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The Intonation Pattern of Imperative Sentences in Uyghur Language

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Abstract

Based on the notion of intonation pattern and method of undulating scale computation, this paper has done a quantitative analysis to the intonation patterns of imperative oral sentences in standard Uyghur language. And give the pitch contour distributions of representative sentences and their different tone groups for the first time. The experimental results show that whether from the contour curves of overall sentences or fluctuations of tone groups pitch contour curves and the width variations, we can observe the distinctive features between different pronunciations. And can also observe the subtle tone differences between different types of statements voiced from a same text sentence.

Keywords*: Uyghur; speech corpus; imperative sentence; intonation pattern; undulating scale*

1. Introduction

In linguistics, intonation is a very famous, but not very well defined conception. In narrow sense, the intonation just is the sentences intonation which is the basic form of pitch contours associated with the sentence's tone. Its objective physical parameter is the pitch which is the function of time; usually it is described by syllable's pitch contour movements. In Uyghur language, for example, the pitch contour of declarative sentence is gradually decreased, and its intonation has the nature of falling (Dilmurat, 2011). The forms and meaning of a word or a sentence in a language may convey different intentions of speakers at different tone circumstances. To the listeners who have a complete awareness of the pragmatic function of intonations who can easily understand the speaker's pragmatic intentions (Cao Jian Fen, 2007). Intonation is the one of key and difficult issues in speech research field. Domestic and foreign scholars have conducting many researches on intonations using different methods. It was introduced the notion of "intonation pattern" have analyzed the pitch contours of Chinese (Shi Feng, 1999). "Intonation pattern" refers to a statement's pitch contour fluctuations, includes variations of their each tone group's pitch width and locations. On the basis "intonation pattern" notion mentioned above, it had just mentioned and further proposed a notion of "undulating scale" and its formula of digitization, and have analyzed the intonation patterns of Beijing dialect declarative sentences (Shi Feng, 2009).It had also further analyzed the Beijing dialect interrogative sentence and Japanese declarative sentence using the calculation method of "undulation" (Wang Ping, 2010). This article uses the notion of "intonation pattern" as well as "undulating scale" calculation method carry on the preliminary analysis of intonation patterns of imperative sentences in Uyghur language for the first time.

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2. Experimental Settings

Uyghur language is not a tonal language, so the convenience of studying, we designed following a relatively simple and typical four imperative sentences which are transcribed to Latin form as:

1) Kuxun Hujumni baxlisun! (Let army go attack!)
2) ular mExiKni tuhtatsun! (Let them end the practice!)
3) xopur svrEtni tezlEtsun! (Let driver speed up!)
4) ErlEr EmgEkni tvgEtsun! (Let men finish the work!)

Each sentence given above is then divided into three tone groups according to the grammatical and prosody analysis.

1) Kuxun / Hujumni / baxlisun!
2) ular /mExiKni /tuhtatsun!
3) xopur /svrEtni /tezlEtsun!
4) ErlEr/ EmgEkni /tvgEtsun!

The first 2 syllables in the top of each sentences are called as “begin tone group”, 3 syllables in the middle of each sentences are called as “middle tone group”, 3 syllables at the last in each sentences called as “end tone group”.

In our experiment, the number of speakers is four labeled as A, B, C and D respectively. A is a graduate student growing up in Urumqi, B is a senior student in college, and also growing up in Urumqi; C and D are senior student too growing up in Kashi. Where A and C are male, B and D are female. The speeches recorded in a professional recording room located in Xinjiang University. Each speaker read each imperative sentence three times in natural style, steady speed, with no semantic emphasis and emotion. Recording software is COOL EDIT PRO2.0. The Speech Analysis software is Praat, the drawing software is Microsoft EXCEL 2003.

The conversion formula from Hertiz (Hz) to a semitone (St) specified in the following expression:

$$St=12\times\lg(f/64)/\lg2 \quad (1)$$

Where f the frequency (Hz) to be converted, 64 is the number of reference frequency Hz.

3. Normalization of Pitch Values

To achieve each speaker’s intonation range, we take an average of those pitch values of 3 pronunciations, and we get the average pitch of 1×8 (syllables) ×10 (pitch) = 80 different values. In which the 10 pitch values are come from by sampling at the 10 edges of 9 equally segmented time zones of whole syllable’s pitch duration, and so no matter how pitch duration length are, in the result the duration length differences between syllables are eliminated. So that we can do comparative analyses on the pitch data in the same normalized time axis. The maximum value in this 80 pitch values is called the upper-line, and the minimum value is called bottom-line. Then we achieve the intonation range (its value is equal to upper-line value minus bottom-line value), shown in following Figure:

Table 1. Intonation Ranges of Uygur Imperative Sentences (in Semitone Value)

values / speaker	Maximum value	Minimum value	Intonation range
A	15.9	4.3	11.6
B	26.1	17.6	8.5
C	22.2	8.17	14.03
D	30.9	18.7	12.2

Table 1 shows that the male speaker's intonation range longer than female speaker's; A's intonation range longer than B's; C's intonation range longer than D's; It is mainly because of that men and women have different speech organs and their degrees of thickness are also different too. According to the average pitch value of the experimental sentences, we can draw the intonation range charts in the same coordinate system as show in Figure 1.

In order to get more specific observations, we also drew the tone group intonation range chart shown in Figure 2. In the tone group, each maximum pitch value is called as the upper line, each minimum pitch value is called as the bottom-line or lower-line, and the average value of upper-line and bottom-line is called as the median-line.

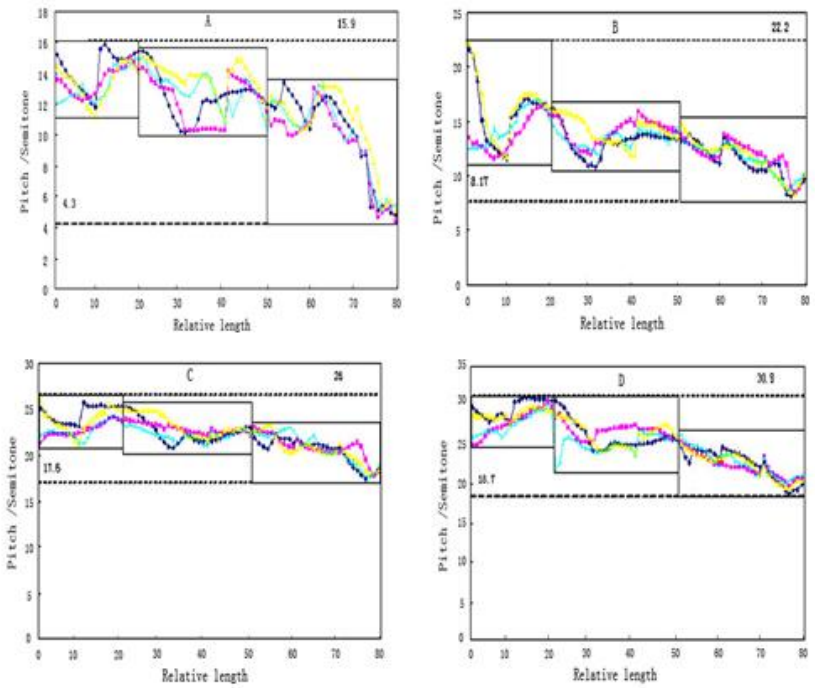

Figure 1. Intonation Ranges in Semitone Values (A, B, C, D)

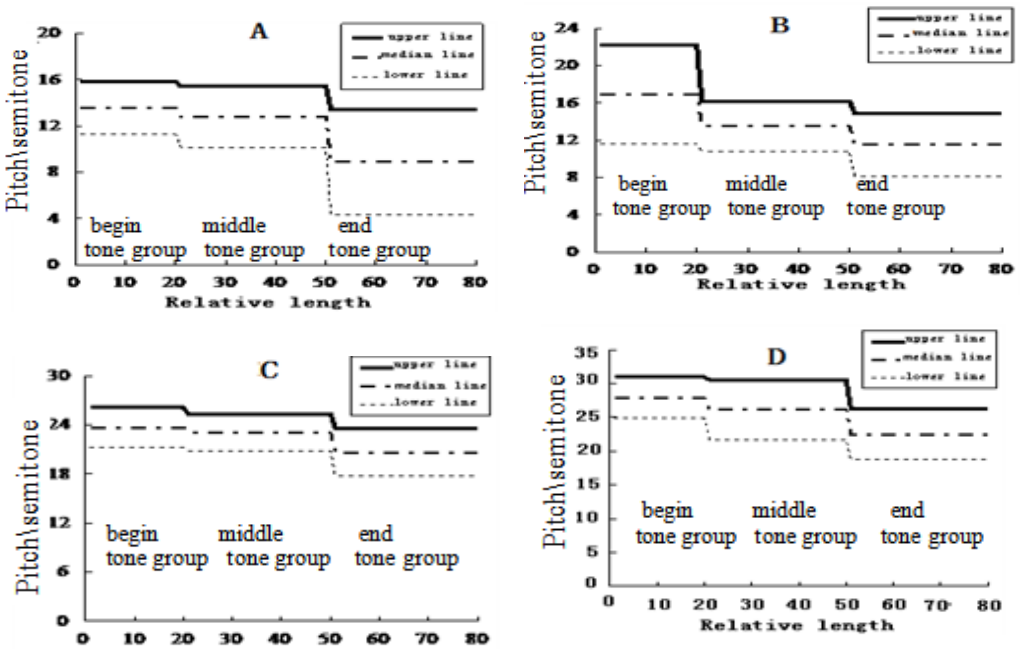

Figure 2. Tone Group Intonation Ranges in Semitone Values (A, B, C, D)

In the study of intonation, except fundamental frequency F0, there are various psycho-acoustic units that semitone, magnesium (Mel), Barker (bark), and ERB *etc.* In which semitone is the best tone unit to reflect the relationship between psycho and acoustic researches (Li Ai Jun, 2005). However, there are certain limitations when it is applied to different languages and contrasting the intonation between different speakers. Due to female's semitone often higher than male's semitone even if they read the same sentence in the same language. And sometimes, the female's minimum semitone higher than male's maximum semitone (Wu Ji Si Gu Leng, 2011). So, it is very necessary to introduce a more relative intonation research method so that conduct comparative study of intonations.

Percentage calculation is considered one the relative normalization algorithm that as follows:

$$Ki=100\times(Gi-Smin)/(Smax-Smin) \quad (2)$$

$$Kj=100\times(Gj-Smin)/(Smax-Smin) \quad (3)$$

$$Kr=Ki-Kj \quad (4)$$

Where Gi denotes the upper-line semitone value in tone group range; Gj is the bottom-line semitone value in tone group range; Smax is the upper-line semitone value in sentence intonation range; Smin is the bottom-line semitone value in sentence intonation range; Ki is the upper-line percentage value of sentence intonation range; Kj is the bottom-line percentage value of sentence intonation range; Kr is the relative percentage value of sentence intonation range.

Table 2. Tone Group Intonation Ranges in Semitone and Percentage Values

Intonation domain / Speaker	Begin tone group	Middle tone group	End tone group
Semitone （St）			
A	4.6	5.3	9.1
	11.2—15.8	10.1—15.4	4.3—13.4
B	4.8	4.5	5.8
	21.2—26	20.8—25.3	17.7—23.5
C	10.6	5.4	6.7
	11.6—22.2	10.8—16.2	8.2—14.9
D	6.0	8.9	7.5
	24.9—30.9	21.7—30.6	18.7—26.2
Percentage （%）			
A	39.9	45.6	78.9
	60.1—100	50.5—96.1	0—78.9
B	56.6	52.6	67.9
	43.4—100	38.3—90.9	1.7—69.6
C	75.5	38	48
	24.5—100	19—57	0—48
D	49.6	72.4	61.3
	50.4—100	24.6—97	0—61.3

Table 2 shows from the data of tone groups transfer domain view, in semitone situation, whether male or female speakers, the transfer domain semitone difference between tone groups of sentences initial, median and end are all within 6 semitones; In percentage situation, whether male or female speakers, the imperative sentences transfer domain's upper limit value is 100 and lower limit value is 0 after relativity. According to percentage value, there be down statement intonation map as shown in Figure 3.

Judging from Figure 3, in the percentage situation, the general trend was consistent line of the statement transfer domain of four speaker's pronunciation. Besides C, the remaining three speaker's transfers domains are about consistency form sentence begin to end. But the landing points of four speakers at the end of the sentence are not consistent, where besides A, other's transfer domain have little upward trend in the sentence end. Because the imperative sentence divided into commend sentence, suggested sentence, discouraging sentence and petitionary sentence *etc.*, in which the characteristics of suggested and petitionary sentences are nice, gentle tone, volume, light, stressed syllable lengthening, the end words slightly flat or slightly rising. So when the above four experimental sentence being pronounced, the speakers think them suggested sentence or petitionary sentence. Therefore the sentence tail appeared slightly rising trend, but the overall trends are falling. This information obtained by acoustic laboratories, and drown map (Figure 1, Figure 2, Figure 3) to further evidence of imperative statements falling tone and so on.

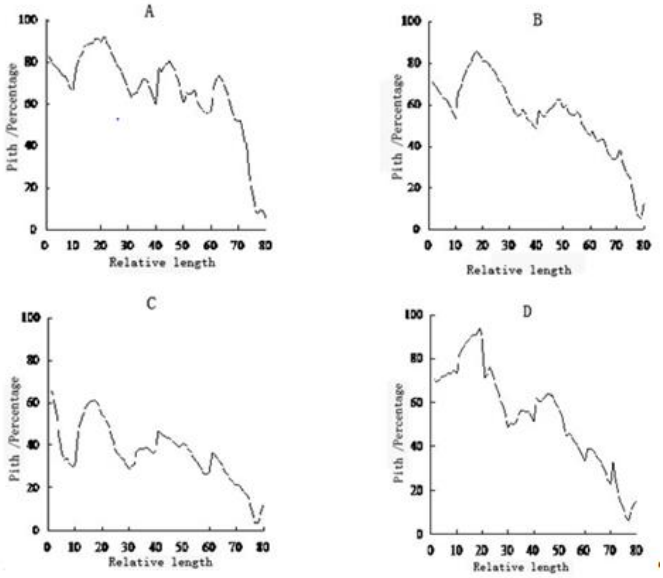

Figure 3. Sentences Intonation Patterns in Percentage Values (A, B, C, D)

4. Undulating Scales

The sentence intonation undulating scale computation is based on the percentage values in tone group range. The undulating scale computation let us do comparative analysis of different expressions come from different sex and the different language background speakers. The undulating scale is denoted with the Q value, and the Q value's category and the position is differed with the subscript such as:

$$Qx=Kx-K(x+1) \quad (5)$$

Where K is the relative percentage value of tone group range, x is the sequence of tone group in sentence.

In the undulating scale computation, a tone group range has upper-line, median-line and bottom-line. Where upper line denote the highest percentage value of each tone group, and bottom-line denote the lowest percentage value of each tone group range. And using a, b, c to indicate pitch contour's upper-line, median-line and bottom-line for tone group ranges. Then, we can calculate 3 kinds of undulating scale: that is Qa is upper-line undulating scale, Qb is median-line undulating scale, Qc is bottom-line undulating scale separately. And then compute the relative value of upper- line and bottom-line, we get median-line value of tone group ranges. At the same time, it is need to describe a sentence's intonation undulating scale with using Q value sequence such as Q0, Q1, Q2, Q3 .....Q. But Q is the all sentence's undulating scale, it is equal to Q1 plus Q2 plus Q3 plus and so on. If the undulating scale data is positive, then the pitch contour is falling, else if it is negative data, then the pitch curve is rising (Mahinur. Ablimit, 2011).

In Table 3, it is listed undulating Q average value of four speaker's reading 4 kinds of imperative sentences. According to Table 3, we can draw Figure 4 for expressing the change of standard Uyghur imperative sentence's undulating scale, as shown in Figure 4.

From Table 3 and Figure 4 , it is shown that Q1 and Q2 are all positive, so the standard Uygur language imperative sentence intonation are used to shoe from high to low status on time axis. And indicate the common rules that the imperative sentence's intonation is overall pitch falling trend. The Q value expressed the overall situation of undulating scale, regardless of the A, B, C or D speakers, if they are all positive, then the imperative

sentence overall is the pitch falling trend. Moreover, from the distribution of Q value size, Q value showing a change from small to big distribution (besides C speaker). In addition, the pitch falling trend of imperative sentences should be relation with the physiology, goal, manner, mood pronunciation person *etc*. From sentence initial to end it is pronounced weakness, so that it is caused that the sentences of very language's pitch curve are all falling basically. And indicate the common rules that the imperative sentence's overall intonation are pitch falling tendency nature.

Table 3. The Undulating Scale (Q Values) of Imperative Statement

Speaker \ Pitch type		Q0 (%)	Q1 (%)	Q2 (%)	Q (%)
A	Upper line a	100	3.9	17.1	21.1
	Median line b	80.1	6.8	33.8	40.6
	Bottom line c	60.1	9.7	50.5	60.1
B	Upper line a	100	9.1	21.3	30.4
	Median line b	71.7	7.1	29	36
	Bottom line c	43.4	5.1	36.6	41.6
C	Upper line a	100	43	9	52
	Median line b	62.2	24.3	14	38.3
	Bottom line c	24.5	5.5	19	24.5
D	Upper line a	100	2.9	35.8	38.7
	Median line b	75.2	14.4	30.2	44.6
	Bottom line c	50.4	25.8	24.6	50.4

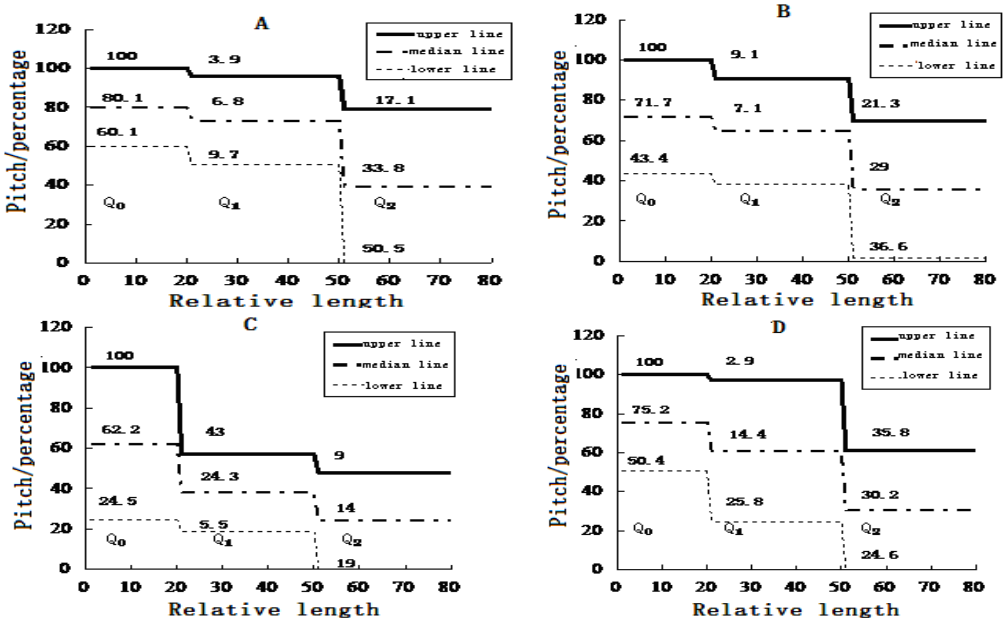

Figure 4. Intonation Patterns in Q Values (A, B, C, D)

5. Conclusions

The results show that the pitch and sentence undulating scale are the important indicators of intonation quantitative analysis. And the method of computation undulating scale can carry on the quantitative analysis regarding the sentence pitch, thus realizes the comparability between different speakers. Then can further seek the distribution characteristic of Uygur imperative sentence intonation undulating scale. Obviously, all imperative sentences are gradually pitch-falling and shrinkage trend from sentence begin to the end. This is the chief pitch feature of standard Uygur language imperative sentences.

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