DYIRBAL INTONATION

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ABSTRACT - Declarative intonation phrases in Dyirbal are analysed using Pierrehumbert's model in order to ascertain the constructs required to account for the Fo contours. Results thus far obtained are presented .

INTRODUCTION

Intonation in Australian Aboriginal languages has, to date, received scant attention. This paper, which presents a quantified analysis of Dyirbal declarative intonation phrases, goes some way towards redressing the imbalance.

Dyirbal is a language of the Innisfail area of North Queensland, a grammar of which was published in 1972 by R.M.W. Dixon. The five texts used for this analysis were recorded by Dixon in the 1960s. These consist of three narratives and two conversations of natural speech by five speakers (one female and four male). Spectrographically derived measurements have been obtained from 240 intonation phrases extracted from the five texts. 94 of these intonation phrases have been used for this analysis.

METHOD

The model being applied to the data was developed by J. Pierrehumbert to give a phonological and phonetic description of English intonation (Pierrehumbert, 1987). This model posits just two tones, a high and a low, and an intonation phrase that is made up of one or more pitch accents followed by a phrase accent and a boundary tone. The pitch accent can either be a single tone, as in figure 1, or a pair of tones as in figure 5. The starred tone represents the centre of the accent and the secondary tone (marked -) denotes the 'leading' or 'trailing' tone. The bitonal form of the pitch accent is responsible for describing the local behaviour of the Fo around the stressed syllable. Pierrehumbert refers to the pitch accents as Fo targets which are crucial points in the contour that can be lined up with crucial points in the text. The overall shape of the intonation phrase is determined indirectly by the rules for implementing the pitch accents; i.e. the phrase contour is only a "... by-product of the application of the local tonal implementation rules" (Pierrehumbert, 1987:78).

The shape of the Fo contour following the pitch accents is determined by the phrase accent and the boundary tone. The phrase accent (H- or L-) controls the Fo from its position following the final pitch accent to the onset of the phrase-final boundary tone. The boundary tone (H% or L%) occurs right at the phrase boundary regardless of the behaviour of the Fo immediately preceding or following it. It can, in some cases, also occur phrase initially.

Pierrehumbert appears to rely totally on Fo contours for her analysis without taking into account the auditory impression (i.e pitch). In this analysis, however, I have utilised auditory observations to ascertain the speaker's intended targets for the tones in conjunction with the spectrographic measurements for the Fo contours. As well, Pierrehumbert makes no attempt to define the pragmatic, semantic and syntactic determiners on intonation and that is the approach I have taken here.

RESULTS AND DISCUSSION

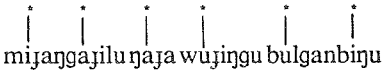
The results show clearly that there is an unmarked contour which occurs in 23% of declarative intonation phrases. In this contour, illustrated in figure 1, the Fo rises to a peak from an initial low boundary tone, declines steadily until the point where it begins to rise for the second pitch accent before declining again to a low final boundary tone. The rules for deriving this contour are predominantly phonological and phonetic; however the marked declarative intonation phrases, which adopt many different contours, are largely determined by pragmatic and other non-phonological rules. The following is a discussion of each component of the intonation contours and an attempt to construct rules which will derive these contours.

1. Pitch accents

A Dyirbal intonation phrase contains at least one and no more than three pitch accents. These can be either a high tone (H*) or a low leading tone followed by a high tone (L- +H*). The L-+H* occurs in only 5% of the intonation phrases but has been analysed as a separate tone due to its contrasting with H* in the same environment. Examples of L-+H* are shown in figures 4 and 5. Pragmatic rules determine which of these two tones will occur on a pitch accent. These rules also control the number of pitch accents and the relative height of peaks in an intonation phrase. The location of the pitch accents, however, is controlled by the following rules:

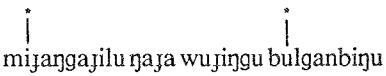
(a) The underlying form of the declarative intonation phrase has stress on the first syllable and every second syllable of a word except the final syllable.

(eg.)



(b) To derive the unmarked surface form delete all stress except on the first syllable of the phrase-initial word and the first syllable of the phrase-final word.

(eg.)



(fig. 1)

(c) The location of the pitch accents in the marked surface form is determined by pragmatic rules. (This is illustrated in figures 3 and 4 where the pitch accents are located according to the emphatic function.)

While the rules above determine on which syllable the pitch accent will fall, the location of the actual Fo peak within that syllable appears to be phonetically controlled. 67% of the pitch accents in the data have the peak occurring between the 30% and the 70% mark of the vowel duration within the syllable. 21% of the pitch accents have the peak outside that range due to Fo perturbations caused by the segmentals. The remaining 12% of the pitch accents have an Fo rise greater than 1% of the speaker's pitch range per centisecond on the accented syllable with the peak occurring after the offset of the accented vowel. These results suggest that the target for the pitch accent peak is around 50% into the duration of the vowel of the accented syllable, however, phonetic influences can precipitate or delay the timing of the peak. It would appear that the speakers overshoot the peak target when there is a sharp rise in the Fo of the accented syllable while the rises and dips in the Fo due to segmental articulation can cause the peak to occur on the adjacent consonant or even on the following syllable.

2. Phrase-initial boundary tone

If pragmatic rules apply:
(a) then the tone is H%; where H% has an Fo decline> 5% of the speaker's pitch range over the duration of the phrase-initial syllable

Otherwise:
(b) the tone is unmarked

The high initial boundary tone (H%), which is illustrated in figure 2, occurs on those intonation phrases where the Fo declines at a rate equal to or greater than the speaker's pitch range between the intercept and the offset of the first syllable of the intonation phrase. The phrase-initial H% is not common, occurring in only 6% of the intonation phrases. The remaining phrases have a non-high boundary tone which is regarded as the unmarked case illustrated in figure 1.

3. Between the initial boundary tone and the first pitch accent

If the initial boundary tone is H% :

(a) then the Fo is determined by pragmatic rules

Figure 1.

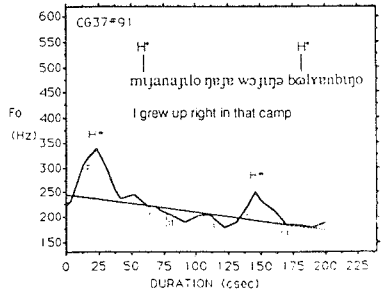


Figure 2.

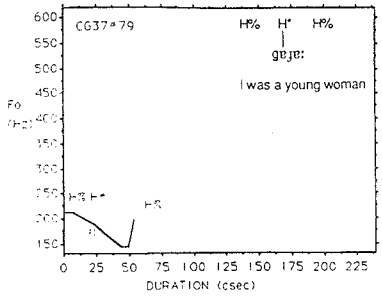


Figure 3.

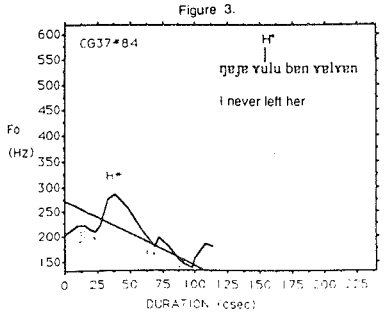


Figure 4.

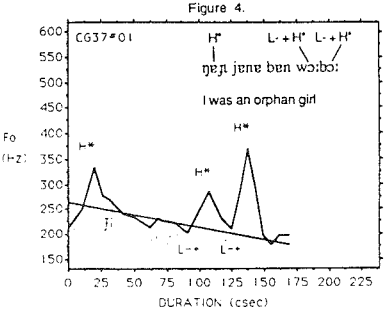


Figure 5.

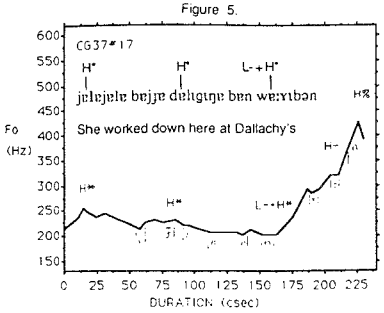
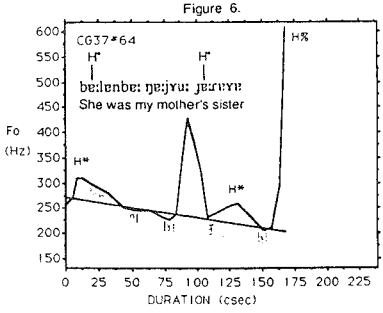


Figure 6.



If the initial boundary tone is not H% :

(b) and the first pitch accent is targeted for the first syllable of the phrase, then there is a direct rise in the Fo from the boundary tone to the pitch accent peak.

(c) and rule (b) does not apply; then the Fo remains at a value lower than that of the first accent peak until it is time to start the rise to that peak.

An example of (a) is shown in figure 2; (b) in figure 1; and (c) is shown in figure 3.

4. Interpolation between pitch accents

If pragmatic rules do not apply:

then the Fo declines n Hz / csec between the offset of the pitch accent and the onset of the next pitch accent; where $0.95 < n < 2.8$

The decline in Fo between pitch accents is shown in figure 1, however in figure 6 there is a rise and fall in the Fo between the pitch accents due to pragmatic considerations (the second pitch accent is audibly locatable on the first syllable of the final word).

5. Between the final pitch accent and the final boundary tone

If pragmatic rules apply:
(a) then there is a rightward spread of H- from the offset of the pitch accent to the boundary tone

Otherwise:
(b) the Fo $\leqslant$ the value of the offset of the pitch accent

Figure 5 illustrates a case where the high phrase accent (H-) has caused the Fo to continue to rise after the offset of the final pitch accent due to pragmatic rules. The Fo in figure 1 continues at a value equal to or lower than the value of the offset of the final pitch accent.

6. The final boundary tone

If pragmatic rules apply:
(a) then the tone is H%; where H% is $\geqslant$ 26% of the speaker's pitch range

Otherwise:
(b) the tone is unmarked

The final boundary is high (H%) only where this has been determined by pragmatic rules. High boundary tones comprise 29% of the data and are illustrated in figures 5 and 6.

CONCLUSIONS

The analysis shows that Dyirbal requires less constructs than English to account for intonation contours. The non-high boundary tone and the non-high phrase accent are the unmarked case so Pierrehumbert's L% and L- for English are redundant.in Dyirbal. There is also no evidence for a low pitch accent (L*) as there is in English. Pierrehumbert's list of tones can therefore be reduced to the following when accounting for Fo contours in Dyirbal declarative intonation phrases:

H%	high boundary tone for both phrase-initial and phrase-final positions.
H*	high pitch accent
L-+H*	high pitch accent with low leading tone
H-	high phrase accent

Comparison with other types of intonation phrases in Dyirbal will be possible when further data has been examined.

NOTES

(1) Declination lines have been fitted to four of the diagrams to illustrate the overall declination of the contours.

(2) I would like to thank Prof. Bob Dixon for making his Dyirbal recordings available to me and Dr. Phil Rose, my supervisor. My gratitude also goes to Nick Holywell and Philip Holywell for their help with the computer program and to Simon and Emily Holywell for their valued assistance.

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Pierrehumbert, J.B. (1987) The Phonology and Phonetics of English Intonation, (I.U.L.C.: Bloomington, Indiana)

THE PHONETICS OF REGISTER IN THE FUZHOU DIALECT OF CHINESE

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ABSTRACT - Investigations are made into the phonetic reality of the phonological feature Register, originally defined by Yip as a bifurcation of the pitch range (1990:196). This is discussed in terms of her analysis of Fuzhou tonology, which uses Register to capture the natural class of tones as defined by their participation in vowel alternations. Mean normalised fundamental frequency contours are presented for the citation tones. The degree of abstractness involved in this analysis is assessed in terms of the original definition of Register. Finally, alternative definitions for Register are explored on the basis of the instrumental data.

INTRODUCTION

The relationship between phonetics and phonology has never been straightforward, as phonology describes the relationships between the sounds of a language, and phonetics serves to describe them on the various levels of the speech chain. The extent to which phonological analyses reflect phonetic reality is indeed up to the individual, with varying degrees of abstractness being tolerated by the different phonological theories. Instrumental phonetic data is indispensable, however, for evaluating competing analyses, and its unambiguous nature is ideal input for definitions. It is my aim to explore the possibility of using such data to define the 'Register' feature.

REGISTER

The feature Register was first proposed by Yip (1980), in an extensive study on Chinese tonology, in order to accommodate the contour tones of Chinese dialects within the autosegmental framework which was originally proposed to account the tones found in African languages. From a universal point of view, Register is a desirable feature for a tonological theory as it enables four pitch levels to be specified and restricts the maximum number of any one contour, with only two features, which is less marked than systems employing more features to meet the above criteria (Hyman 1985).

Yip claims that tone is represented by two features bearing a hierarchical relation: [upper], which is dominant, splitting the pitch range into two registers, and [high] (now called [raised]), which is subservient, and further sub-divides each Register. So a 'tone' while realised phonetically as pitch, is phonologically represented by two features: Register ([±upper]) and Tone or melody ([±high] which is written as H and L). Register and Tone interact to define four pitch levels:

Register	Tone	
+ upper	+ high	(H)
	- high	(L)
- upper	+ high	(H)
	- high	(L)

Figure 1. Interaction of Register and Tone

Each of the two features forms a separate autosegmental tier, and is therefore subject to the Well-Formedness Condition. However only Tone occurs in sequences underlyingly, Register remains constant over the whole morpheme. As the Register feature is both dominant and binary, the tonal inventory is restricted to no more than two of any given contour.

FUZHOU

Fuzhou is one of the Min dialects, which are found in Southeast China, most of Fujian province and the North-eastern corner of Guangdong.

A reasonable amount of descriptive work has been done on Fuzhou. Chan (1985) produced a list of all the relevant sources and the corresponding values assigned to the seven citation tones. All of these