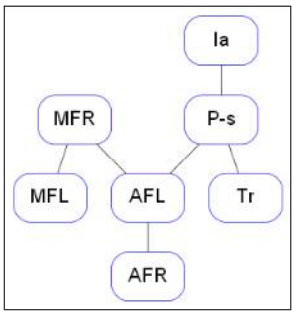
sp.ia.L.con	sp.ia.L.dis[o]	sp.ia.L.dis[X]
Does not admit a Hasse representation.		

P-s	Ia	Tr	AFL	AFR	MFL	MFR
	W	L				
			W	L	W	L
L		W	W			

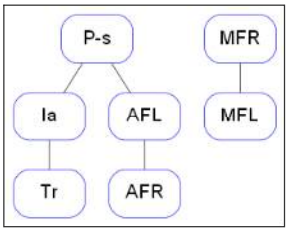
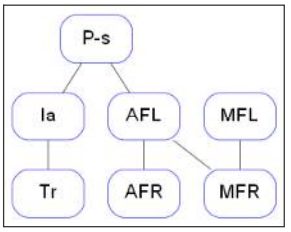
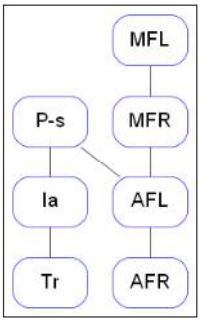
P-s	Ia	Tr	AFL	AFR	MFL	MFR
L	W					
			L		L	W
L			W			
W		L		L		

P-s	Ia	Tr	AFL	AFR	MFL	MFR
			L		L	W
L			W			
W	L			L		
	W	L				

(42) Grammars of iambic, left-aligned weakly dense languages

wD.ia.L.con	wD.ia.L.dis.[e]	wD.ia.L.dis[d]
		

(43) Grammars of iambic, left-aligned strongly dense languages

SD.ia.L.dis	SD.ia.L.con.[e]	SD.ia.L.con[d]
		

Appendix II. Properties and Treeoids of nGY

A complete list of the properties of nGY and their scopes.

(44) Constraint classes of nGY

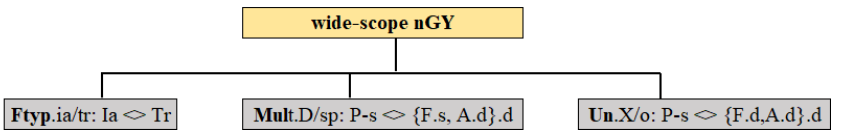
F = {Ia, Tr}
A = {AFL, AFR}
M = {MFL, MFR}
L = {AFL, MFL}
R = {AFR, MFR}

(45) Properties of nGY

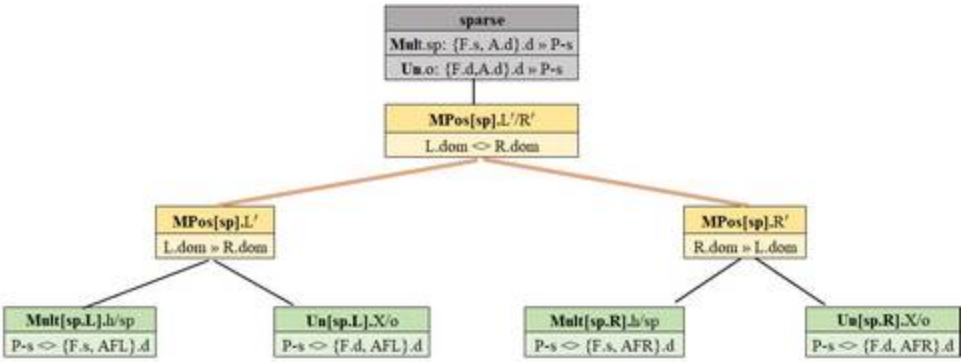
Wide-scope	***Antagonists***
Ftyp.ia/tr	Ia <> Tr
Mult.D/sp	P-s <> {F.sub, A.dom}.dom
Un.X/o	P-s <> {F.dom, A.dom}.dom

Narrow-scope	***Antagonists***	***Scope***
FPos.L/R	AFL <> AFR	Mult.D
MPos.L′/R′	MFL <> MFL	Mult.D
AM[wD].a/m	A.dom <> M.dom	wD & discordant
AM[SD].a/m	A.dom <> M.sub	SD & concordant
MPos[sp].L′/R′	L.dom <> R.dom	sp
Mult[sp.L].h/sp	P-s <> {F.sub, AFL}.dom	MPos[sp].L
Mult[sp.R].h/sp	P-s <> {F.sub, AFR}.dom	MPos[sp].R
Un[sp.L].X/o	P-s <> {F.dom, AFL}.dom	MPos[sp].L
Un[sp.R].X/o	P-s <> {F.dom, AFR}.dom	MPos[sp].R

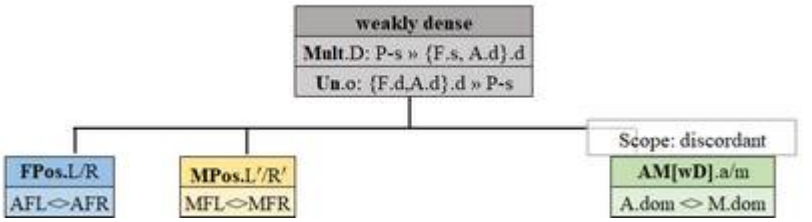
(46) Wide-scope sub-treeoid



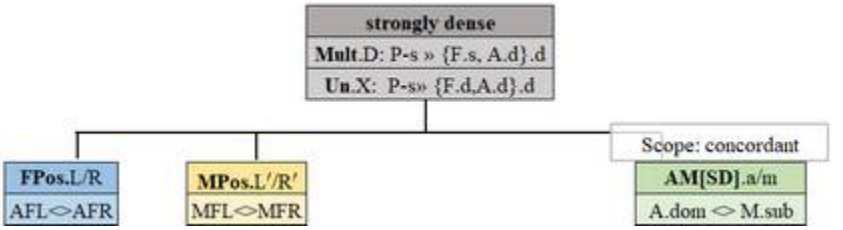
(47) Sparse sub-treeoid



(48) Weakly dense sub-treeoid



(49) Strongly dense sub-treeoid

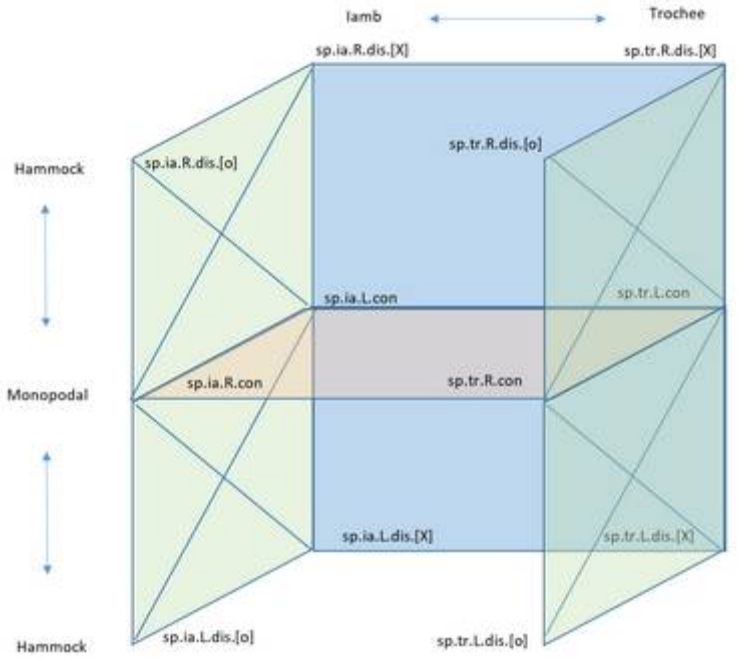


Appendix III. Typohedra of nGY

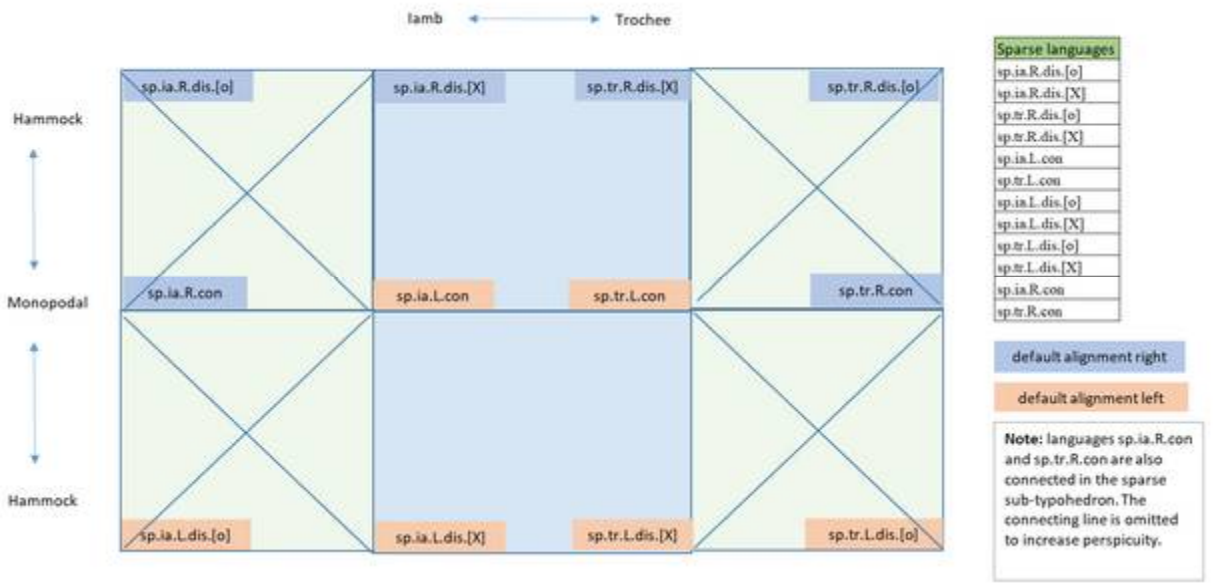
The sparse subtypohedron is constructed from the nGY typohedron by removing all grammars that are not of density type sparse along with any edges connected to non-sparse grammars. Remaining are all sparse grammars and all edges between sparse grammars.

The weakly dense and strong dense subtypohedra are constructed in the same manner as the sparse subtypohedron.

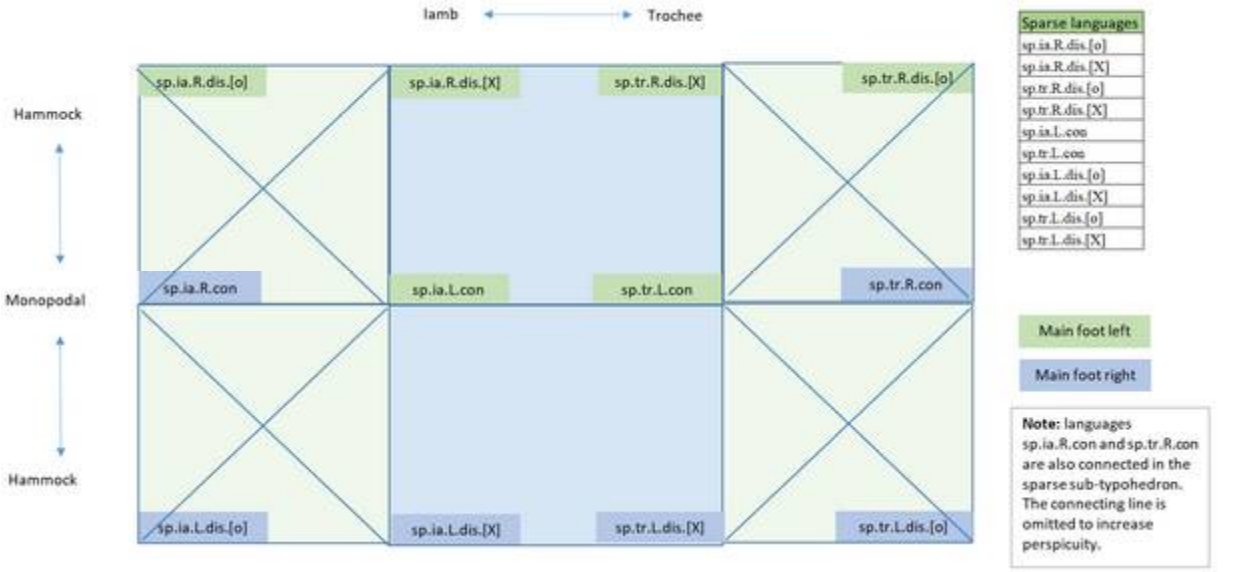
(50) Sparse subtypohedron



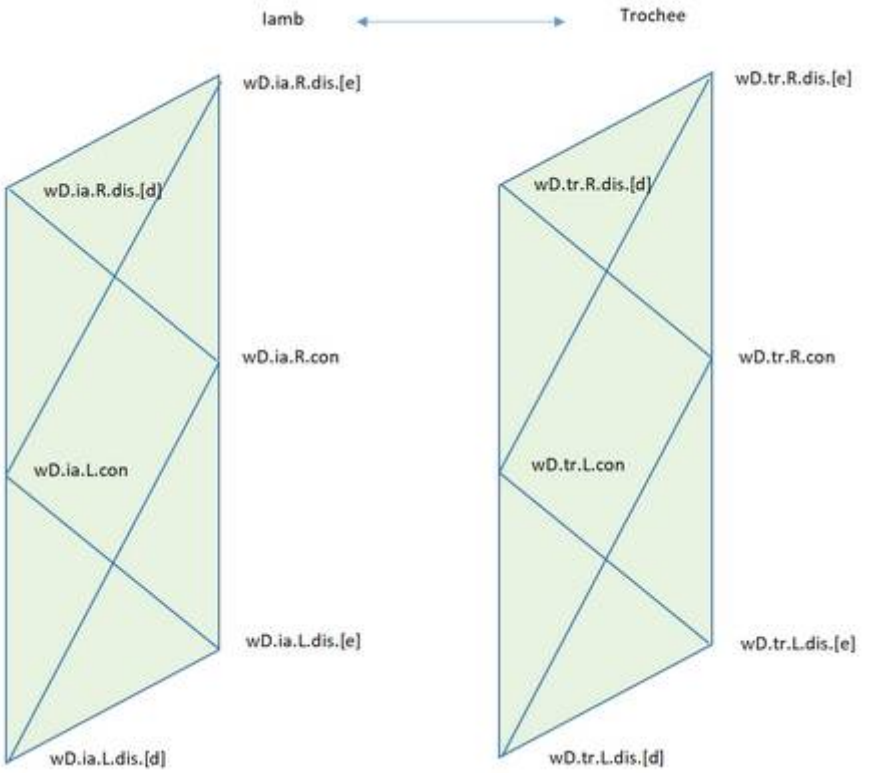
(51) Sparse subtypohedron – default alignment left and right



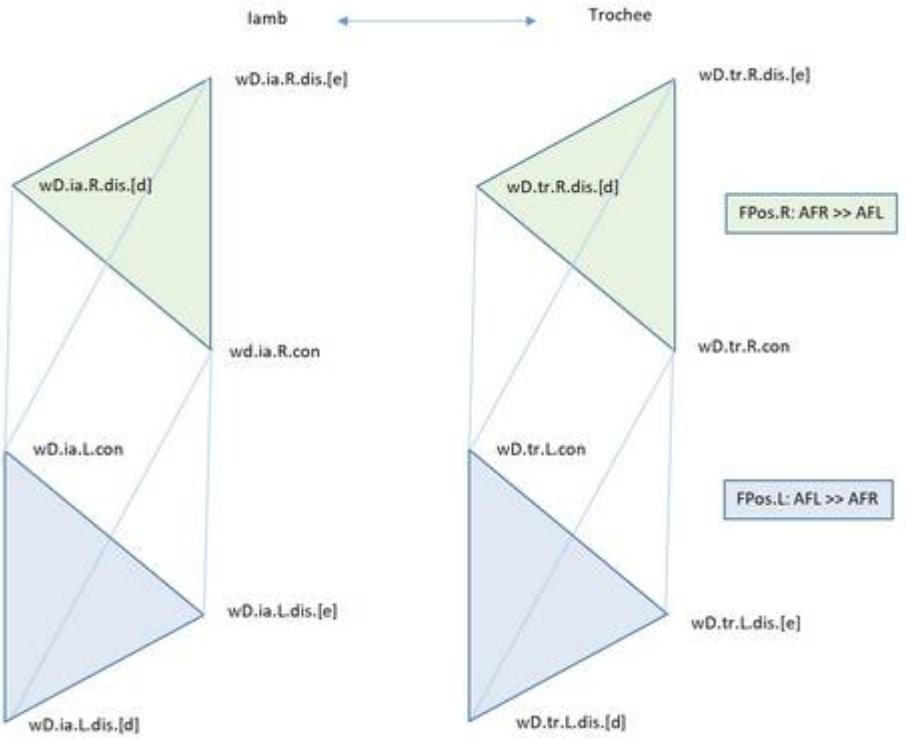
(52) Sparse subtypohedron – Mpos



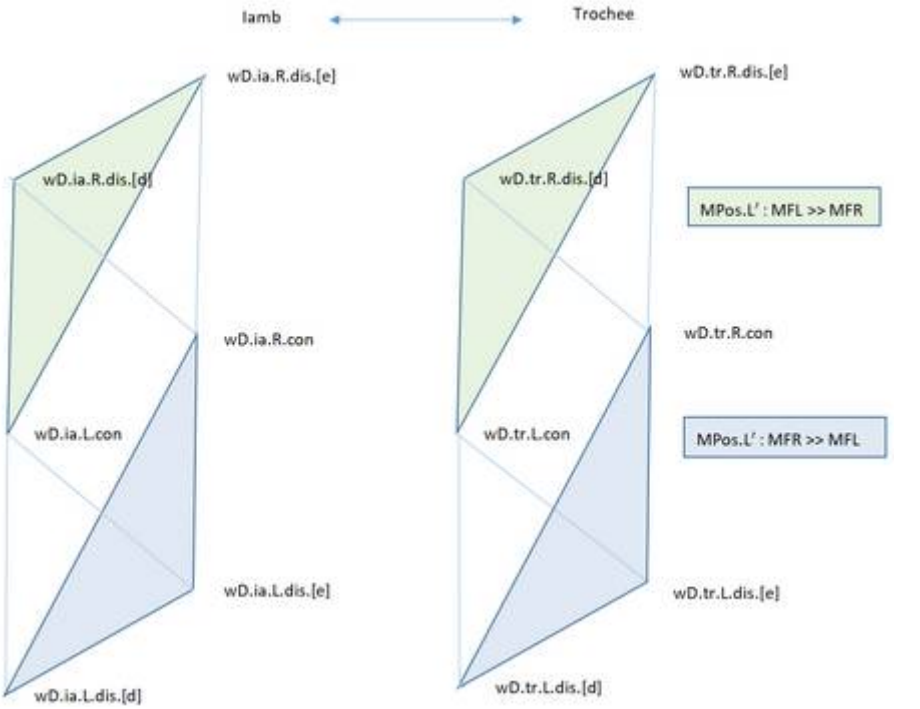
(53) Weakly dense subtypohedron



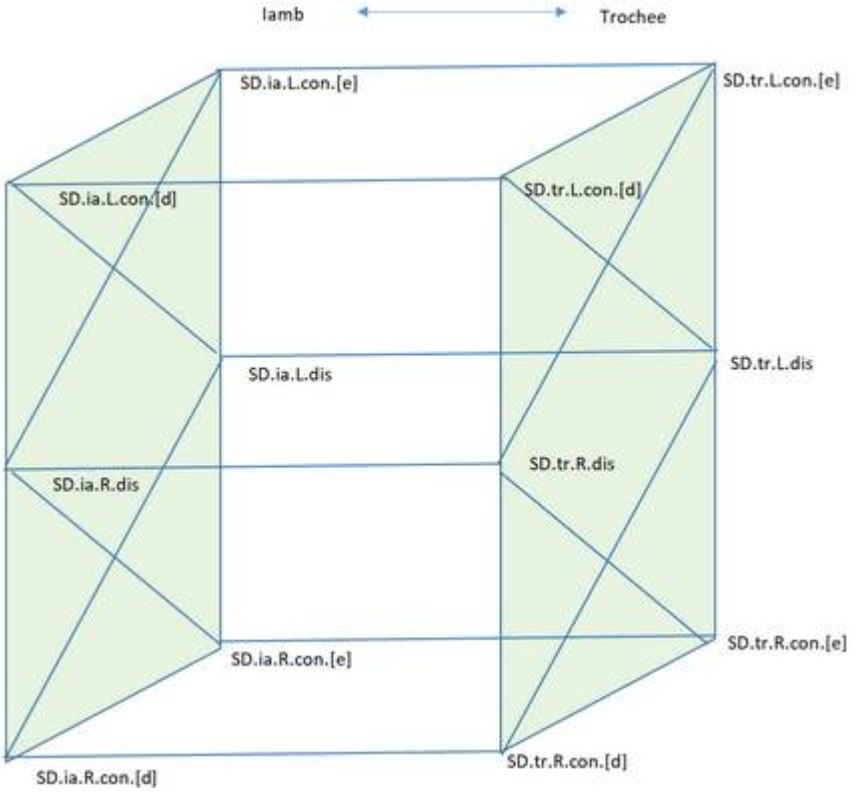
(54) Weakly dense subtypohedron – FPos



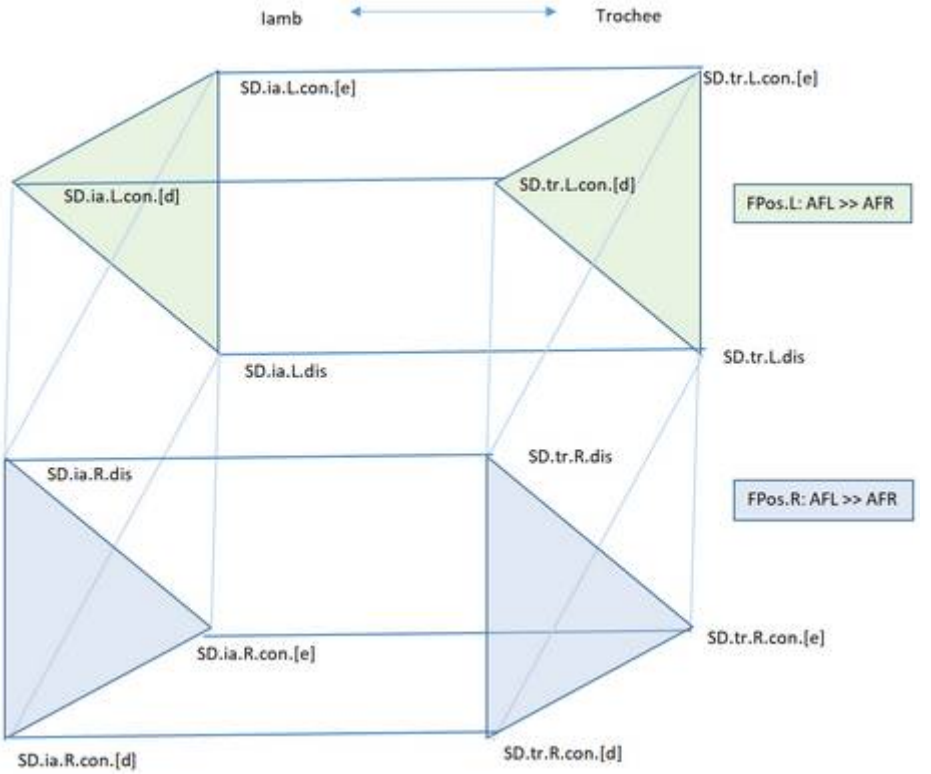
(55) Weakly dense subtypohedron – MPos



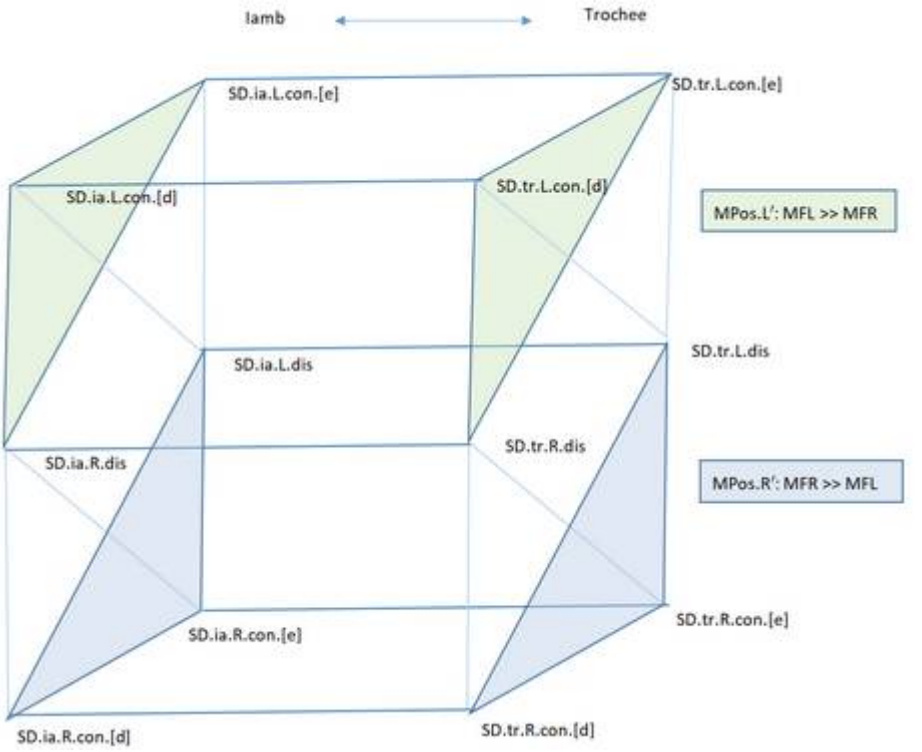
(56) Strongly dense subtypohedron



(57) Strongly dense subtypohedron – FPos



(58) Strongly dense subtypohedron – MPos



References

Alber, Birgit & Alan Prince. 2017. The Book of nGX. Memoirs of the Society for Typological Analysis. ROA-1312.

Alber, Birgit & Alan Prince. In prep. Typologies. ms. U. Verona & Typohedron.org

Alber, Birgit, Natalie DelBusso, and Alan Prince. 2016. From Intensional Properties to Universal Support. Language 92(2):e88-116. [DIO: 10.1353/lan.2016.0029]. ROA 1235.

Brasoveanu, Adrian & Alan Prince. 2005/2011. Ranking and Necessity: the Fusional Reduction Algorithm. Natural Language & Linguistic Theory 29.1, 3-70. ROA-794.

Elenbaas, Nine and René Kager. 1999. Ternary rhythm and the lapse constraint. Phonology 16, 273-329.

Hyde, Brett. 2012. Alignment constraints. Natural Language & Linguistic Theory 30: 789-836.

McCarthy, John. and Alan Prince. 1993. Generalized Alignment. ROA-7.

McManus, Hope. 2016. Stress Parallels in Modern OT. PhD. Dissertation. Rutgers University. ROA-1295.

Merchant, Nazarré & Alan Prince. 2016. The Mother of All Tableaux. ROA-1285.

Merchant, Nazarré & Martin Krämer. 2018. Holographic Principle: Typological Analysis Using Lower Dimensions. Proceedings of the Annual Meeting on Phonology. ROA-1340.

Merchant, Nazarré. 2018a. SOTA series #1.3: Supplemental Workbook to the Contours of nGY.

Merchant, Nazarré. 2018b. Workbook of nGH. Ms. Eckerd College.

Merchant, Nazarré. In prep. The Story of nGY. Ms. Eckerd College.

Prince, Alan, and Paul Smolensky. 1993/2004. Optimality Theory: Constraint Interaction in Generative Grammar. Blackwell. ROA-537.

Prince, Alan, Nazarré Merchant, and Bruce Tesar. 2007-2017. OTWorkplace.