A phonetic study of the Cantonese rising-falling intonation

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Summary: This paper describes the phonetic realisation of the rising-falling intonation in Cantonese [1], which expresses an objection towards what the speaker believes about the hearer's belief. Based on the phonetic realisation, the intonation is analysed as a boundary tone HL%. It is further demonstrated how the intonation interacts with the six lexical tones of Cantonese. The realisation of lexical tones is affected by the intonation, but the tonal features are still preserved through various means. The observation may improve our understanding of the role that intonation plays in tonal languages like Cantonese in general.

Research questions: Two research questions are to be addressed: 1) Is the intonation only a boundary tone or it affects the utterance body? 2) How does the intonation interact with the lexical tone of the final syllable?

Method: In the production test, four native speakers of Hong Kong Cantonese (two males and two females) were invited to record the following sentences, according to the contexts provided: [1]

(1) Hai6 aa3, nei1 go3 zi6 duk6 **wai**.
Yes SFP, this Cl word pronounce **wai**.
Yes, this word is pronounced as **wai**.

(2) Nei1 go3 zi6 duk6 **wai**↷, dim2 wui5 duk6 X gaa3?
This Cl word pronounce **wai**↷, how Aux pronounce X SFP?
This word is pronounced as **wai**. How can it be pronounced as X?

(1) is a statement, while (2) is a sentence with the intonation attached. The syllable "wai" was recorded in all six lexical tones. The total number of sentences tested is: 4 subjects × 2 intonations × 6 tones × 3 trials per subject = 144 sentences.

Results: The underlined parts (five syllables in each condition) were extracted for analysis in Praat [2]. For each syllable, 50 points of F0 data were extracted by ProsodyPro [3] and converted into Z-scores. Items with an absolute Z-score larger than 2 were discarded, which accounted for 3.20% of the original set of data. An SSANOVA (Smoothing Spline ANOVA) analysis was conducted. The data of the six tones are shown separately in Fig.1. The dotted line separates the last syllable.

The I curves (blue, rising-falling) are generally higher than the S curves (red, statement). This paper argues that this is not a global rise for the following reasons: the I curves are not higher than the S curves totally and steadily; variation was observed among different subjects; the use of the higher F0 for this intonation can be attributed to paralinguistic factors: the intonation is often used in denials, which may easily lead to a rise of F0.

Regarding the effect on the lexical tones of the sentence-final syllables, except for T1 – which is at the upper limit of pitch range (so the realisation may be affected by ceiling effect), the realisations of the other five tones are similar. Simply speaking, instead of modifying the pitch of the whole syllable, the initial part of the syllable remains unaffected (the two curves are basically overlapping right after the dotted lines), with the rising-falling contour attached right after it.

Beside the initial part of the lexical tone, some other tonal features are also preserved. For example, for T2 and T5 (rising tones), the apexes of the two curves in the corresponding graphs are at the same height, showing that the pitch target is preserved. The end points of the I curves in

[1] The symbol "↷" is used for simpler representation of the intonation here. Cantonese data are transcribed in LSHK Jyutping.

T3 and T6 (level tones) are also at the same height as the level parts of the corresponding S curves, which is another cue of preservation of tone height. Also note that a much larger and longer falling pattern was observed in T1, while the rising pattern starts at an extra low position in T4 (the lexical tone that is at the lower limit of pitch range). These cues may also help tone perception (under the disturbance of intonation).

Conclusion: This study investigates the phonetic realisation of the rising-falling intonation (analysed as a boundary tone HL%) in Cantonese. The initial part of the final syllable remains unaffected, with the intonation contour attached at the end. Some other tonal features are also preserved, which may act as acoustic cues for tone perception. This will be left for further research.

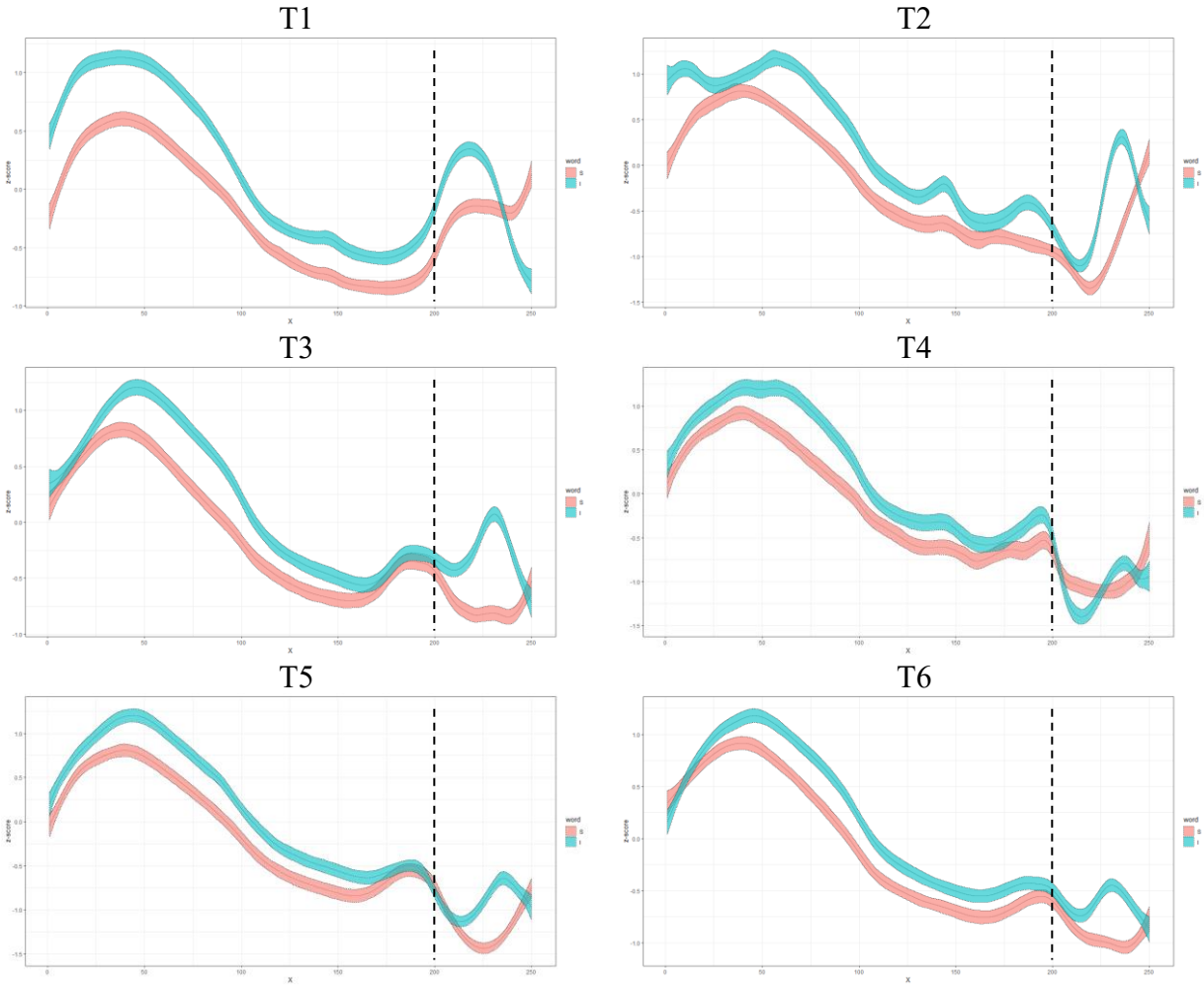

Fig.1 Sentences with and without the rising-falling intonation in six lexical tones

References

[1] Kwok Chang, H. H., & Luke, K. (1986). An Initial Study of Intonation in Cantonese. *Yuwen Zazhi*, *13*, 32-40.

[2] Boersma, P., & Weenink, D. (2019). *Praat: doing phonetics by computer [Computer program]*. Version 6.0.50, retrieved 31 March 2019 from http://www.praat.org/

[3] Xu, Y. (2013). ProsodyPro — A Tool for Large-scale Systematic Prosody Analysis. In *Proceedings of Tools and Resources for the Analysis of Speech Prosody (TRASP 2013)* (pp. 7-10). Aix-en-Provence, France.