

DECLINATION LINE AND TONAL VARIATION IN STANDARD CHINESE BROADCAST AND TV NEWS SPEECH

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ABSTRACT

Our experiment investigate on the one hand the pattern of declination in Standard Chinese broadcasts and TV news speech, the interaction of this effect with the sentence length and on the other hand the evolution of the tones F0 values during the sentence. Furthermore, we have investigated the structure of news cast discourse.

I. INTRODUCTION

The observed F0 shape is a combination of many factors. Observable complex F0 patterns can be decomposed in a various ways. In Chinese because of the presence of a tone system which use the same parameters than the intonation the problem is more delicate.

During the last decade a great attention has been paid to the so-called declination of the fundamental frequency contour and on the lowering of the peaks of accented syllables towards the end of the declarative sentence. Declination refers to the fact that the pitch (strictly speaking fundamental frequency) of the voice is most lower at the end of a sentence than it is at the beginning. The existence of the declination line and its origin are regularly put to question. There are two assumptions for explaining this phenomenon : one of the most common hypotheses is that the declination is due to physical constraints. The drop of F0 is due to the drop of subglottal pressure. The other hypothesis is that declination is a “pre-planning” strategy of the speaker, conditioned by the length of linguistic units eg. length of sentence. The declination of F0 is partially planned by speaker such that speakers often adjust the rate of declination according to the length and the syntactic structure of the sentence.

For Chinese, Shih Chilin (1997) have found for isolated mandarin high level tone sentences that there is a clear declination effect stronger in magnitude than previously reported, and that declination interacts with sentence length and focus.

Speakers use prosodic means (among other) to communicate to listeners the structure of the message that they wish to impart. Intonational prominence, in particular, is a prosodic device which does principal serves as an indicator of message structure. Moreover, it is a phenomenon of considerable cross-linguistic

generality. Concerning the structure of discourse it is fairly well recognised among researchers that, prosodically, the majority of languages organise spoken discourse into intonation units. Previous studies on prosodic structures and discourse organisation (Yang Lichung, 1995) has demonstrated for english that pitch movements shows that discourse is hierarchically organised by intonation. Topic initiations often begin with a high pitch level while endings are marked by a low pitch level or a narrow pitch range. A shift in discourse topic is accompanied by raised F0 (reported for English, Japanese, Scottish English, American English).

There is no question that Mandarin speakers use intonation as a linguistic resource to express various aspects of modality, emotion, attitude and to perform other interactional functions just as do speakers of other languages. It should be noticed that the majority of works studied F0 declination line is based on the analysis of “laboratory speech” consisting of isolated sentences pronounced out of context and usually read rather than produced naturally. Some claims based on isolated, controlled sentences have a limited domain of application for natural discourse data.

The aim of our paper is to propose an experimental design to investigate, using a set of televisual and radio newscasts records, the phenomenon of declination in Standard Chinese TV and broadcast news, and the structure of a such discourse.

II. MATERIAL

The speech material is composed of a set of radio and televisual news pronounced by different speakers. Radio newscasts was recorded in Beijing, and televisual newscasts on CCTV 4 in France via a satellite equipment. Because it is an ongoing research the speech material which served for this communication consists of a radio newscasts record (pronounce by a male) and a record of televisual international news (pronounce by a female).

The radio corpus is composed of two paragraphs and fifteen sentences, each sentence includes from 8 to 40 syllables which are grouped from 1 to two clauses.

The televisual newscasts corpus which served for this paper is composed by three paragraphs with a total of 15

sentences from 19 to 70 syllables grouped from 1 to 5 clauses.

III. WHY DID WE CHOOSE A RADIO AND TV NEWSCASTS CORPUS ?

There are several reasons for choosing radio or TV news. Several features are common to radio and TV newscasts all over the world such as monology, reading aloud, standard pronunciation, very clear articulation, objective (neutral) but convincing presentation and the absence of immediate listeners. Furthermore, certain speech acts, that is questions or exclamations can't occur in newscasts, which limit the prosodic patterns.

IV. MEASUREMENTS AND METHODS

After recording, the speech material was digitalised at 22 KHz sampling rate and then was analyzed, segmented and hand labelled. In order to describe the phenomenon of declination and the mannerisms in newsreading we have investigated several parameters :

- F0 was measured at three points of the tone, 10 ms after the beginning, at the middle and 10 ms before the end of the tone.
- F0 distribution (mean, standard deviation, minimum and maximum)
- pause lengths (within and between sentences)
- duration of each word, syllable and tone.

Signalize™. speech processing system running on a Macintosh was used for analysis.

V. RESULTS

We have paid attention to the global features of the F0 contour considering newscasts as a textual unit, sentences as paragraph units and in relation their contexts, and clauses as units within sentences.

Our analysis reveals the following results :

- 1) the presence of sentence declination line. In figure 1 it can be observed a global tendency of sentence declination. Same results have been observed for both corpus (radio and TV news corpus). There is a significant effect of sentence length on the F0 values the more the sentence is longer, the more the slope is weaker and vice versa. This result leads to suppose that there is a programming and a prediction of the length of the sentence. (It seems that the speaker preprogram the length of the sentence). Table 1 below shows the declining effect in regards with the length of sentence for radio news corpus. For sentences composed with a few syllables for example sentence n°11 composed with 8 syllables the regression coefficient is higher (-6,93)

comparatively of those for sentence n°5 (-0,87) composed with 40 syllables. That is to say that the sentence n°11 declines more abruptly than sentence n°11.

- 2) The declination effect for clauses composing sentences. The same results were observed for clauses with the presence of resetting between clauses. (see figure 2). Each clause composing sentence begin with a high F0 value and finish with low F0 value, after this decrease there is a resetting of the F0 curve, the following clause begin with a higher F0 value. This result gives us some informations on the syntactic structure
- 3) The resetting of the declination line indicates a change of the subject, that is a new given information (a new paragraph) is marked by a starting point higher in frequency), so there is a special structure of the paragraph. The most lower F0 values were observed at the end of the paragraph, the last syllable of the paragraph is often pronounced with a creaky phonation, even for female speaker. Sentence initial F0 level depends very much on the thematic connection to the previous sentence. The final syllables are most typically the lowest ones.
- 4) The F0 values of tones evolve according to their position in the sentence. Whatever the tone may be, the F0 value at the center of the tone decrease along the sentence, the low tone is less varying than others.
- 5) The distribution of pauses Pause durations between and within sentences has also been identified as an indicator of discourse structure. The shortest pauses were observed within sentences, the longer ones betterave sentences. The longest pauses were found betterave paragraph. The major pauses between sentences mark a change of information. (see figure 5)

VI. CONCLUSION

In Chinese TV and Radio broadcast news like in other languages the discourse is hierarchically organized by intonation. Initiations often begin with a high pitch level or expanded pitch range, while endings are marked by a low pitch level or a narrowed pitch range. The magnitude of F0 increase corresponds to the hierarchical level of discourse structure. An increase of F0 range signals the beginning of a « paragraph » while final lowering signals the end of it.

Downstepping between phrases usually occurs when there is a natural elaboration of topic idea which move toward a resolution. The degree of step lowering

represent the degree of completeness and finality of the phrase relation to the topic hierarchy.

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在广播和电视新闻语料中的 F0 下倾和声调变化

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概要

在语流中声调和语调同时并存。汉语跟别的语言也有 F0 下倾 (declination), 通过声学语音的实验本文考查电视和广播新闻联播语料。本文讨论几个问题 :

- F0 下倾和句子长时有什么关系
- 句子里面的声调 F0 变化
- 这样讲话的结构

从我们结果可以看到：

— 句子越来越短 F0 下倾的斜度越来越粗暴的；我们也发现了分句也有 F0 下倾。就是说，F0 下倾 ressetting 程度表示说法结构的等级的水平。

— 声调也是在句子里面不同的。不关是什么声调它的 F0 降下。句子开始的时候声调的 F0 特别高，句子结束的时

候声调的 F0 特别低。去声比别的声调的变化少得多。

— 句子里面和两个句子中间的 pause 时长不相同。小的在句子里面长的在两个句子中间也就是表示说法结构的等级的水平。

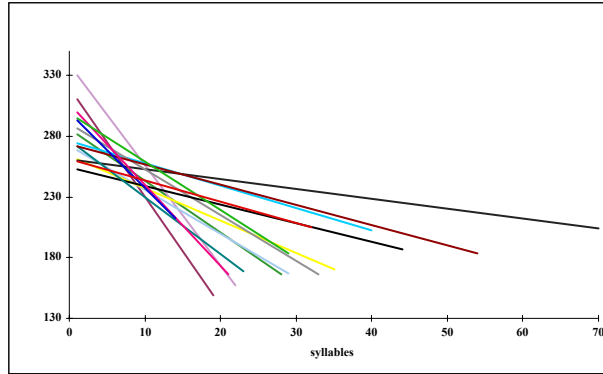


Figure 1 evolution of F0 values in the middle of the tones for all sentences (TV corpus)

sentence	regression coeff.	determination coeff.	nb syllables
11	-6,93	0,36	8
1	-6,39	0,52	10
9	-6,69	0,55	15
3	-2,91	0,30	18
6	-1,52	0,04	19
7	-2,56	0,24	24
8	-1,95	0,23	28
2	-1,96	0,38	32
10	-1,03	0,14	37
4	-1,13	0,14	38
5	-0,87	0,11	40

Table 1 table of regression coefficient of F0 slope in regard to the number of syllables in sentences

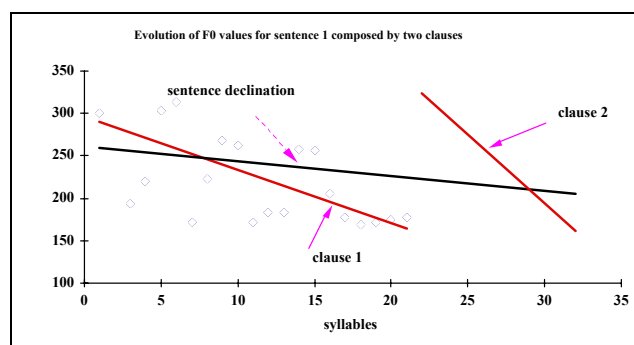


Figure 2 evolution of F0 values for sentence 1 composed by two clauses

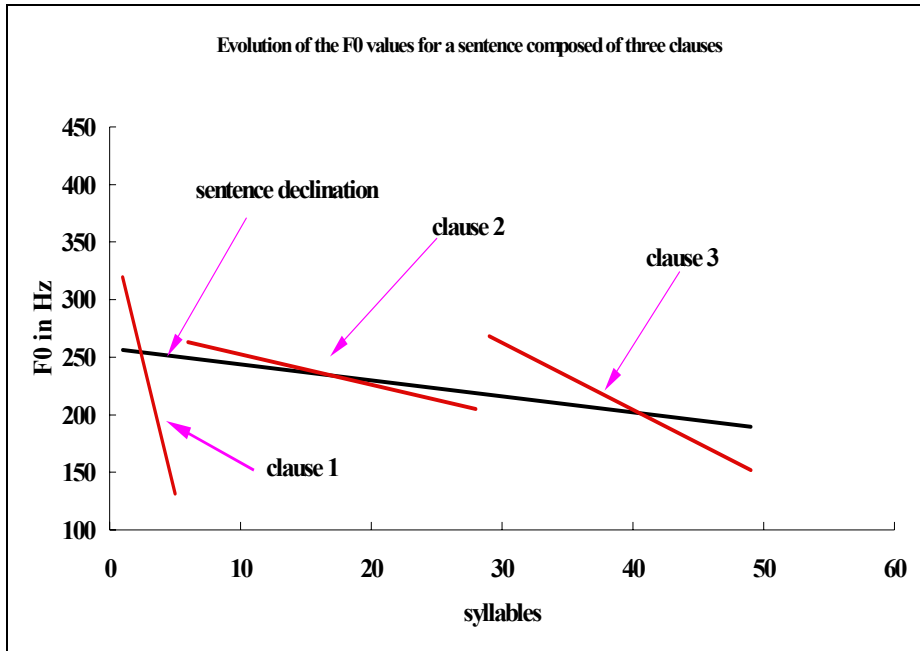


Figure 3 evolution of F0 values for a sentence composed of three clauses

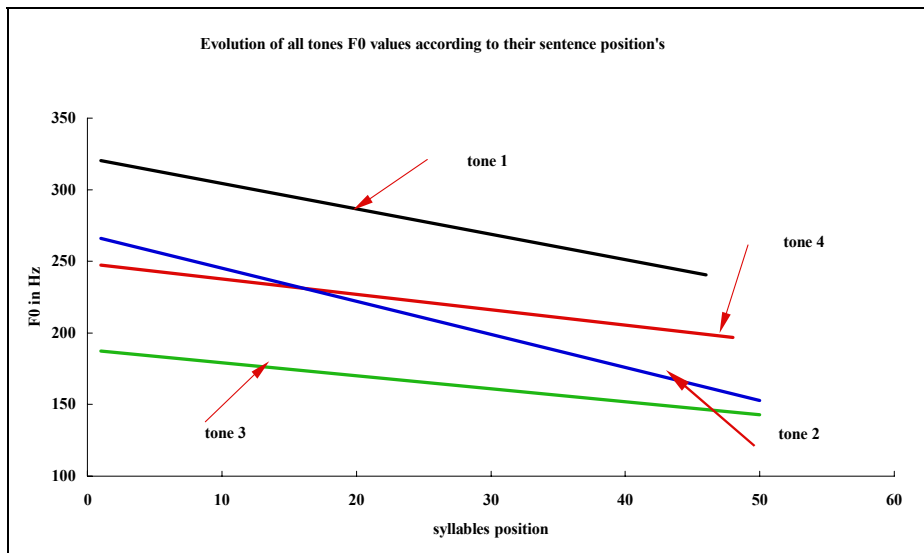


Figure 4 evolution of all tones F0 values according to their sentence position's

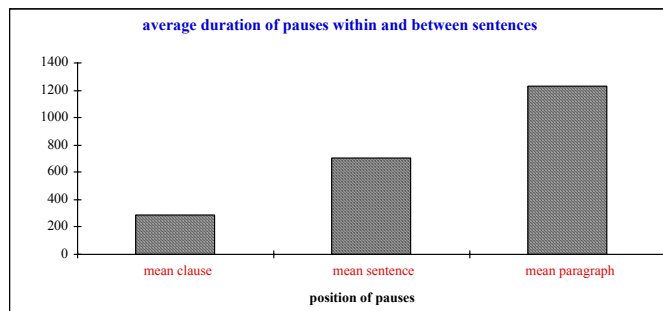


Figure 5 average duration of pauses within and between sentences