A realizational approach to Khaling Morphology

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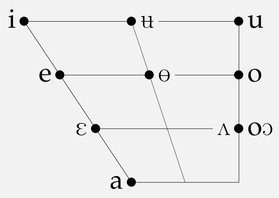
I. Introduction

Khaling is a Kiranti language of the Sino-Tibetan family, spoken mainly in the district of Solukhumbu, in eastern Nepal.

- 14 500 speakers (Lewis *et al.*, 2016)
- 2 dialects: Northern and Southern



Vowel system

Consonant system :

		Bilabial	Coronal	Palatal	Velar	Glottal
Plosive	voiceless	p	t	ts	k	ʔ
	aspirated	p^h	t^h	ts^h	k^h	
	voiced	b	d	dz	g	
	aspirated	b^h	d^h	dz^h	g^h	
Nasal		m	n		ŋ	
Fricative			s	ç		ɦ
Approximant		w	r	j		
	lateral		l			

- All vowels may be long, except for ʌ which is in complementary distribution with the long diphthong *oɔ*.
- There are two contrasting tones : a level tone (written V̄) and a falling tone (written V̂). They are restricted to long vowels and the diphthong *oɔ*.

Khaling verb stems are all monosyllabic, with a CVC or CV form (Jacques, 2016), yet their inflection is very complex. Stem alternations are present in every verb and intricately combine morphological and phonological processes. These stems then take a number of affixes, as they inflect for both subject and object, in a direct/inverse system : person hierarchy (1^{st}> 2^{nt}> 3^{rd}) conditions the inflected form.

The Khaling verbal template (partially adapted from Jacques *et al.*, 2012):

-1	0	1	2	3	4	5	6	7
Prefix	Stem	Aux.	Person	TAM	Person	Person	Reflexive	Number

The present poster describes only past and non-past personal forms. Forms including auxiliaries, reflexive pronouns and numbers will not be treated here.

II. Method

In order to analyze Khaling inflectional data, we use a framework developed by G. Stump (Stump, 2001; Stewart et Stump, 2007; Bonami et Stump, 2014): **Paradigm Function Morphology** (PFM), a highly heuristic formalization of paradigm complexity. We base our work on Sino-Tibetan languages specialist Guillaume Jacques (2016)'s collected data and his own analysis of Khaling inflectional classes.

Extensive stem alternation and syntactic complexity in languages are difficult to handle and have often been described with *ad hoc* phonological rules and diachronic considerations, which are only applicable to a single system. Working from a synchronic approach, we believe that they can be modeled as sets of simplex rules using PFM, based primarily on morphology, with Rules of Stem Choice (RSC) and Rules of Exponence (RE), phonology being secondarily formalized in a block of Morphophonological Rules (MPR).

III. Partial paradigm of the transitive verb *lop*

Lop, "to catch" (from Jacques *et al.*, 2012)

(First person dual and plural forms, as well as some of the inverse forms, have been excluded for concision.)

Subject > Object	-Past	Past
1Sg>3Sg	lob-u	lob-u-t-ʌ
1Sg>3Du	lob-u-su	lob-u-t-ʌ-su
1Sg>3Pl	lob-u-nu	lob-u-t-ʌ-nu
2Sg>3Sg	ʔi-lō:b-ɯ	ʔi-lô:p-t-ɛ
2Sg >3Du	ʔi-lô:p-su	ʔi-lô:p-t-ɛ-su
2Sg >3Pl	ʔi-lô:p-nu	ʔi-lô:p-t-ɛ-nu
2Du >3	ʔi-lɵp-i	ʔi-lɵp-i-t-i
2Pl >3	ʔi-loɔ̂m-ni	ʔi-lɵp-t-ɛ-nu
3Sg >3	lō:b-ɯ	lô:p-t-ɛ
3Du >3	lô:p-su	lô:p-t-ɛ-su
3Pl>3	lô:p-nu	lô:p-t-ɛ-nu
3/2Sg >1Sg	ʔi-loɔ̂m-ŋʌ	ʔi-lɵp-ʌ-t-ʌ
3/2Du >1Sg	ʔi-loɔ̂m-ŋʌ-su	ʔi-lɵp-ʌ-t-ʌ-su

Khaling shows a high level of paradigm complexity, with both extensive stem alternations and numerous affix slots. For this reason, we have chosen to focus our analysis mainly on one inflectional class.

The verb *lop* belongs to the first inflectional class (IC1), according to Jacques (2016), which is the most common class, made up of CVC-stem verbs. The last two rows of the table show two inverse forms, where the object is hierarchically higher than the subject. Their main distinction from the the rest of the paradigm is their specific prefix *ʔi-*.

IV. Stem alternations

Both the verb's vowel and second consonant show alternations, with quantity, length and tone alternations in the vowel. These make up a complex paradigm with a high number of different stems.

We describe these stems with Rules of Stem Choice (RSC), where stem X_1(*lɵp*) is the default weak stem, i.e. a rule where the property set is left blank and applies to every cell not filled by another rule. It is contrasted with stem *Y* (*loɔ̂m*), which is the strong stem. X_3 is a longer allomorph of the X_1 stem and is also weak (Jacques, 2016; Léonard et Kihm, 2013, for the rules' formulation). The PERS (person) feature here corresponds the the person highest in the hierarchy.

Rules of Stem Choice :

RSC_{IC1} : X_1 & (<lop, σ{ }>) ↔ <lɵp, σ>
RSC_{IC1} : X_2 & (<lop, σ{CONJ: Dir [PERS: 2 NB: Sg] [PERS: 3>3]}>) ↔ <lô:p, σ>
RSC_{IC1} : Y & (<lop, σ{ CONJ: Inv TAM: -Past PERS: 1 NB: Sg}>) ↔ <loɔ̂m, σ>

Abbreviations :

DU – Dual
C – Consonant
CONJ – Conjugation
DIR – Direct
IC – Inflectional class
INV – Inverse
MPR – Morpho-phonological Rules
NB – Number
PERS – Person
PFM – Paradigm Function Morphology
PL – Plural
PRES – Present
RE – Rules of Exponence
RSC – Rules of Stem Choice
SG – Singular
TAM – Tense, Aspect, Mode
V – Vowel
-Past – Non-Past

V. Affixes

Affixes are formalized with Rules of Exponence (RE). Each affix slot is formalized as a block of rules, so that no two rules in a single block can apply to the same form. The first block (RSC being block 0) gives the prefix, which is polyvalent as it is the same for the second person and the inverse alignement.

Block I (prefix)
RE_{IC1}: I, X_v, σ{CONJ: Inv} ↔ ʔi**X**
RE_{IC1}: I, X_v, σ{CONJ: Dir PERS: 2} ↔ ʔi**X**

Block II corresponds to the tense suffix *t*, with a single rule:

Block II (tense suffix)
RE_{IC1}: II, X_v, σ{TAM: Past} ↔ **X***t*

Block III is the first person agreement block : it corresponds to a "trapped" morpheme, only present in the past tense, expressing the highest person in the hierarchy.

Block III ("highest "person agreement I)
RE_{IC1}: III, X_v, σ{TAM: Past CONJ: Dir PERS 1} ↔ **X***u*
RE_{IC1}: III, X_v, σ{TAM: Past CONJ: Dir PERS 2} ↔ **X***i*
RE_{IC1}: III, X_v, σ{TAM: Past CONJ: Inv PERS 1} ↔ **X**ʌ

Block IV is a second block of person agreement : it corresponds to the person highest in the hierarchy.

Block IV ("highest" person agreement II)
RE_{IC1}: IV, Xv, σ{ PERS: 1 NB: Sg} ↔ X_1ʌ
RE_{IC1}: IV, Xv, σ{ TAM: Past CONJ: Dir PERS: 1 NB: Sg} ↔ X_1ʌ
RE_{IC1}: IV, Xv, σ{ TAM: -Past CONJ: Dir PERS: 1 NB: Sg} ↔ X_1u
RE_{IC1}: IV, Xv, σ{ TAM: -Past CONJ: Inv PERS: 1 NB: Sg} ↔ Yŋʌ
RE_{IC1}: IV, Xv, σ{ PERS: 2 NB: Du} ↔ X_1i
RE_{IC1}: IV, Xv, σ{ PERS: 2 NB: Pl} ↔ Y*ni*
RE_{IC1}: IV, Xv, σ{ PERS: 2 NB: Pl TAM: Past} ↔ X_1nu
RE_{IC1}: IV, Xv, σ{ TAM: -Past CONJ: Dir PERS: 2sg>3sg/3sg>3} ↔ X_2ɯ
RE_{IC1}: IV, Xv, σ{ } ↔ X_2

Block V gives the other person agreement : the lowest in the hierarchy.

Block V ("lowest" person agreement)
RE_{IC1}: V, Xv, σ{ PERS:3 NB:Du } ↔ **X***su*
RE_{IC1}: V, Xv, σ{ PERS:3 NB:Pl } ↔ **X***nu*

VI. Morphophonology

Khaling consonantal and tonal alternations are tightly linked to the person endings, and they can be mainly resolved by morphophonological rules. These rules model the phonological interactions between stems and affixes.

Morphophonological Rules :

- Epenthetic ɛ :

MPR_{IC1} : <t<(CV)>> ↔ <tɛ<(CV)>> /__#

- Consonant voicing and vowel centering before -u:

MPR_{IC1} : < lɵp <u> > ↔ < lob <u> >

- Consonant voicing and tone lowering before -ɯ:

MPR_{IC1} : < lô:p <ɯ> > ↔ < lō:b <ɯ> >

VII. Other inflectional classes

There are two other inflectional classes in Khaling :

- A class of verbs with an additional stem of the form CVCt, but a simpler vowel opposition (either length or quality, but not both).
- A class of open root verbs, whose exponents differ somewhat, although the making strategy remains the same.

Intransitive verbs share the same classes. Here is an example of an IC_1 intransitive verb :

Singular forms of the intransitive verb k^hot, "to go" (Jacques *et al.*, 2012)

	Singular		
	1st person	2nd person	3rd person
-Past	k^hoɔj-ŋʌ	ʔi-k^hoɔj	k^hoɔj
Past	k^hɵs-tʌ	ʔi-k^hɵs-tɛ	k^hɵs-tɛ

The suffixes correspond for the most part to the inverse forms of *lop*. The main stem alternation, between a short consonant and a diphthong, is equally similar, though the secondary contrast between the short and long consonant does not appear here. Rules of Stem Choice :

RCR_{IC1} : X & (<k^hot, σ{ }>) ↔ <k^hɵs, σ>
RCR_{IC1} : Y & (<k^hot, σ{[PERS: 1 NB: Pl] [TAM: -Past [NB: Sg] [PERS: 2/3 NB: Pl]]}>) ↔ < k^hoɔj, σ>

VIII. Conclusion

Khaling verbal paradigms are truly complex, in terms of both stem alternations and affixal template. The PFM approach highlights this intricacy, but it also proves to be highly heuristical, as it allows us the disentangle the morphological and phonological processes taking part in paradigm construction.

Our modelization shows that Khaling uses a concatenative strategy in its affixal morphology, allowing to combine a limited number of forms to make up a complex paradigm, that stem alternations rely primarily on strong/weak vowel opposition, with secondary length changes, and that consonant and tone modifications depend completely on the phonological interaction with the suffixes.

Accordingly, we can explain the structural complexity of Khaling verbal morphology with sets of rules that reveal simplex mechanisms which cannot be discerned at first glance.

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