

# Tone and intonation in Cantonese English

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## Abstract

Cantonese English tonal patterns are analyzed based on the description provided by K.K. Luke. Results of a production test with isolated words lead to the conclusion that the language has at least three intonations, declarative, emphatic and interrogative. The last two are expressed through the boundary tones L% and H%, while the first is characterized by having no boundary tone. The interaction with the word tone on the last syllable leads to a situation in which L-ending words (whose British English counterparts have non-final primary stress) either have a rising or a low final syllable, but H-ending words (whose British English counterparts have final primary stress) have high pitch, low pitch or high rising pitch. A comparison with British English shows that surface contours receive very different interpretations in the two languages.

Index Terms: Hong Kong English, Cantonese English, lexical tone, boundary tone

## 1. Introduction

The word prosody of varieties of English that have a tone language substrate consists of lexical tone patterns that are systematic translations of the pitch contours occurring in citation pronunciations of the donor language, British English. These tone patterns are likely to be a subset of the tone patterns of the substrate language. Cantonese has seven tones, High, Mid, Low, High Rise, Low Rise and Low Fall, but only three of these are apparently used in Cantonese English words [1]. The sentence prosody of these tonal varieties of English consists of concatenations of the lexical tone patterns, plus any systematic adjustments in the pitch values of the tones, as in the case of automatic downstep, and any additional intonational tones, as in the case of final boundary tones. Below, the pitch patterns of Cantonese English words are derived from the British English citation pronunciations, following a revision of the algorithm presented by Luke [1] (section 2). In section 3, it is argued that concatenations of the tone patterns of words largely give the sentence prosody, with the exception of an account of the endings of pitch contours and their meanings and the downstepped implementation of H- tones after M-tones. The existence of final intonational boundary tones was not recognized by Luke. It will be argued in section 4 that a full understanding of the pitch shapes of IP-final words requires an account of these boundary tones and their interaction with the preceding lexical tones.

## 2. Cantonese English words

According to [1], three Cantonese lexical tones are used in Cantonese English, H, M and L. English words are H if they are monosyllabic (*tea*) or if the first syllable has secondary

stress and the final main stress (*Chinese*). If there is any syllable after the main or primary stress (*coffee, conversation, character*), it has L, and if there is any word-initial syllable before the primary stress or before the preprimary secondary stress if there is one, it is M (*about, cartoon, consideration*). These observations are illustrated in (1). In (1a,b), H-toned words are shown, in (1c) there are two L-toned syllables after H, in (1d) three H-toned syllables before L, in (1e) a M-tone precedes a series of three H-tones before a final L-tone, and (1f) shows a word with two M-tones. Representative pitch contours for the lexical words (1a,b,c,e) are shown in Fig. 1. It will be clear that a Cantonese English word maximally has a MHL-melody, where H and L may occur more than once.

(1) a. tea	b. Chinese	c. character
H	HH	H L L
d. conversation	e. consideration	f. into
H H H L	M HH H L	MM

[1] analyzed the relation between British English and the tonal structure of Cantonese English as in (2). While he presented the description as if it applied to words that have stress and whose stressed syllables are provided with a pitch accent, his description is evidently intended as an account of the historical development from British English to Cantonese English. Tone patterns are lexical, and there is no necessary implication that tones are assigned to words in Cantonese English in the way that pitch accents are assigned to English words. An analysis whereby tones are assigned to Cantonese English words would imply that these words are lexically listed with accented syllables, like the words of Japanese, and that accented syllables are provided with tone (pitch accents) at a later stage. An accentual analysis for Cantonese English is in fact quite viable, as will be argued after the sentence prosody has been dealt with. Before we get to a consideration of the merits of an accentual vs a tonal analysis, I have found it convenient to continue the metaphor of ‘tone assignment’ for ‘historical origin of the word tones’. It is also to be noted that ‘function word’ is a fairly undefined category and that the description of where M-tones are assigned is far from complete.

- (2) a. Place MH\*L on the main stress of the word
- b. Place MH\*L on any secondary stress preceding the main stress.
- c. Place M on any function word.
- d. Raise L to H if followed by either H or M.
- e. Delete M after any other tone in the word.
- f. Copy tones right to empty syllables.

This account can be simplified. Apart from function words, the M-tone of the pitch accent only shows up in any word-

initial syllable that is unstressed in British English. Since it also appears on function words, it can be removed from the pitch accent and be assigned by default. This leaves us with H\*L as the pitch accent, further HL. To get these H, M and L tones to occur on any following syllables that haven't been provided by a tone, a spreading or copy rule was tacitly assumed by [1]. A spreading single H-tone across all high-toned syllables in an IP was proposed by [2]. I have assumed a copying rule within the word, simulating the representations in [1], but nothing much depends on this choice of analysis. Copying tones to empty syllables on the right as given in (2f) gives the results shown in (1). By this procedure, given in (3), we lose M-Deletion.

- (3)
- Place H\*L on the primary stressed syllable and any preceding stresses.
  - Raise L to H if followed by H.
  - Place M on word-initial syllables without tone and function words.
  - Copy tones right to empty syllables.

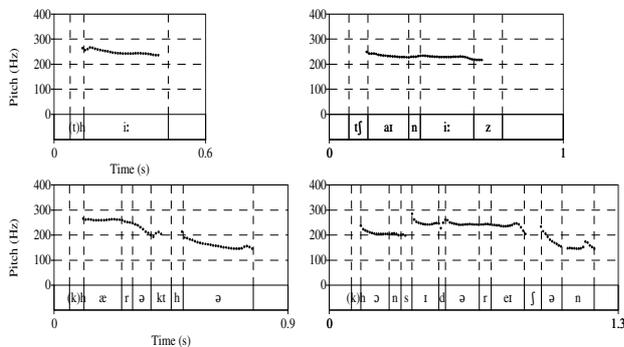


Figure 1: Declarative (panels a, d), emphatic declarative (panels b, e) and interrogative (panels c, f) intonation contours for *tea* (panels a, b, c) and *apple* (panels d, e, f).

### 3 Cantonese English sentences

The sentence prosody in tone languages as given by the concatenations of the tone patterns of the words is additionally defined by any post-lexical phonological rules, any intonational tones and any phonetic implementation rules that have a major impact on the pronunciation.

A cross-linguistically frequent example of this third type is downstep. In many languages, H-tones, and any following tones after them, are pronounced at a lower pitch than a preceding H-tone in the same domain, conditioned by the presence or absence of intervening L-tones. Cantonese English has downstep if one or more M-tones intervene between the trigger-H and the target H, but consecutive H-tones are pronounced on the same pitch. As usual, downstep is iterative. This is illustrated in Fig. 2 (panel a) for an utterance of the sentence given in (4). Here, there are two M-tones interrupting a series of H-tones, and downstep occurs twice, on *stop* and on *-bout*, as a result. To bring out the pattern, a close-copy stylization has been added to the measured F0-contour. By contrast, cross-word pitch patterns of lexical words without M-tones are strikingly high level [2]. The phrase in (5) is an example, an utterance of which is shown in Fig. 2 (panel b).

- (4)
- |     |        |      |          |       |    |
|-----|--------|------|----------|-------|----|
| You | should | stop | thinking | about | it |
|     |        |      |          |       |    |
| H   | M      | H    | H        | H     | MH |

- (5)
- |       |     |
|-------|-----|
| lemon | tea |
|       |     |
| H     | H   |

Before the conclusion that L-Raising is adopted as a post-lexical rule, it needs to be confronted with an alternative assumption. If L only shows up on any IP-final syllables after a H-tone in the same word, it makes sense to 'generate' L only in that location. However, a tone that only appears in IP-final position should not be analyzed as a lexical tone, but as a right-edge boundary L%. While this would reduce the need for L-Raising, there would need to be an account for the fact that it doesn't show up when the final syllable is either H or M. A possible analysis here would be that H in syllables with primary stress does not copy rightward, leaving potentially low-toned final syllables free to be associated with the L%, while final syllables with H or M are merely lowered somewhat through the effect of a floating L%.

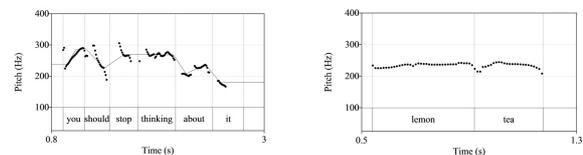


Figure 2: F0 track and close-copy stylization of an utterance of (4) illustrating downstep of H after M (panel a) and F0 of an utterance of (5) illustrating absence of downstep of consecutive H-tones (panel b).

If L only appears finally in the IP, it is a reasonable candidate for the status of a boundary tone. Citation intonations are declarative intonations, and declarative intonations are typically falling or low-ending. If there were to be an interrogative intonation with rising pitch, the distribution of L% could be compared with that of H%. In order to investigate this issue, a list was composed with words a variety of stress patterns in three orthographic conditions, which was recorded by a 27-year old female native speaker. Words ended with no punctuation mark, followed by '!' and followed by '?'. This procedure led to three pitch patterns for words which have final primary stress in British English and to two patterns for words with penultimate or antepenultimate primary stress in British English. Specifically, words like *Chinese* and *tea* has a pitch fall, a level tone or a pitch rise on the final syllable, with words like *character* and *apple* had low pitch or a low-to-high rise on the final syllable. Fig. 3 gives representative results.

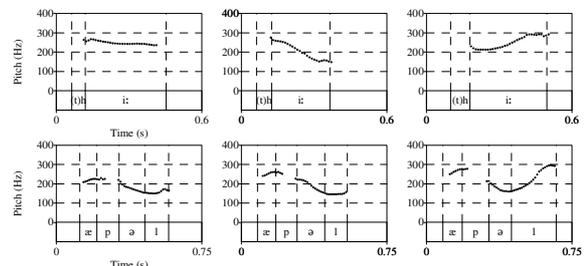


Figure 3: Declarative (panels a, d), emphatic declarative (panels b, e) and interrogative (panels c, f) intonation contours for *tea* (panels a, b, c) and *apple* (panels d, e, f).

These results are surprising if the pitch contours in Fig. 3 are taken to be intonation contours. Intonation contours are typically orthogonal with word prosodic structures. That is, it is uncommon for the structure of the word to determine how

many of the possible intonation contours can be used. Moreover, on the basis of the cases that have been reported, the situation in Cantonese English wouldn't be predicted. They either concern avoidance of contours that involve excessive tone crowding or avoidance of forms that would form a precarious contrast with another form. Avoidance due to tone crowding is exemplified by the English rise-fall-rise on monosyllables [3]. Avoidance due to poor discriminability was reported for a fall-rise monosyllabic contour used with one of tones of the language, in order to avoid confusion with the other tone in a Limburgish dialect [4].

Neither case applies to Cantonese English. First, of the six potential forms obtained by combining a fall, a rise and a level intonation with *tea* and *apple*, the missing contour is by far the easiest to produce, a level tone over two syllables. Second, if there were a concern over the maintenance of the phonological contrast between M and H, both of which are level tones, this would be as problematic on monosyllables as on disyllables. In fact, this contrast exists in monosyllables, since function words have M and lexical words have H. As a result, *can* 'tin' and the auxiliary *can* 'be able' form a tonal minimal pair, as do *inn* and *in*, *wood* and *would*, and so on. An example is given in (6). There is no case to be made, in other words, for form avoidance motivated by a concern for the low perceivability of a contrast between M and H.

- (14) a. The workers can fish  
 | | | | |  
 M H H M H  
 'The workers are able to fish'
- b. The workers can fish  
 | | | | |  
 M H H H H  
 'The workers put fish in tins'

#### 4. Intonational boundary tones

What requires an explanation, then, is the finding that monosyllabic words like *tea* can have level pitch, but disyllabic words like *apple* do not. The difference between the monosyllabic and disyllabic words in Fig. 3 lies in the fact that the disyllables have a syllable after the last H-tone, corresponding to an unstressed syllable or a post-primary stressed syllable in British English. When clause (3a) assigns a HL pitch accent to a word-final syllable with primary stress, as it will in the case of monosyllabic function words, the L apparently has no reality, and should either not be assigned or be deleted. Deletion is easily achieved if it is assumed that all lexical tones need to be associated and that Cantonese English has obligatory one-to-one associations between tones and syllables. The L of HL then remains floating, and is deleted as a result.

However, under the assumption that there is no L-tone in a level high pronunciation of words with final H, the question arises why there is a falling contour for such words at all. Given that both *tea* and *apple* can end in a rise, the solution here is to assume that IPs can end in H% and in L%, and that a H% will lead to a rise and L% to a fall. To account for the level pitch, which would appear to be the default pattern for words that in British English have final primary stress, the absence of a final boundary tone is assumed, notated  $\emptyset$  [5], [6].

Going by the distribution of the contours over the orthographic punctuation marks in the word list, the absence of a boundary tone represents a neutral declarative intonation. When this same intonation is used for words that have at least one syllable after the last H-tone, like *apple*, the final syllable has low pitch.

While in British English, a Fall on *apple* (H\*L L% [6] or H\* L- L% [7]) and a Level tone on *tea* (H\* H- L% [6] and H\* H-L% [7]) are interpreted as different intonations, in Cantonese English these are instances of the same intonation, the interrogative H%. Conversely, the implication is also that while in British English a Fall on *apple* and a deeper Fall on *apple* of the kind illustrated in Fig. 3, panels (d) and (f), count as the same intonation, in Cantonese English they must be assumed to be instances of different intonations, neutral declarative  $\emptyset$  and emphatic declarative L%. The emphatic declarative was elicited by the exclamation mark in the script. The three IP-final boundary conditions are given in (7).

- (7) Declarative:  $\emptyset$   
 Emphatic declarative: L%  
 Interrogative: H%

Assuming (3), the assignment of HL to a word like *tea* will lead to a deletion of L, because there is no syllable after *tea* which can serve as its Tone Bearing Unit. The representations of the contours in Fig. 3 are given in (8a, b, c) for the contours in panels (a) (b) and (c), respectively, and in (9a, b, c) for the contours in panels (d), (e) and (f), respectively. The explanation for the absence of the level tone for *apple* is thus provided by the fact that the word has a lexical L-tone on its last syllable, giving a fall, regardless of whether a boundary L% is added. And the absence of this L-tone in (8b) explains why three contours show up for the IP-final H-toned syllable.

- (8) a. tea | H  $\emptyset$   
 b. tea | H L%  
 c. tea | H H%
- (9) a. apple | H L  $\emptyset$   
 b. apple | H L L%  
 c. apple | H L H%

Intonational boundary tones have a different functional status from lexical tones, since they represent morphemes in themselves, rather than forming part of the representation of morphemes that are also specified in terms of vowels and consonants. However, their phonological status is also different in that they are floating, yet are not deleted. By contrast, the L-tone of HL will delete when no syllable is available for it.

What does this mean for the status of Luke's L-Raising [1]? In all positions other than the last primary stress of the last word in the IP, it disappears on the surface, whether this is between the H-tones within words or across words. If we maintain the assignment of HL in (3), L-Raising becomes a post-lexical rule and needs to be ordered after lexical M-insertion. Lexical representations of lexical words might then include one or two instances of HL, depending on whether the words have a secondary stress before the primary stress, while lexical representations of function words then have M-tones, as will any word-initial syllables without tone. Post-lexically, all L's disappear except that after the last H in the IP. The stretches of level high pitch will then arise through spreading

of H or copying of H within words, as before. More economically, words can be listed with accents in position of H. Postlexically, H is inserted on every accented syllable, while the last accented syllable in the IP additionally has a L-tone. Any toneless word-initial syllable receives M, and tones spread or copy right.

- (10) a. Pitch accent: H  
 b. Insert L after last H in the IP.  
 c. Place M on empty word-initial syllable  
 d. Copy tones right

In (11a), an illustrative sentence is given with lexical representations. These are now toneless, but provided with accents where H is needed. In (11b), H is provided to all accents and L is added after the last, following (10b). Subsequently, (11c) illustrates (10c), while (11d) finishes the representation following (10d).

(11) a. You cǎn't chǎngé yésterday into tomórrrow

b. You cǎn't chǎngé yésterday into tomórrrow  
 | | | | |  
 H H H H L

c. You cǎn't chǎngé yésterday into tomórrrow  
 | | | | | | | | |  
 M H H H M M H L

d. You cǎn't chǎngé yésterday into tomórrrow  
 | | | | | | | | | | | | |  
 M H H H H H M M H L

We must assume that both the primary stress and the preprimary secondary stress are accented, following [1]. If we were to have an accent only on the first stressed syllable in a word, it would not be clear where to stop copying H rightwards so as to preserve the contrast between words that have a final L and words that do not. Conversely, we could not just have an accent on the primary stress, again speaking in British English terms, since it would not be clear where to stop copying H leftwards so as to preserve the contrast between words that start with M and those that do not.

## 5. Conclusion

Analyzing the tonal system of a language without taking the intonation into account can be risky. The danger is not just that generalizations about the intonation are missed, but that the understanding of the data remains incomplete. Pitch phenomena may be assigned to lexical tones that belong to intonational tones. Cantonese English is a case in point. Unexpectedly from a British English point of view, falling pitch on a final syllable with primary stress (e.g. *tea*, *support*) is always the realization of a lexical tone (H) and a final intonational boundary L%, while falling pitch over the last two syllables of a word with penultimate stress (e.g. *apple*, *consideration*) can be due to just lexical tone, H on the penult and L on the final syllable. The fact that in words with penultimate stress no syllable is available for a L-tone explains that a falling-rising contour over the last two syllables is functionally equivalent to a rising contour on the final syllable of a word with final stress. Also, a level contour on the final syllable of a word with final stress is equivalent with a falling

contour over the last two syllables of words with penultimate stress.

Two perception tests were conducted with 40 Cantonese listeners whose second language is English in order to find support for these predictions. Both experiments presented citation pronunciations, i.e. the pronunciation in IP-final position, of final-stressed and penultimate-stressed words in which the F0 had been manipulated using Praat [8]. Stimuli in Experiment I included F0 contours that were predicted to be ill-formed, like a fall-rise on a final stressed word, and F0 contours that were attested in the production experiment. It required listeners to (a) judge whether the pronunciation of each word was acceptable Cantonese English, and (b) if so, to indicate the degree to which the pronunciation was likely to signal a question. Stimuli in Experiment II consisted of pairs of words with different F0 contours. In an adaptation of the 'passable imitation task' used by [9], listeners were asked to indicate in each case whether the intonation on the two words was the same or different. The results of these experiments will be presentable at the workshop.

Since the lexical L only appears on syllables after the stress in the last word of the IP, it stands to reason to represent the words of Cantonese English as accented, not as tonally specified. Accented syllables receive H-tones post-lexically. Tonal specifications would imply either that L-tones will need to be deleted in words that end up in IP-medial position, or – if they are left out in the lexical representations, to be supplied in words that end up in IP-final position. In this analysis, Cantonese English thus is a language like Japanese, with unaccented words, like *in*, *would*, *into*, and accented words like *inn*, *wood*, *apple*, *consideration*, etc.

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