THE REPRESENTATION OF INTONATION IN MANDARIN CHINESE

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ABSTRACT

This paper proposes a three-dimensional model for the representation of intonation in Mandarin Chinese. In this model, I use two different types of features, which appear on different planes. Hierarchically-related tonal features [Upper] and [Raised] are used to represent tones. Pitch range features [Expanded Range] and [Raised Range] deliver the intonational meaning. [Expanded Range] is related to Focus; [Raised Range] has to do with expressiveness, such as questions. The paper discusses the representation of the neutral tone, focus, and questions within the framework of this model.

1. INTRODUCTION

Mandarin Chinese is a tone language with four lexical tones. These distinguish lexical meaning and are specified in the lexicon,as shown in (1):

(1)

Tone	Pitch Value	Ex.	Gloss
1	HH	ma^1	mother
2	MH	ma^2	hemp
3	LLH'	ma^3	horse
4	HL	ma^4	scold

Since lexical tone and intonation are both characterized by pitch, their relationship has been a constant issue in the analysis of Chinese intonation. In this paper I use two different types of features in a three-dimensional model (Halle & Vergnaud 1987) to represent tone and intonation.

2. THE MODEL

I follow Yip(1989) in assuming two coplanlar features on the tonal plane: the register feature [Upper] and the sub-register feature [Raised], which are hierarchically-related, as in (2):

(2)

+Upper	+Raised	H
	-Raised	H'
-Upper	+Raised	M
	-Raised	L

I differ from Yip in taking the mora as the tone-bearing unit as well as a timing unit,as shown in (3)

(3)

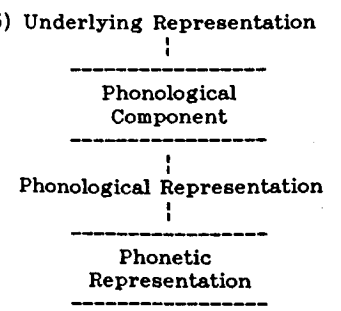
I follow the application of underspecification theory by Pulleyblank (1986) in assuming that the universal default values for the two tonal features are [-U] and [+R]. So these two features are not specifeid in the lexicon.Thus the underlying representation of the four tones are Tone 1: [+U], [+U]; Tone 2:[-R], [+U]; Tone 3: [-R], [-R]; Tone 4: [+U], [-R].

The above four tones occur only with stressed syllables. Unstressed syllables do not bear any of the four tones, but are said to have a neutral tone.In underlying representation, the neutral tone is represented as having one mora and no tonal features, as shown in (4):

(4)

In this model I recognize a phonological component and a phonetic component on the tonal plane. The phonological component consists of a set of phonological rules which bring about a change in tonal category. These are the Tone Sandhi Rule (which change Tone 3 to Tone 2 when it occurs before another Tone 3) and the Tone Deletion Rule (which changes the tone of unstressed syllables to neutral tones). The input to the phonological tonal component is the sequence of underlying tones with stress assigned. Stress is represent on another plane (stress plane) by metrical grids. The output of the phonological component is the phonological tonal representation, which is the input to the phonetic component. This component contains a set of allophonic rules deriving the phonetic tonal representation. This is shown in (5):

(5)



The phonetic tonal representation constitutes the basic pattern upon which pitch range features (which deliver intonational meaning) interact. Pitch range features include [Expanded Range] and [Raised Range], which are on a separate plane, and linked to the relevant syllable by association lines. They expand or raise the pitch range of the tone linked with that syllable via the mora.

3. Neutral Tones

The above model can adequately resolve the issue of the representation of the neutral tone, which has been largely ignored or over-simplified in previous literature.

Traditioanlly, the pitch value of the neutral tone is said to be solely determined by the tone of the preceding syllable: it is H' when it is preceded by Tone 3, M when preceded by Tone 2 and L when preceded by Tone 1. But this has not taken into account the full range of positions that the neutral tone may be in. First, it does not take into account the distinction between the prepausal and non-prepausal positions of the neutral tone. Secondly, it does not take into account the fact that neutral tones can occur consecutively in a sequence. And lastly, neutral tones can sometimes appear in initial position.

Taking the above facts into consideration, we get the following data:

(6)

a. Neutral tone in prepausal position

Preceding Tone	Neutral Tones 1	2	3
Tone 1	L	ML	MLL
Tone 2	L	ML	MLL
Tone 3	H'	H'L	H'ML
Tone 4	L	LL	LLL

b. Neutral tone in non-prepausal position

Preceding Tone	Neutral Tones 1	2	3
Tone 1	M	MM	MMM
Tone 2	M	MM	MMM
Tone 3	H'	H'M	H'MM
Tone 4	M	MM	MMM

c. Neutral tones in initial position bear the pitch value M

All these values for the neutral tone can be obtained in the phonetic component through the interaction of the default rules (which supply the universal default values mentioned above) with the language-specific rules in the component. I will not go into detail here for lack of space. Interested readers are referred to Wang (forthcoming).

4. Focus

Intonational meaning is usually divided into two parts: the expressiveness part and the informational part. In the informational aspect, the distinction between new and given information is related to that property called Focus. Roughly speaking, what is focussed in a sentence is new information, what is not focussed is given information.Focus is not related to syntactic structure and is not represented by metrical grids (or trees) on the stress plane. Following Selkirk (1984), we represent it by means of the (F)ocus-label device in the focus structure. Consider the sentence in (7): (As we are concerned here only with the presence or absence of stress and not with its varying degrees, we represent stress with an asterisk over the stressed syllable).

(7)

```
                F
*       *       *   *
qing3  ni3  gei3  wo3  mai3  liang3
please you  for   me   buy   two

        *
ba3     san3
measure umbrella
word
```

(Please buy two umbrellas for me.)

Now with this sentence we will consider what consequences focus has on stress and tone in Mandarin Chinese and how we represent them in our model.

1. A focussed syllable always receives stress. For instance, in the sentence in (7), wo does not have stress on the stress plane, but since it bears focus, so it is stressed. We can represent this by a focus rule, stated as in (8):

(8) Focus Rule
A syllable which has the F-label is stressed.

2. Focus destresses all the syllables following the focussed syllable. The syllables preceding it are not destressed. Thus in (7), the stressed syllables mai (buy), liang (two) and san (umbrella) are destressed, because they follow the focussed syllable wo.This can be captured by a focal destressing rule, stated as in (9):

(9) Focal Destressing Rule
All syllables following the F-labelled syllable are destressed.

The above two rules apply to the stress pattern of the sentence before it is inputted into the phonological component. Thus the same sentence with F on different syllables will result in different stress patterns and consequently derive different phonological tonal representations.Take again the sentence in (7). Applying the Tone Sandhi Rule and Tone Deletion Rule to it, we get the derivation in (10).

(10)

```
          F
*       *   *
qing ni gei wo mai liang ba san
  3   3 3  3 3   3     3 3
TSR 2 3 2  2 3   2     2 3
TDR 2 0 2  0 3   2     0 0
```

However, if the focus is on liang, we would get a different stress pattern and a different phonological tonal representation, as shown

in the derivation in (11).

(11)

```
              F
*     *     *   *
qing ni gei wo mai liang ba san
  3   3 3  3 3   3     3 3
TSR 2 3 2  2 3   2     2 3
TDR 2 0 2  0 3   2     0 0
```

3. When the focussed syllable is Tone 1, Tone 2 or Tone 4, the pitch range is expanded in that H becomes extra high.This can be taken account of by positing an [Expanded Range] feature on a separate plane, the pitch range plane.Focussed syllables in the phonetic tonal representation are linked to that feature([+ER]) by an association line.

4. When the focussed syllable is Tone 3, if it is in prepausal position, L becomes still lower and the final H' rises higher. If it is in non-prepausal position and is followed by neutral tones, then the L becomes lower as in the above case, but the H' of the following neutral tone gets higher. In the latter case, [+ER] spreads to the syllable to the right, which has the feature [+U], as in (12).

(12)

```
        [+ER]
         ¦  \
      syll syll
         ¦   ¦
      [-U][+U]
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From the above we can see that Focus plays a twofold role. It determines the stress pattern of a sentence together with the metrical structure on the stress plane before the application of the phonological rules and it also is related to the [+ER]feature,which interacts with the phonetic representation.

5. THE INTONATION OF QUESTIONS

Concerning the intonation of questions, there is general consensus that the tones and pitch contours of all the syllables except the last one are the same as in statements (Ho 1977, Wu 1982). There is difference in opinion,however, about the pitch contour of the last syllable: whether it makes a rise thus changing the pitch contour or whether it retains its pitch contour with only a rise in the pitch range.Ma(1988) found in his acoustic studies that there is a raising in the pitch range for questions rather than a change in the pitch contour of the last syllable. Ma also observed that the question xia yu le?(Is it raining?) has been mistaken for a statement. I have on more that one occasion found that isolated yes-no questions without the question marker ma has been mistaken by listeners for statements. This can serve as evidence that questions have basically the same pitch contours as statements. The difference effected by the raised pitch range can not be discerned when the question is asked alone with no previous utterance to serve as a reference point. Thus we can represent the intonation of questions by linking a [+Raised Range] feature, which is on the pitch range plane, to the last stressed syllable of the question.

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