

INTONATIONAL THEORY OF CHAO YUEN-REN AND FUNCTIONAL INTONATION IN CHINESE

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ABSTRACT

In this article, Yuen-Ren Chao’s intonational theory, which is about the act of mood, emotion and stress on tone and neutral intonation, resulting in the actual intonation via “algebraic sum” and “elastic band”, is essentially presented in Figure 1.

The opinion of “algebraic sum” is scientifically verified. The relationship between the interrogative and declarative boundary tone and tone in Standard Chinese, that is the scale of interrogative boundary tone is higher than that of the boundary syllable, whereas the scale of declarative boundary tone is lower than that of the boundary syllable, is shown in our experiments.

The “elastic band” is used as the analogy to pitch range and duration. This analogy to stress is both visual and appropriate. There are two causal types of stresses: narrow focus stress and broad focus stress. They differ from each other both acoustically and perceptibly. The perception of narrow focus stress is pitch prominence, whereas the perception of broad focus stress is pitch distinct.

As for the actual intonation, this article illustrates simply that it is a reflection on rhythm, and the sentence rhythm is the perception induced together by the regular occurrence of the stress (and duration) of prosodic word and prosodic phrase. This means that the sentence rhythm is an integrated perceptual effect of the rhythms of prosodic phrase and prosodic word.

Seen from the respect that intonation contains two essential elements--- stress and mood, Chao Yuan-ren’s intonation theory was proposed half a century earlier than the auto-segmental (AM) theory.

Keywords: Y.R. Chao Intonation Boundary tone Stress Rhythm

1. INTRODUCTION

At the International Tonal Symposium which was held to celebrate the 95th birthday of Mr. Zongji Wu in 1994, Mr. Dayou Ma highly evaluated Yuen-Ren Chao’s intonational theory in his speech on “Chao’s viewpoint of Chinese intonation” [21]. He pointed out that “Mr. Chao was the first linguist who had thoroughly researched Chinese intonation. He had made a thorough description on Chinese intonation in the 1920’s and the early 1930’s by virtue of his acute ear and his intelligent thoughts.”

This current research, through various experiments, confirms that the “algebraic sum” opinion and “elastic band” analogy proposed by Mr. Yuen-Ren Chao in 1920s and early 1930s perfectly fit in Chinese intonation research, and point out that Chao’ intonational theory has meaningful for general linguistics.

In this article, what is the actual intonation is also

addressed.

It is hoped that researchers in the mainland and overseas work on Chinese intonation from various perspectives, in order to make a more scientific and accurate acquisition of Chinese intonation.

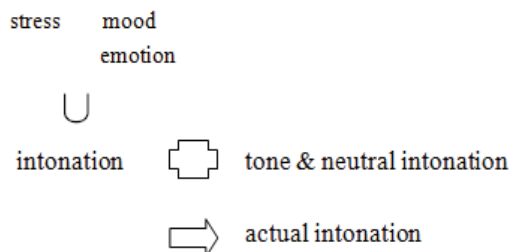
2. YUEN-REN CHAO’S THEORY ON CHINESE INTONATION

In 1929, Mr. Chao first proposed his opinion on “algebraic sum”. He said that “the actual intonation of Chinese speech is an algebraic sum of etymological or intrinsic word tones and speech intonation proper. It is necessary therefore to disentangle one from the other in order to see what is speech intonation. There is, however, a phenomenon in Chinese tone-change, which is of an intermediate nature between the two. This consists of in change of tone when words are put in juxtaposition without any semantic function whatever. This may be called neutral intonation.” For the neutral intonation, Chao further said that “in plain matter of fact statements, the tones of words undergo marked or even radical changes in connected speech, we call these changes as neutral intonation.” [1, 2, 7, 8]

At the mean time when he proposed the “algebraic sum”, he associated expanded pitch interval (pitch range) and prolonged duration with stress. Chao used “elastic band” as the analogy to pitch interval (pitch range) and duration in 1932. He said that “the most important intonational changes are the amplification or reduction of pitch range and time, which can be compared to a ‘device’, and this ‘device’ is a ‘elastic band’ ”. [1, 2, 3, 7, 8]

It is called Yuanren Chao’s intonational theory that mood, emotion and stress act on tone and neutral intonation, and then generate the actual intonation via “algebraic sum” and the “elastic band” effect, which is essentially presented in Figure 1. [11, 12, 18]

Figure 1. Sketch map of the model of Chao’s Chinese intonational theory



In Figure 1, □ indicates that intonation acts upon tone and neutral intonation; ⇒ indicates that the actual intonation is generated by both of tone and neutral intonation; U indicates that intonation expresses moods, emotions and stress (core contents of intonation in Chinese).

This paper aims to confirm the validity of Chao’s theory

from the perspective of functional intonation in Chinese.

3. FUNCTIONAL INTONATION

3.1. Mood

Mood is one of the core contents of Chao's intonational theory.

3.1.1. Interrogative and declarative mood

"Algebraic sum" and mood: In 1929, Yuen-Ren Chao illustrated the "algebraic sum" using the examples "your name is Wang, my name is Ye" and "my name is Ye, your name is Wang" [1, 7]. In 1968, he further explained what is the "algebraic sum": in "your name is Wang, my name is Lu", the rising intonation in the further referring clause will make the rising 2nd tone Wang rise higher than usual, and the falling intonation on the 4th tone Lu fall lower than usual". But in "my name is Lu, your name is Wang", Lu will be pitched higher as a whole, but still with a 4th tone contour, and Wang will be pitched lower as a whole, but still with a 2nd tone contour, without losing the identity of the tones." [5]

It can be seen that there are two meanings in the "algebraic sum". Firstly, the rising intonation and the falling intonation act on the final syllable in a sentence. Secondly, the rising intonation enhances the scale of the sentence-final syllable and the falling intonation lowers the scale of the sentence-final syllable, leaving the shape of tone unchanged. These two meanings are the essential implications of the "algebraic sum".

Interrogative and declarative mood and boundary tone: From acoustic analysis and perceptual experiments, it can be seen that the information that differentiates interrogative and declarative mood in standard Chinese mainly lies in one or two final stressed syllables or initial syllables in a phrase. This means that the tune of the boundary syllable that differentiates interrogative and declarative mood is the boundary tone. There are three pitch patterns between the interrogative and declarative boundary tone: (i) the starting-point of the interrogative boundary tone is higher than that of declarative boundary tone and the ending-point even higher; (ii) only the starting-point of the interrogative boundary tone is higher than that of declarative boundary tone; (iii) only the ending-point of the interrogative boundary tone is higher than that of declarative boundary tone. No matter which pattern is adopted, the shape of pitch is not changed because of interrogation.

As for the relationship between the interrogative and declarative boundary tone and tone in Standard Chinese, we can see from experiments that the scale of interrogative boundary tone is higher than that of the boundary syllable, whereas the scale of declarative boundary tone is lower than that of the boundary syllable. Thus the "algebraic sum" proposed by Chao is scientifically verified by experiments [14, 15, 16, 17, 18, 19].

3.1.2. Exclamatory mood and imperative mood

Chen [9] has researched on exclamatory mood. His result is that strong stress and wide pitch range are the constituent and perceptual elements of non-marked exclamatory mood in Standard Chinese.

Lu and Sun [20] has researched on imperative mood. Their result is that non-marked imperative mood is mainly reflected through the boundary tone.

3.2. Stress

Stress is one of the core contents of Chao's intonational theory.

3.2.1. "Elastic band" and stress

Chao advocated that "it is best phonemically to set up no more than three degrees of stress: normal, contrastive, and weak." [5] As for the property of stress, Chao said that "the pitch range of Chinese stress is expanded in the way that H tone (tone-1, tone-2 and tone-4) becomes much higher and L tone (tone-3) becomes lower, which is like stretching an "elastic band." [2, 8] This analogy is both visual and appropriate.

3.2.2. The acoustic characteristics of stress

The results in this research are as follows: There are two causal types of stresses: narrow focus stress and broad focus stress. They differ from each other both acoustically and perceptibly.

In intonational phrase (I.P.), the acoustic characteristics of narrow focus on tone-1, tone-2 and tone-4 are different from that on tone-3. The pitch contour of the syllable with tone-1, tone-2 or tone-4 by stress of narrow focus is raised prominently (first arises slowly and then drops abruptly), the pitch range is expanded, and the duration is prolonged. But, the dipping-point of the pitch curve of the syllable with tone-3 by stress of narrow focus is lowered (its pitch curve is in V-shape). The perception of narrow focus stress is pitch prominence. As for broad focus stress, the top-point of the pitch curve from the first prosodic word (P.W.) to the last one is not raised, but the bottom-point of the pitch curve from the first P.W. to the last one is lowered (its curve in tone-3 is in arc-shape), and the pitch range of the last one or two syllables in phrase is more wider. The pitch contour of the intonation phrase with broad focus stress is dropped progressively, and the duration of the last syllable is longer. The perception of the last one or two syllables with narrow focus stress is pitch distinct [16, 17, 18].

3.3. Functional intonation of Standard Chinese

Stress and boundary tone are the two key elements of Chinese functional intonation, while the other parts of the pitch curve of intonational phrase are usually affected by factors such as co-articulation which are redundant with regard to intonational features. A two-key-element model of Chinese functional intonation is proposed based on stress and boundary tone together with their features, as illustrated in Figure 2, in which the interrogative, declarative, imperative and exclamatory moods are concerned. The stress includes the stress of narrow focus and broad focus.

Figure 2. A model of two-key-elements in Chinese functional intonation

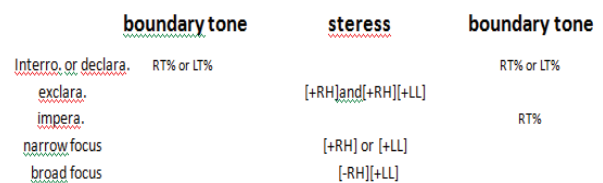


Figure 2: A model of two key elements in Chinese function-intonation

In Figure 2, RT% and LT% in the first row are the abbreviations of the features [+RAISETONE] and [+LOWERTONE] of the interrogative and declarative boundary tone. In the second row, [+RH^], [+RH] and [+LL] are the abbreviations of [+RAISEH], [+RAISEN] and [+LOWERL] of the exclamatory Mood. RT% in the third row is the abbreviation of [+RAISETONE] of imperative Mood. In the last two rows, [+RH] or [+LL] are the abbreviations of [+RAISEH] or [+LOWERL] of the stress features of narrow focus; [-RH] and [+LL] are the abbreviations of [-RAISEH] and [+LOWERL] of stress features of broad focus; in which H and L denote the highest and lowest points of the concerned pitch contour, not the high and low tones [18, 19].

4. WHAT IS THE ACTUAL INTONATION?

In this paper, the actual intonation, as generally said, is “light and heavy, slow and fast, and fall and rise, pause and transition”. It is a reflection on rhythm, since it is regarded as the perceptual pattern generated by regular occurrence of prominent element in speech, poems and songs. [22] In the Chinese sentences, there are two prosodic units: P.W. and P.P. Both have their own stresses. [23] Therefore, the sentence rhythm is an integrated perceptual effect of the rhythm of P.W. and P.P., if the P.P. has two or more than two P.W.

4.1. Rhythm of prosodic phrase (P.P.)

In P.P.(namely, I.P.), the pitch curve of stress induced by narrow focus on tone-1, tone-2 and tone-4 first rises slowly and then drops abruptly[10, 13, 24], and the dipping-point of the pitch curve induced by narrow focus on tone-3 slightly lowers; The pitch induced by broad focus descends gradually and the pitch range of the last syllable is expanded (the stress is finally located). To sum up, the pitch of the P.P. is higher before the stress than after the stress.

There are more than one stress in a sentence when it is divided into P.P. according to the boundary cues of boundary tone. In the sentence, there are more than one pitch unit in which the pitch is higher before the stress than after the stress; The phrase-final syllable is usually stretched(read slowly); When there is a certain difference between the pitch of phrase-initial syllable and that of its preceding final syllable, a filled pause is generated by the pitch leap between the phrases; and the silent pause and a distinct pitch pattern of boundary tone appears. So, the actual pitch curves are formed in a sentence. The perception induced by the regular occurrence (the period is approximately the duration of the prosodic phrase) of the stress of P.P. in the sentences is called the rhythm of P.P..

4.2. Rhythm of prosodic word (P.W.)

There are three stress patterns for P.W.: (i) initial-stressed (the pitch falls from the first syllable), (ii) medial-stressed (the pitch falls from the medial syllable) and (iii) final-stressed (the pitch raises) [13]. The perception induced by the regular occurrence (the period is approximately the duration of the prosodic word) of the stress of P.W. in the sentences is called the rhythm of P.W.

4.3. Chao’s discussion on “word rhythm”

Chao said: “since the monosyllables are very much alive and meaningful as units of small change, there is a great

degree of rhythmic monotony in connected speech. But I mean that there is less variation in length and loudness from syllable to syllable than in many other languages; at least that is my impression in pending experimental and statistical confirmation” [6, 8]. In fluent speech in Chinese, there are tone, tone-sandhi, neutral tone, and unstressed syllable.

4.4. Sentence rhythm

The sentence rhythm is the perception induced together by the regular occurrence of the stress (and duration) of P.W. and P.P., if the P.P. has two or more than two P.W.s. It is obvious that the stress of the P.P. is stronger than that of the P.W.

5. CONCLUSION

Chao’s opinion of “algebraic sum” is scientifically verified and the analogy “elastic band” to stress is both visual and appropriate.

It is proposed that the actual intonation is “light and heavy, slow and fast, and fall and rise, pause and transition”, and it is a reflection on rhythm. The sentence rhythm is an integrated perceptual effect of the rhythms of P.P. and P.W., i.e., the sentence rhythm is the perception induced together by the regular occurrence of the stress (and duration) of P.W. and P.P., if the P.P. has two or more than two P.Ws. And it is obvious that the stress of the P.P. is stronger than that of the P.W.

From the above statements, just as Mr. Ma said, “Yuen-Ren Chao has given a most thorough description on Chinese intonation”. Seen from the respect that intonation contains two essential elements--- stress and mood, Chao Yuan-ren’s intonation theory was proposed half a century earlier than the auto-segmental (AM) theory. However, the contributions of the auto-segmental (AM) theory also lie in the features of pitch accent and boundary tone. Along with the proposals of the “algebraic sum” and “elastic band” used respectively for mood and stress, Chao Yuan-ren also put forward the “overall intonation perceived by our ear”. Therefore, Chao’s intonational theory has also pointed out the directions for the intonation research on non-tonal languages, which meaningful for general linguistics.

It is hoped that researchers in the mainland and overseas work on Chinese intonations from various perspectives. Synthetic technology is requested for the speech engineers to compose mood, emotion and stress together with sentences even with paragraphs and articles, in order to make a more scientific and accurate acquisition of Chinese intonation.

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