

PREDICTABILITY OF DIFFERENT ATTITUDINAL INTONATION IN STANDARD CHINESE

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ABSTRACT

In the sentence intonation of Standard Chinese(SC), the range registers of phrasal contours(PC) are shifted to different extents according to various attitudes. Normalization by frequency transposition after converted the F0 into chromatic scale, the PC values are rather identical that can be predicted based on given patterns.

INTRODUCTION

The intonation contours of SC sentences are a compound of interrelative constituents of tonemic and poly-syllabic tone-sandhis patterns in PCs; as well as attitudinal modified inter-PC glidings, initial and ending drifts in global sentential contours. Most of them present the surface forms rather different from their original patterns. In our lab., fundamental studies on PC's tone-sandhis were carried out[1,2,3], for which poly-syllabic tone-sandhi rules were derived and had been tested in synthesis[6].

As for the SC intonation, two obstacles, say, the largely deviations of the absolute registers and the frequency ranges caused by the modification of sentence attitudes, had bewildered phoneticians and engineers for long time. It can be analyzed by F0/ST(semitone) conversion and frequency transposition. Thus, predictability of SC intonation may be realized in the near future.

MEASUREMENTS AND ANALYSIS

For the problems of absolute registers and frequency ranges, a number of spoken sentences with different moods collected from different sources were analyzed[4]. Measurements were done by segmentation of the PCs according to the margins of sense groups. It was found that the tone contours of some PCs with their registers modified by the sentential expressions will be higher or lower; however, their contour patterns are similar to the forms of normal moods. Also, the contour ranges of all the PCs were identical to each other in the scale of melodic intervals if the linear F0 scale had been converted into chromatic semitones(ST). Thus, any PC in different register can be normalized to a given pattern by frequency transposition or change key process. It means that all the melodic ranges among the PCs in the sentences of different moods spoken by the same speaker are rather consistent. Table I shows two sentences with different moods measured both by F0 scale and chromatic one. The absolute F0 and their ranges are different among all PCs, while the absolute key notes of the PCs are shifted to different extent, however, their ranges in ST are all identical, with some exceptions in ending drifts. Moreover, another experiment was arranged[5], in which hundreds sets of four SC syllables were spoken by two Pekinese speakers, male and female. The speakers were asked to pronounce isolately with tone 1 tuned to three

Table I: The upper-lower thresholds and the F0 range of different PCs in an question sentence and an exclamatory one

Sentence	Phrasal contour	F0 Range in Hz*			Melodic key in ST**		
		Upper	Lower	Width	Upper	Lower	Width
Interrogative	PC1	260	170	90	C4	F3	7
	PC2	350	230	120	F4	B3	7
	PC3	270	170	100	C4	F3	7
Exclamatory	PC1	250	120	130	B3	B2	12
	PC2	350	180	170	F4	F3	12
	PC3	390	200	190	G4	G3	12
	PC4	270	140	130	C4	C3	12

Note: *Upper threshold, lower threshold and width of PC range

**ST=semitones(concert scale)

different keys. The result showed however the upper thresholds of the four tone ranges were different from each other, their lower thresholds were all shifted to an extent of the same range-width in ST scale.

DISCUSSION

In the PCs of sentence, even their surface forms are far different from their underlying patterns, it can be recognized by rules[3]. As for the analyzing of global contours, the PCs modified by intonation and the inter-PC glidings, can be processed by PC segmentation, ST conversion and register transposition. The initial and ending drifts modified by sentence intonation are appeared in

different surface forms such as the raising or lowering contours, the neutralization of the first and/or the last syllables of the PCs. These are much more verified by different moods and individual speakers respectively, they were not easy to be normalized and further studies have to be going on.

There is another problem in the analysis of SC intonation, i.e., how do the prosodic features other than tones play the roles in intonation. It is worthwhile to mention that there were not a few papers presented to a symposium of prosody in Yokohama on account of the relation of the three prosodic features to intonation. Lehiste stated that perceptions of prosody are differed in language backgrounds, e.g.,

stress as prominent cue in English and duration in Estonian. Ohala gave the result that there is no significant difference between a "clear" speech and repeated one. It is interesting to compare these results with that in SC.

As in Chinese, It is true that the tone pitch is the chief prominent cue in intonation. A number of tentative experiments on speech synthesis had shown that in a synthesized exclamatory sentence the absolute register of a prominent PC raised to a certain extent is not significant in loudness unless a certain degree of amplitude and/or duration are added to an appropriate proportion.

Measurements of further more samples show that the proportions of the three prosodic features are differed in different cases. Fig.1(a,b,c) are three samples of SC sentences with their prominent cues in PCs contributed by different prosodic features: (a)lengthening duration in 1st PC; (b)increasing of all three features in last "repeated"PC; and (c)a cheer with three "long live"s louder and longer by increased durations. It shows that the prominence cues can be represented by any of the prosodic features, or both, or all, in SC intonation. Percentages of the three features taken part in different prominence cues will be a current topic in SC intonation studies.

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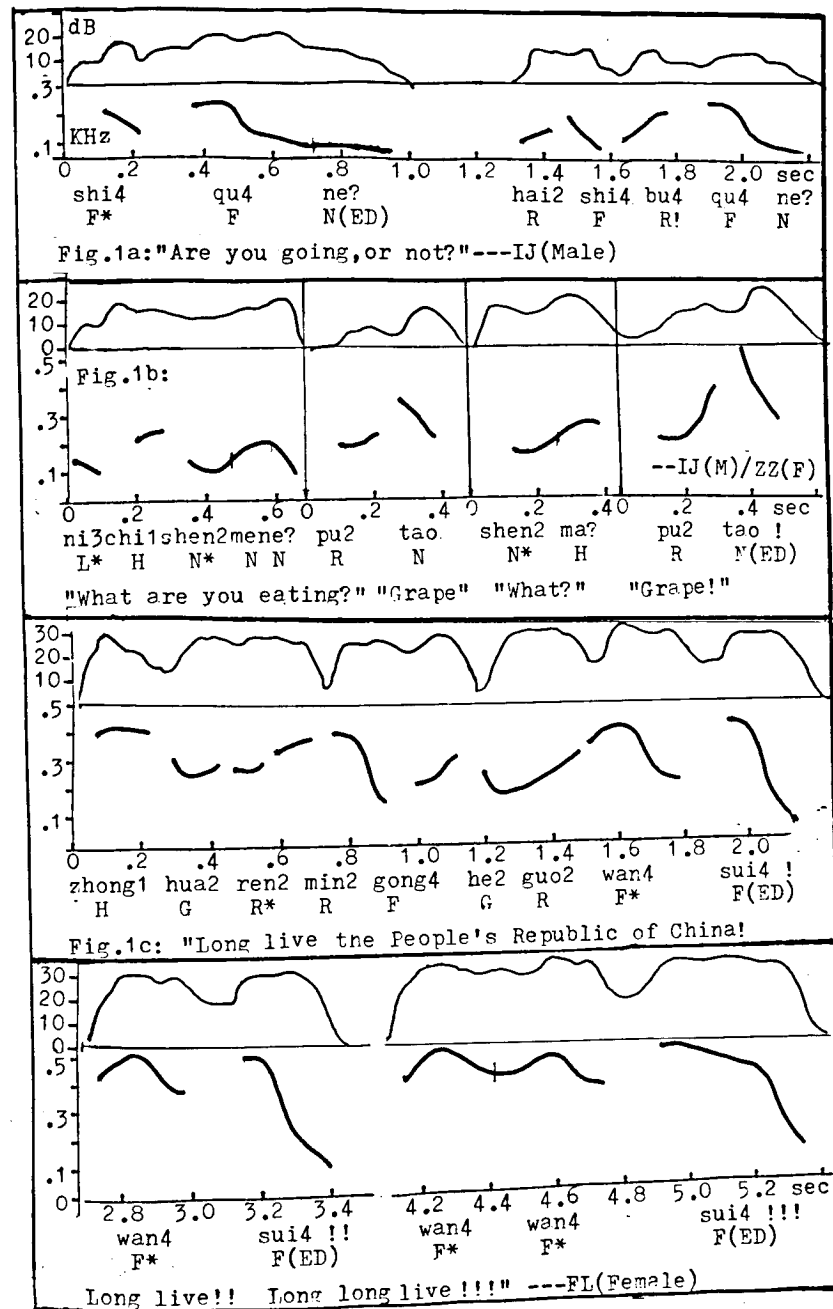


Fig.1: Intonation contours traced from narrowband Sonagrams. (a) A yes/no question sentence. (b) Question/answer between two persons. (c) A cheer in the National Day Celebration.