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Grammatical tone in Cantonese vocative reduplication

Cassandra Caragine[*]

Abstract. Cantonese vocative reduplication appears to have complete tonal overwrite with both copies undergoing tone changes. However, this paper argues that the tone changes should be analyzed as the result of two separate morphemes. The first is a prefixal reduplicant which conveys a diminutive meaning and has a prespecified tonal melody, analogous to fixed-segmentism. The second is a vocative morpheme which consists of a floating high tone suffix. I show that when these two morphemes combine, regular tonal interactions yield the correct surface forms.

Keywords. Cantonese; reduplication; tone; grammatical tone; morphophonology

1. Introduction. Cantonese vocative reduplication presents a challenge for linguistic theory because sometimes the tone of first copy in reduplication matches that of the unreduplicated base (1a-b) and other times the tone of the second copy matches the unreduplicated base (1c-d). There are even cases in which the tone of neither copy matches the tone of the unreduplicated base (1e-f). I argue that the tonal alternations in Cantonese vocative reduplication (Yu, 2009) are due to the interaction of (i) a prespecified tonal melody on the prefixal reduplicant and (ii) a floating grammatical high tone that causes regular tone changes to the base.

(1) Cantonese reduplicative vocatives, data from Yu (2009), autosegmental tones following Chen (2000)

a.	fei^{21}	fei^{21}-fei^{25}	‘fatty’
b.	taai^{33}	taai^{33}-taai^{25}	‘wife’
c.	zai^{25}	zai^{21}-zai^{25}	‘son’
d.	bi^{55}	bi^{21}-bi^{55}	‘baby’
e.	mui^{22}	mui^{21}-mui^{25}	‘younger sister’
f.	nai^{23}	nai^{21}-nai^{25}	‘husband’s mother’

As can be seen in (1), generally in vocative reduplication the first copy has the tone 21 and the second copy has the tone 25. Yu (2009) treats this as a fixed tonal melody for the entire reduplicative complex, implementing this with tonal alignment constraints specific to the vocative cophonology. Under this analysis, after doubling the root, there are constraints which require 25 or 55 to align with the right edge of the reduplicative complex and 21 to align with the left. This causes complete overwrite of the tone of the root.

I argue that a better explanation of these tone changes is suffixing a grammatical high tone and prespecifying the tone of a reduplicative prefix. As will become clear, this reanalysis has several advantages. First, it provides a principled explanation for the 55~25 alternation in the second copy. Second, it incorporates Cantonese ‘changed tone’ *(pinjam)*, aligning it with broader patterns in Cantonese grammar. Finally, by decomposing the pattern into fixed tone reduplication plus an independent grammatical tone, the analysis eliminates the need for complete tonal

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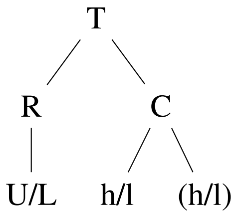
overwrite, bringing Cantonese in line with cross-linguistic generalizations about reduplicative faithfulness.

1.1. BACKGROUND. I will be adopting an internally complex tonal geometry like that argued for by Bao (1990) and Yip (2002) in which tones consist of two distinct parts: a register node (R) which is either upper (U) or lower (L), and a contour node (C) which can be high (h), low (l), or some combination there of [1]. This is schematized in (2).[2]

(2) Tonal geometry



The choice to represent tones as internally complex is important because it allows for a clear grammatical tone analysis which is obscured if using Jyutping's monolithic tonal labels (Linguistic Society of Hong Kong 1993). Table 1 translates the numeric representations of Cantonese tones into the geometric system adopted in this paper.

Jyutping	Chao (1930)	Bao (1990)
1	55 (53)	U(h)
2	25	U(lh)
3	33	U(l)
4	21	L(hl)
5	23	L(lh)
6	22	L(l)

Table 1. Cantonese Tones

I propose that vocative reduplication consists of two distinct morphemes. First, the reduplicative morpheme contributes a diminutive reading and is associated with a prespecified L(hl) melody (3a), parallel to fixed-segmentism (McCarthy & Prince 1996; Marantz 1982). Second, vocative morphology introduces a floating U(h) tonal suffix (3b). This floating U(h) morpheme shifts the register of the base to Upper and contributes a high tonal contour element. Under this analysis, the tone of the second copy is not overwritten but systematically derived from independently motivated assumptions about tonal geometry and floating tonal features.

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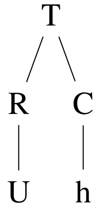
[1] These feature labels could easily be replaced by binary features such as +/-upper and +/-high (Yip 1980) without any detriment to the analysis. U/L and h/l are chosen simply for expository ease.

[2] Structures such as these will often be abbreviated in the text such that the register is indicated by capital letters and the contour is indicated by lowercase letters inside parenthesis (see Table 1).

(3) a. $n^0_{[\mathrm{DIM}]} \longleftrightarrow \mathrm{RED}^{\mathrm{L(hl)}}$

b. $\mathrm{D}^0_{[\mathrm{VOC}]} \longleftrightarrow$



The changes in the base (second copy) mirror independently attested ‘changed tone’ (*Pinjam*) patterns in Cantonese familiar vocatives, supporting the claim that both constructions involve the same grammatical floating high tone. The proposal that the tone changes in the reduplicative vocative can be accounted for by the same grammatical tone as the familiar vocative was briefly introduced by by Alderete et al. (2022). However, they did not provide an analysis extending the grammatical tone account of *pinjam* to reduplication as this paper does. This paper aims to provide a complete account of the tonal changes seen in Cantonese vocative reduplication, arguing that the reduplicative construction decomposes into (i) fixed-tone reduplication and (ii) a floating grammatical U(h) tone.

The remainder of the paper is organized as follows. Section 2 lays out the reduplication data in more detail. Section 3 discusses Cantonese ‘changed tone’ and the similarities it shows to the reduplication data. Section 4 provides a formal analysis. Section 5 discusses previous analyses of these phenomena. Section 6 concludes.

2. Cantonese vocative reduplication. Returning to the reduplication data, (4) repeats the examples in (1), with numeric representations of tone converted to the system which will be adopted for the remainder of the paper.

Looking at the first copy in reduplication, the tone is U(l) if the base was U(l) and is L(hl) elsewhere. For the second copy, the tone is either U(lh) or U(h). If the original tone was U(h), the tone in the second copy is U(h), else the tone is U(lh).

(4) Cantonese reduplicative vocatives, data from Yu (2009), autosegmental tones following Bao (1990)

a.	fei$^{\mathrm{L(hl)}}$	fei$^{\mathrm{L(hl)}}$-fei$^{\mathrm{U(lh)}}$	‘fatty’
b.	taai$^{\mathrm{U(l)}}$	taai$^{\mathrm{U(l)}}$-taai$^{\mathrm{U(lh)}}$	‘wife’
c.	zai$^{\mathrm{U(lh)}}$	zai$^{\mathrm{L(hl)}}$-zai$^{\mathrm{U(lh)}}$	‘son’
d.	bi$^{\mathrm{U(h)}}$	bi$^{\mathrm{L(hl)}}$-bi$^{\mathrm{U(h)}}$	‘baby’
e.	mui$^{\mathrm{L(l)}}$	mui$^{\mathrm{L(hl)}}$-mui$^{\mathrm{U(lh)}}$	‘younger sister’
f.	nai$^{\mathrm{L(lh)}}$	nai$^{\mathrm{L(hl)}}$-nai$^{\mathrm{U(lh)}}$	‘husband’s mother’

Neither copy appears to be more faithful to the input form across the board. Both copies have one environment in which the tone remains the same as the base: U(l) remains U(l) in the first copy while everything else becomes L(hl), and U(h) remains U(h) in the second copy while everything else becomes U(lh). Thus there is no obvious motivation to treat one copy as the base and one copy as the reduplicant.

However, the tone changes seen in the second copy of vocative reduplication are the same as those seen elsewhere in Cantonese. These tone changes are identical to those in *Pinjam* ‘Changed

Tone', indicating that they need not be attributed to the reduplication. Given this, I analyze the second copy as the base and the first copy as the reduplicant with a prespecified tone.

3. Cantonese changed tone. *Pinjam* meaning 'changed tone' is well known in Cantonese as a case of morphologically triggered tone change. One context in which this changed tone occurs is in the familiar vocative.

(5) Cantonese familiar vocative, data from (Alderete et al. 2022), autosegmental tones following Bao (1990)

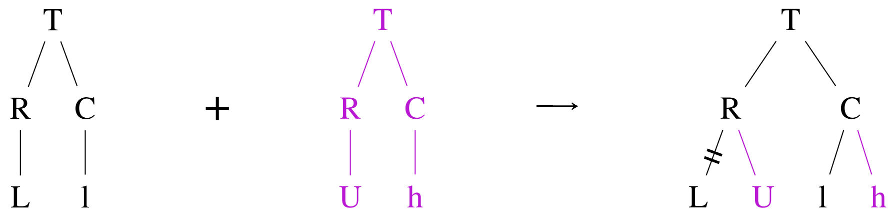
	Surname	Familiar Vocative	Gloss
a.	jip$^{L(l)}$	a:$^{U(l)}$-jip$^{U(lh)}$	Mr. Yip
b.	woŋ$^{L(hl)}$	a:$^{U(l)}$-woŋ$^{U(lh)}$	Mr. Wong
c.	got$^{U(l)}$	lou$^{L(lh)}$-got$^{U(lh)}$	Old Got
d.	duŋ$^{U(lh)}$	a:$^{U(l)}$-duŋ$^{U(lh)}$	Mr. Tung
e.	lei$^{L(lh)}$	lou$^{L(lh)}$-lei$^{U(lh)}$	Old Li
f.	buk$^{H(h)}$	a:$^{U(l)}$-buk$^{H(h)}$	Mr. Buk

Alderete et al. (2022) notes that surnames in Cantonese can receive the prefix [a:$^{U(l)}$-] or [lou$^{L(lh)}$-] to mark familiarity. In addition to these prefixes, many of the familiar vocatives undergo a tone change (5). Following Yip (1980) and Chen (2000), Alderete et al. argue that all of these tonal changes can be explained by suffixing a floating high tone.

These are the same tonal changes seen in the second copy of vocative reduplication. Therefore, I argue that this suffixed high tone is a distinct morpheme conveying the vocative meaning (as given in 3).

3.1. AUTOSEGMENTAL AFFIXATION. When the floating high tone is added to a base with a preexisting tonal specifiacation, the register and contour plains are concatenated independently. In the case of (6), adding the floating U(h) to a base with the tone L(l) yields the structure on the right. Because there can only be a single register feature (Bao 1990) and the features of the floating tones are prioritized, the original register feature deletes.

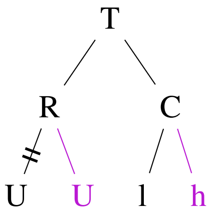
(6)



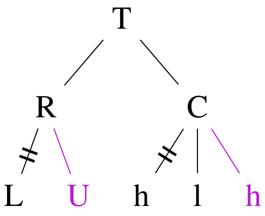
Example (7) provides the structures that result from tonal affixation for each of the five other contrastive tones in Cantonese. It is always the case that the grammatical material (in magenta) is maintained. For the register this means the the original register is always deleted. There is more variability in the contour. Sometimes no contour element is deleted (6,7a), sometimes the first contour element is deleted (7b-c), and sometimes the medial element is deleted (7d-e). Note, however, that as with the register, the new grammatical material always remains.

(7)

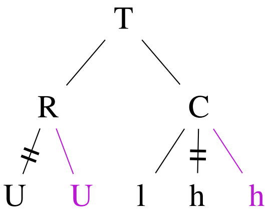
a. U(l) + U(h) = U(lh)



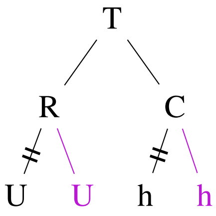
c. L(hl) + U(h) = U(lh)



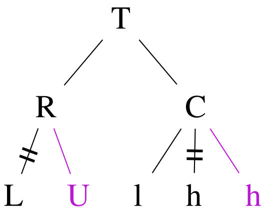
e. U(lh) + U(h) = U(lh)



b. U(h) + U(h) = U(h)



d. L(lh) + U(h) = U(lh)



Which contour element deletes is fully predictable. When suffixation causes a sequence of adjacent high tones and/or a contour node with more than two elements, the first high tone is deleted. Section 4 provides a formal analysis for this pattern in OT.

3.2. INTERIM SUMMARY. As I have demonstrated throughout this section, suffixing a floating grammatical U(h) tone appropriately captures the tone changes in *pinjam*. Because these tone changes are the same as those seen in the second copy of the reduplicative vocative, I argue that the same tonal morpheme is active here. Therefore, I propose that the second copy is the base, and it is not a property of reduplication which causes a tone change but rather a separate a morpheme.

This leaves only the tone changes on the first copy unexplained. It has often been observed that segments or features will get replaced in the reduplicant. This has been referred to by many names such as fixed feature/fixed-segmentism, melodic overwriting, prespecification, among others (McCarthy & Prince 1996; Marantz 1982). The same pattern has been observed with tone in reduplication (Downing 2005; Haas 1946). Rather than specifying, say, the first consonant of the reduplicant, in Cantonese the diminutive reduplicant has a prespecified L(hl) tonal melody.

4. Optimality Theoretic Analysis. This section provides an analysis in Optimality Theory (Prince & Smolensky 1993) utilizing Base-Reduplicant Correspondence Theory (McCarthy & Prince 1995). I begin with the second copy in reduplication as it is the one affected by *pinjam* as discussed above.

4.1. SECOND COPY–BASE. The second copy in reduplication clearly shows the grammatically triggered tonal alternations seen elsewhere in Cantonese. For clarity of exposition, the register and contour nodes will be discussed separately.

4.1.1. REGISTER. The second copy is always in the Upper register. This can be accomplished by prioritizing the new, grammatical material over the original lexical tone. There are several ways of accomplishing this, but I shall adopt the following constraints from Wolf (2005).

(8) a. MaxFloat: All autosegments that are floating in the input have output correspondents (Wolf 2005).

b. *Float[3]: Assign one violation for each floating autosegment in the output.

In addition, I add the following two constraints. Max-Reg prevents deletion of a register feature. *MultiReg prevents a register node from hosting more than one tonal feature. This constraint is supported by previous research that states that contour tones may split but register ones may not (Bao 1990; Yip 2001).

(9) a. Max-Reg: Each register feature in the input has a correspondent in the output.

b. *MultiReg: Assign one violation for each tone with more than one register feature.

The tableaux in (10) shows how a high ranking of MaxFloat and *Float forces realization of the new grammatical material. When combined with a high ranking *MultiReg, the original register is replaced.

(10) Register

	L(l) $^{+U(h)}$	*MultiReg	MaxFloat	*Float	Max-Reg
a.	LU(lh)	*!			
b.	L(lh)		*!		*
c.	L(lh)$^{+U}$			*!	
d.	☞U(lh)				*

The derivation is assumed to be identical when the original tone is Upper register, though there is technically no way to tell which of the two Upper register features is kept. For consistency I argue that the new grammatical material is kept at the expense of the original register feature.

4.1.2. Contour. There are three types of interactions when suffixing a high contour tone depending on the original tone of the base. These different patterns are shown in Table 2.

additive	l+h = lh
adjacent identical	lh + h = lh
contours	h + h = h
complex contour	hl + h = lh

Table 2. possible contour interactions

When the original contour is a single low tone, adding the grammatical high is a simply additive process. When the original contour ends in a high tone, adding the grammatical high would result in two adjacent high contour features. To resolve this, one of the highs is deleted. When

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[3] This constraint was frequently used in Wolf (2005) but never formally defined.

the original contour is (hl), adding the grammatical tone would result in a ternary branching contour node. To resolve this, the initial high contour is deleted. The three constraints in (11) must be added to handle each of the possible tonal interactions.

MAX-CONTR is simply another constraint in the MAX family which prevents the deletion of a contour feature. *CMPLXCONTR is a markedness constraint which limits the number of features in a contour node to two. The obligatory contour principle (OCP) prohibits adjacent identical elements on the same tier within a particular domain. Typically this domain is some higher level structure like the phonological word or foot. However, there is no principled reason why this could not be used at a more local domain, specifically within the same TBU.

(11) a. MAX-CONTR: Each contour feature in the input has a correspondent in the output.

b. *CMPLXCONTR: The contour node is maximally binary branching. Assign one violation for each tone with more than two contour specifications.

c. OCP: Assign one violation for each pair of adjacent high features within a contour node.

In the most simple case, the floating high is simply added to the contour of the stem (12). This occurs when the contour consists of only a single low tone, as with U(l) or L(l).

(12) Additive contour

	U(l) $^{+U(h)}$	MAXFLOAT	*FLOAT	MAX-CONTR
a.	U(l)	*!		*
b.	U(l)$^{+h}$		*!	
c.	U(h)			*!
d.	☞U(lh)			

The combination of MAXFLOAT and *FLOAT force the grammatical tone to be realized. There is nothing triggering deletion of any contour element, so candidate (d), which realizes both the stem contour and the grammatical contour, is the most optimal.

If the floating high is added to a stem whose contour ends in a high (13), there would be two successive high contour tonal elements. This occurs for the tones U(h), U(lh), and L(lh). The candidate which realizes all of the contour elements (a) would incur a segment internal OCP violation. To rectify this, the optimal candidate (d) deletes the stem high.

(13) Adjacent identical contours

	U(lh$_i$) $^{+U(h_j)}$	OCP	MAXFLOAT	*FLOAT	MAX-CONTR
a.	U(lh$_i$h$_j$)	*!			
b.	U(lh$_i$)		*!		*
c.	U(lh$_i$)$^{+h_j}$			*!	
d.	☞U(lh$_j$)				*
e.	U(lh$_j$)$^{+h_i}$			*!	

The last case occurs when the floating high is suffixed to stems with L(hl) tone (14). Here when the high tone is added a complex contour would be created–falling then rising (a). This is prevented by invoking the *CmplxContr constraint. To satisfy this without violating MaxFloat and *Float one of the stem contour elements must delete. Candidate (e) deletes the low tone, but this causes a violation of OCP. To solve this, one of the high tones could also be deleted (f). However, this now has two violations of Max-Contr. The winning candidate (d) deletes only the stem high.

(14) Complex contour

	U(hl) $^{+\text{U(h)}}$	*CmplxContr	OCP	MaxFloat	*Float	Max-Contr
a.	U(hlh)	*!				
b.	U(hl)			*!		*
c.	U(hl)$^{+\text{h}}$				*!	
d.	☞U(lh)					*
e.	U(hh)		*!			
f.	U(h)					**!

As demonstrated throughout this section, the tone changes on the second copy are due to a floating high tone suffix. Thus it is only the first copy (the reduplicant) which must have a prespecified tonal pattern.

4.2. First copy–reduplicant. The first copy in Cantonese vocative reduplication is taken to be the reduplicant. This prefixal reduplicant has a prespecified tone analogous to fixed-segmentism. Rather than specifying, for example, the height of the vowel, the reduplicant specifies the tone it should be realized with. This 'fixed-tonism' has been reported as a relatively common behavior of tone in reduplication–see Downing (2005) for several examples in African languages.

There are many ways to formally analyze fixed material in reduplication; I shall be using floating tones as it is most consistent with the rest of my analysis. Due to space constraints, Max-Contr and Max-Reg will be merged into Max-IO, which will incur a violation for any deletion in either the register or contour nodes. In additon, I introduce a common Max-BR constraint forcing identity between the base and reduplicant.

(15) a. Max-IO: Assign one violation for each tonal feature in the input which does not have a correspondent in the output.

b. Max-BR: Assign one violation for each tonal feature in the base which does not have a correspondent in the reduplicant.

The Tableaux in (16) provides the derivation of the fixed tone in the reduplicant. This is illustrated with a base of the tone U(h) as it shows no change in the base and thus provides the clearest example. However, the derivation for each of the other input tones is identical–with the exception of U(l) discussed in Section 4.2.1.

(16)

RED $^{+L(hl)}$ - U(h) $^{+U(h)}$		MAXFLOAT	*FLOAT	MAX-IO	MAX-BR
a.	U(h)-U(h)	*!**		*****	
b.	U(h)$^{+L(hl)}$-U(h)		*!**	**	
c.	L(hl)-L(hl)	*!*		****	
d.	☞L(hl)-U(h)			**	**

Candidates (a) and (b) violate MAXFLOAT and *FLOAT respectively because they do not realize the floating tone prespecified by the reduplicant. (c) is a possible 'backcopying' candidate where the base is changing to match the prespecified material on the reduplicant. This would cause a violation of *MAXFLOAT because the backcopying prevents the realization of the floating grammatical high tone. Thus candidate (d), which maintains the tone of the base and realizes the prespecified floating tone, is optimal.

4.2.1. MID-TONE EXCEPTIONALITY. There is one context in which the prespecified L(hl) does not appear; when the unreduplicated base tone is U(l) the first copy in reduplication is realized with a U(l) tone rather than the expected L(hl). The tableaux in (17) shows how the current constraints incorrectly predict that the prespecified tone should be realized on the first copy rather than the base tone (d).

(17) Failed derivation of mid-tone reduplication

RED $^{+L(hl)}$ - U(l) $^{+U(h)}$		MAXFLOAT	*FLOAT	MAX-IO	MAX-BR
a. ☹	U(l)-U(lh)	*!**		****	*
b. ☹	U(l)$^{+L(hl)}$-U(lh)		*!**	*	*
c.	L(hl)-L(hl)	*!*		****	
d. 💣	L(hl)-U(lh)			*	*

Yu (2009) captures this exceptionality by introducing a special constraint prioritizing this mid tone (18). This is an obvious solution in Morphological Doubling Theory where both copies in reduplication are assumed to have equal access to the unreduplicated base. However, when adopting a BRCT analysis this may be dispreferred. The exceptional faithfulness is seen in the first copy, which is taken to be the reduplicant due to the prespecified tone which typically appears here. It is frequently assumed that the base and the reduplicant have an asymmetrical relationship to the input. The base has direct access to the input through Input-Output Correspondence while the reduplicant has only indirect access to the input through Base-Reduplicant Correspondence. This asymmetry is frequently appealed to as an explanation for TETU (The Emergence of the Unmarked) effects in reduplication (McCarthy & Prince 1995).

(18) MAXT3[4]: If there is an association between x and tone T3 in the input, then there is an association between x' and T3' in the output, where x' and T3' are the correspondents of x and T3 respectively. (Yu 2009)

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[4] Yu (2009) utilized Jyutping tonal numbers in their analysis which simply numbered the tones 1-6. Tone 3 is equivalent to U(l) in the tonal system used here. See 1 for the full conversions.

There are two possible analyses for the mid-tone exceptionality: one which appeals to Input-Reduplicant identity and one which appeals to cyclic phonology. An Ident-IR approach can use the same constraint as that proposed in Yu, renamed MaxU(l) to align with the tonal system adopted here. Additionally a Dep-IO constraint is added since the addition of a single contour node would satisfy Max-BR, producing the incorrect result.

(19) a. MaxU(l)-IR: If there is an association between x and U(l) in the input, then there is an association between x' and U(l)' in the reduplicant, where x' and U(l)' are the correspondents of x and U(l) respectively.

b. Dep-IO: There should be no tone T in the output which has no correspondent in the input.

The tableaux in (20) shows how an analysis utilizing input-reduplicant identity constraints can appropriately account for mid tone exceptionality. Max-IO is replaced by Max-IB (Input-Base) for clarity. MaxU(l)-IR forces U(l) to surface in the reduplicant despite the high ranking MaxFloat and *Float. The floating high suffix links as usual.

(20) Input-Reduplicant faithfulness account of mid-tone exceptionality

RED $^{+L(hl)}$ - U(l) $^{+U(h)}$	MaxU(l)-IR	MaxFloat	*Float	Dep-IO	Max-IB	Max-BR
a. ☞ U(l)-U(lh)		***				*
b. ☞ U(l)$^{+L(hl)}$-U(lh)			***			*
c. L(hl)-L(hl)	*!			*	**	
d. L(hl)-U(lh)	*!					***
e. U(lh)-U(lh)		***		*!		

There is an alternative cyclic analysis which does not require Ident-IR. The reduplicative morpheme is taken to be the spell out of $n^0_{[DIM]}$ while the grammatical tone is taken to be the spell out of $D^0_{[VOC]}$. If categorizers head a cyclic domain, there would be (at least) two phonological cycles to produce the reduplicative vocatives (Embick 2010). First the reduplicative prefix is added and phonology applies (22a). This output is then used as the input to which the grammatical tone is added and the next cycle of phonology occurs (22b). This eliminates the need for Ident-IR because at the time of reduplication, there is no grammatical tone and the base would be identical to the unreduplicated root. Therefore, rather than requiring access to the input, the reduplicant can simply access the base as would be expected in an asymmetrical model of reduplicative identity. The input-output correspondence constraint in (19a) can be replaced by the base-reduplicant correspondence constraints in (21).

(21) a. MaxU(l)-BR: If there is an association between x and U(l) in the base, then there is an association between x' and U(l)' in the reduplicant, where x' and U(l)' are the correspondents of x and U(l) respectively.

b. MaxU(l)-IO: If there is an association between x and U(l) in the input, then there is an association between x' and U(l)' in the output, where x' and U(l)' are the correspondents of x and U(l) respectively.

The tableaux in (22) demonstrate a cyclic analysis of mid tone exceptionality. In the first cycle, MAXU(l)-BR and MAXU(l)-IO force realization of the mid tone in both the base and the reduplicant. This is then used as the input for Cycle 2, along with the newly added grammatical high tone. Here MAXU(l)-BR and MAXU(l)-IO do not have an overt effect. This is because no contour element needs to be deleted, and while one of the register feature must be deleted, it is vacuous.

(22) a. Cycle 1

	RED $^{+\text{L(hl)}}$ - U(l)	MAX U(l)-BR	MAX U(l)-IO	*FLOAT	MAX FLOAT	DEP-IO	MAX-BR
a.	☞U(l)-U(l)				***		
b.	U(l)$^{+\text{L(hl)}}$-U(l)			***!			
c.	L(hl)-L(hl)		*!			*	
d.	L(hl)-U(l)	*!					*

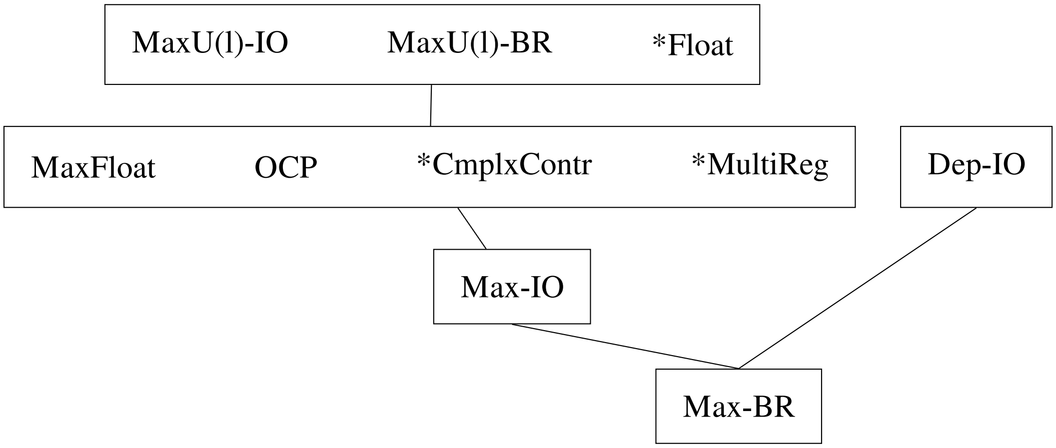
b. Cycle 2

	U(l) - U(l) $^{+\text{U(h)}}$	MAX U(l)-BR	MAX U(l)-IO	*FLOAT	MAX FLOAT	DEP-IO	MAX-BR
a.	U(l)-U(l)				**!		
b.	U(l)-U(l)$^{+\text{U(h)}}$			**!			
c.	☞U(l)-U(lh)				*		*
d.	U(lh)-U(lh)				*	*!	
e.	U(l)-U(lh)		*!				*

As the need for cycles has been argued for independent of reduplication and the existence of Input-Reduplicant faithfullness has been repeatedly called into question, I shall adopt the cyclic account. However, both analyses are consistent with the argument of this paper.

4.3. FULL DERIVATION. These separate pieces of the analysis can be combined, yielding the final constraint ranking in (23).

(23)



As discussed in Section 4.2.1, in order to account for the behavior of U(l), I am proposing that the reduplicant and gramamtical tone are added in two seprate cycles. To demonstrate that this cyclic analysis is still able to produce the typical pattern, (24) provides a complete derivation for a base with a typically behaving tone L(lh). The behavior of MaxU(l)-BR and MaxU(l)-IO to produce the exceptional mid tone faithfulness was demonstrated in (22), they will be omitted in (24) as they play no part in the derivation. For ease of reading, violations in the tableaux are marked with C or R, indicating whether they occur on the contour or register tier.

(24) a. Cycle 1

RED $^{+L(hl)}$ - L(lh)	*Float	Max Float	OCP	*Cmplx Contr	Multi Reg	Dep IO	Max IO	Max BR
a. L(lh)-L(lh)		$*_{C}!*_{C}*_{R}$					$*_{C}*_{C}*_{R}$	
b. L(lh)$^{+hl}$-L(lh)	$*_{C}!*_{C}$							
c. L(hl)$^{+L}$-L(lh)	$*_{R}!$							$*_{C}*_{C}$
d. L(hl)-L(hl)							$*_{C}!*_{C}*_{R}$	
e. ☞L(hl)-L(lh)								$*_{C}*_{C}*_{R}$
f. LL(hl)-L(lh)					$*_{C}!$			$*_{C}*_{C}$
g. L(hllh)-L(lh)			$*_{C}!$	$*_{C}$				$*_{R}$

b. Cycle 2

L(hl) - L(lh) $^{+U(h)}$	*Float	Max Float	OCP	*Cmplx Contr	Multi Reg	Dep IO	Max IO	Max BR
a. L(hl) - L(lh)		$*_{C}!*_{R}$					$*_{C}*_{R}$	$*_{C}*_{C}$
b. L(hl)-L(lh)$^{+U(h)}$	$*_{C}!*_{R}$							$*_{C}*_{C}$
c. ☞L(hl)-U(lh)							$*_{C}*_{R}$	$*_{C}*_{C}*_{R}$
d. U(lh)-U(lh)							$*_{C}*_{C}*_{R}!*_{R}$	
e. L(hl)-U(lh)		$*_{C}$					$*_{R}!$	$*_{C}*_{C}*_{R}$
f. L(hl)-U(hh)			$*_{C}!$				$*_{C}*_{R}$	$*_{C}*_{C}*_{R}$
g. L(hl)-LU(lh)					$*_{R}!$		$*_{C}$	$*_{C}*_{C}*_{R}$
h. L(hl)-U(lhh)				$*_{C}!$			$*_{R}$	$*_{C}*_{C}*_{C}*_{R}$

The first cycle contains only the base and the reduplicative morpheme with its prespecified tonal melody. The combination of MaxFloat and *Float force the realization of the prespecified material. Dep-IO along with the markedness constraints prevents the addition of new material to satisfy Max-BR. Max-IO prevents backcopying. This results in the optimal candidate (e) which has the prespecified tone on the reduplicant and the underlying tone on the base. This is used as the input to the second cycle along with the newly added grammatical tone. Again MaxFloat and *Float force realization of the grammatical material. OCP, *CmplxContr and MultiReg Force deletion of the original register and and original high contour element. Because the prespecified tone on the reduplicant is no longer floating in the input, it is not protected by MaxFloat and *Float. However, it is protected by Max-IO, which prevents copying of the newly adjusted base onto the reduplicant.

5. Previous Analysis. This section looks at some previous work on Cantonese. It is divided into two parts. The first, Section 5.1, looks at some recent alternative analysis to Cantonese changed tone, and the second, Section 5.2, takes a deeper look at Yu (2009)'s analysis of Cantonese vocative reduplication, arguing that the analysis proposed here should be preferred.

5.1. CHANGED TONE. The primary difference in the way Changed Tone is handled in this paper in comparison to other recent analysis is in the representation of tone that is used. Here I adopt an internally complex tonal geometry like that argued for by Bao (1990) and Yip (2002).

Both Chen (2000) and Alderete et al. (2022) utilize a H/M/L tonal system when analyzing Cantonese changed tone. The tonal geometry analysis put forth above functions quite similarly, and if one were set on adopting their representation, the core argument of this paper is compatible with it. Given this, it may not be immediately clear why an internally complex tonal geometry would be desirable if there are no obvious cases of the register and contour functioning independently. However, I argue that there is still a benefit of this format.

Bao (1990) and Yip (2002) both argue that a complex tonal geometry is required to analyze tone spreading patterns cross linguistically. If this representation is required in these languages, the most parsimonious option would be to adopt this representation across the board.

In addition to cross linguistic consistency, there is a language internal benefit of this representation as well. Recall that when a base with the tone L(l) undergoes *pinjam*, it results in U(lh). In a non-geometric autosegmental system, this would be restated as L becoming MH. However, when a floating H tone is suffixed to a L tone, there is no intrinsic motivation for raising L to M, yielding MH. Some extra mechanism is needed. Alderete et al. (2022) utilizes a constraint limiting the maximal distance between tones in a contour to cause raising from LH to MH. However, the analysis presented here provides a more principled explanation. If there may only be one register feature per TBU (Bao 1990), it explains why a the first portion of the tone is raised. If the base is L(l) and you add U(h), you have a register conflict. Either due to the prominence of H register (Yip 2002), the need to realize morphological material (Kurisu 2001) or faithfulness of floating material (Wolf 2005), the high register is kept leading to U(lh).

5.2. VOCATIVE REDUPLICATION-(YU 2009). Yu (2009) analyzed the tone changes in the reduplicative vocative as the product of a fixed tonal melody for the entire reduplicative complex, implementing this with the following tonal alignment constraints specific to the vocative cophonology.

(25) a. ALIGNR-T1,2: The right edge of a PrWd must be aligned with the right edge of a syllable with T1 or T2.

b. ALIGNL-T4: The left edge of a PrWd must be aligned with the left edge of a T4 syllable.

Yu (2009) utilized Jyutping tonal numbers in their analysis. These monolithic labels simply numbered the tones 1-6. T1 is equivalent to U(h), T2 is equivalent to U(lh), and T4 is equivalent to L(hl) in the tonal system adopted here. See Table 1 for full conversions.

This complete overwrite analysis cannot explain the U(h)~U(lh) alternation. The fact that either tone can appear is simply baked into the constraint. This does not capture the predictability with which the tones appear. By contrast, in the analysis proposed here, vocative morphology introduces a floating U(h) tonal suffix. This derives the fact that an U(h) base remains U(h) while everything else becomes U(lh). The floating U(h) morpheme shifts the register of the base to Upper and contributes a high tonal contour element. The resulting alternations fall out from independently motivated constraints against multiple register specifications, complex contours, and adjacent identical tonal elements.

Additionally, the complete overwrite account misses an important commonality in Cantonese morphophonology – *Pinjam*, morphologically triggered tone changes. Yu (2009) does address the possibility that the tone changes could be a part of the larger pattern of changed tone, but ultimately decides against it. Yu argues that a changed tone analysis would only accounts for half of the puzzle–leaving the tone changes on the first copy unexplained. Yu additionally shows that this complete overwrite is not a general property of reduplication in Cantonese, pointing toward attenuative reduplication which has the same tone changes in the second copy but the first copy is faithful to the base.

I argue that these are actually both points in favor of my analysis. Changed tone *does* only account for half the puzzle, but it makes it easier to account for the second half; it makes the fixed tone-ism easier to spot. Additionally, the fact that the attenuative behaves differently from the vocative is unsurprising. While these two meanings are both realized through reduplication, they are different morphemes. The reduplicative morpheme in the vocative has a prespecified tonal pattern while the reduplicative morpheme in the attenuative does not.

Finally, complete tonal overwrite of the kind proposed by Yu is otherwise unattested in reduplication (Caragine 2026). Having a fixed melody triggered by reduplication may appear to parallel fixed-segment or fixed-feature reduplication, but it has one very important difference. While there are cases of fixed segmental content causing a mismatch between the two copies in reduplication, one copy always matches the base (such as English *table-schmable*). In cases where neither copy matches the base, this change is made for the sake of base-reduplicant identity (see Wilbur (1973) for several examples). With the exception of Cantonese, there are no instances where both copies can have overwritten material and still not be identical. Therefore, until a need for complete melodic overwrite in reduplication can be proven, an analysis which does not rely on complete overwriting is preferred.

In sum, Yu (2009)'s complete overwrite analysis has several analytical shortcomings: it does not explain the U(h)~U(lh) alternation, it does not incorporate *Pinjam*, and it introduces an otherwise unattested reduplicative phenomenon. I argue instead that a suffixed grammatical high tone and a pre-linked tone on the prefixed reduplicant more accurately accounts for the empirical data and provides a deeper understanding of the pattern.

6. Conclusion. I have shown that tonal changes in Cantonese vocative reduplication are due to two distinct morphemes: a vocative morpheme which is a prefixal reduplicant with a fixed L(hl) tonal melody and a diminutive morpheme which is a suffixal floating U(h) tone. This analysis has several benefits. First, it provides a principled explanation for the U(lh)~U(h) alternation in the second copy. Second, by incorporating *pinjam*, 'changed tone', it aligns with broader patterns in Cantonese grammar. Finally, by decomposing the pattern into fixed tone reduplication plus an independent grammatical tone, the analysis eliminates the need for complete tonal overwrite, bringing Cantonese in line with cross-linguistic generalizations about reduplicative faithfulness.

This reanalysis has broader implications for tonal theory. First, it supports representing contour tones as sequences of tonal elements rather than single unitary features. A rising tone must be represented as low followed by high; treating such tones as monolithic features (e.g. [+rising]) or relying solely on traditional Cantonese tone numbers (Yu, 2009) obscures the morphological generalization. Second, the data argue for distinct register and contour nodes. Without a register node, the generalization that L(l) surfaces as U(lh) under high suffixation cannot be straightforwardly captured.

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