

ON THE INTERACTION OF ACCENTUATION AND INTONATION IN DUTCH

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Introduction

The general aim of this symposium is to track down universal features concerning the relation between word prosody and sentence prosody, with the exclusion of durational phenomena. We will present our viewpoints about the relation at issue in as far as we have been confronted with it in our experiences with Dutch intonation and accentuation.

Dutch intonation lacks the occurrence of "tonemes". Therefore, on the level of the word, we can limit our discussion to phenomena of "lexical accentuation"; on the level of the sentence we have to discuss "sentence accents" and "intonation". On the latter level particular problems may arise as regards the interaction of accentuation and intonation. In fact, sentence accents manifest themselves as "pitch accents" on words or syllables, whereas intonation patterns are realized as "pitch contours" extending over entire utterances. In other words, two aspects of sentence prosody are interwoven in the same phonetic variable, viz. the variation of F_0 (or pitch) as a function of time.

In the literature, the problem of the interaction between accentuation and intonation is coped with in a number of ways, most of which share the assumption that the overall pitch contour can be considered simply as the sum, or the linear addition, of the variations of F_0 associated with accentuation and those associated with intonation. We will confront this assumption with a number of phenomena as observed in Dutch.

Word prosody

In Dutch, each word is said to possess a lexical accent. In polysyllabic words the location of this accent is not fixed but, in principle, it can be predicted by rule.

Lexical accents may be considered as abstract features on the level of word phonology. A subsequent and separate problem is to specify when and how these lexical accents manifest themselves phonetically.

If we take, for example, the word Amerika (America), we find a lexical accent on the second syllable. When this word is spoken in isolation, as a one-word utterance, a listener will hear the

second syllable as prominent. Acoustic measurement of the utterance will reveal substantial changes of F_0 (hereafter referred to as "pitch movements") on the second syllable: a rise, a fall, or a combination of the two. These pitch movements may be considered a phonetic correlate of the lexical accent, since it can be shown experimentally that their deletion or displacement causes prominence judgments to change accordingly. That pitch movements are efficient cues for prominence is not surprising if one realizes that, psycho-acoustically speaking, only a few percent change of F_0 is sufficient to be supraliminal, whereas in actual speech F_0 changes are observed that are eight to ten times as large as these threshold values.

At this point we may conclude that lexical accents in one-word utterances are realized (among other things) by means of pitch movements: rises, falls, or combinations of both, apparently without a particular preference for any of these various possibilities.

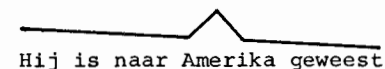
Since a one-word utterance is an utterance all the same, we may as well extend the discussion to longer utterances with one or more accents.

Sentence prosody

In the introduction we have already mentioned that on the level of the sentence, pitch changes correlate with both accentuation and intonation. On the linguistic level these categories are easily kept apart, but on the phonetic level the distinction may become blurred to the extent that the observable pitch changes can be associated with either of the two categories (or with both). One would therefore like to sort out how accentuation and intonation interact in shaping up the ultimately observable course of the pitch in concrete utterances.

Let us illustrate this problem with the following example. The Dutch sentence Hij is naar Amerika geweest (He has been to America) may be pronounced with one accent, viz. on the syllable -me- of Amerika. Again, F_0 measurements will show pitch movements on that syllable, e.g. a rise-fall combination. Of course, a sufficiently refined F_0 measurement will also reveal changes on other syllables than the accented one, but experiments with artificial, stylized pitch contours show that such changes are not

relevant to the perception of either accentuation or intonation. In the example below, the stylized rise-fall may be preceded and followed by a gradual downward running movement of pitch (the so-called "declination"). This is sufficient to make the contour prosodically well-formed.



The essential shape of the pitch contour of this example corroborates our prior suggestion that, phonetically, no distinction can (nor has to be) made between the realization of a lexical accent in a one-word utterance and the realization of a single accent in a longer utterance: both may manifest themselves in the form of the same pitch movement(s). In both cases the pitch movements are the phonetic correlate of the accent inasmuch as their deletion or displacement has consequences for the perception of prominence.

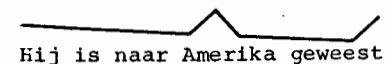
Primacy of accentuation

Let us now consider one possible explicit formulation of the principle that the overall pitch contour is obtained by a linear addition of the accentual and intonational requirements. The principle would then be phrased as follows:

P1 Those pitch movements that co-occur with prominent syllables are entirely and exclusively related to accentuation, the remaining pitch movements of the contour are associated with intonation.

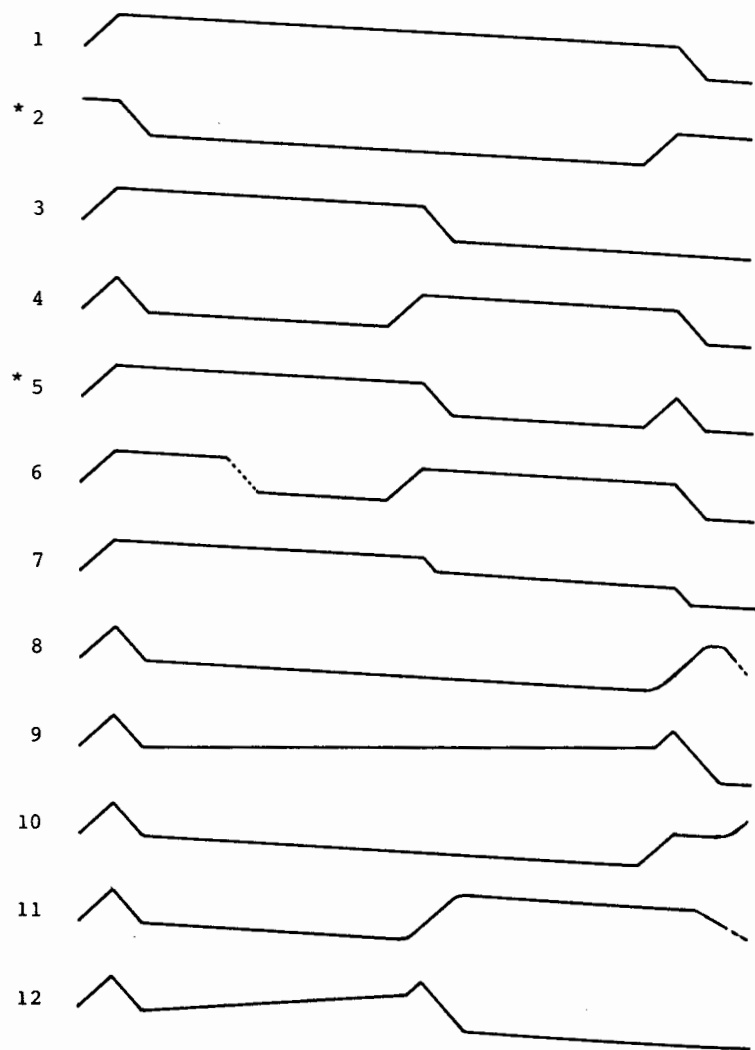
How would P1 account for the pitch contour of Hij is naar Amerika geweest? P1 might relate either the rise or the fall to accentuation and the other pitch movement (plus the declination) to intonation; or P1 would assign the rise-fall combination to accentuation, in which case there would be no particular intonation (except for the declination).

The sentence Hij is naar Amerika geweest may also be pronounced as follows:



In this instance, P1 would assign the final rise to intonation,

Variant:



Grootmoeder gaat met de kinderen naar het zwembad

Fig. 1. Stylised representation of twelve different pitch contours for a given specimen sentence. Variants 2 and 5 are not acceptable.

since it does not lead to an additional accent.

Let us now turn to another, more complicated Dutch specimen sentence, with variants of accentuation and intonation. These variants are listed in Figure 1. They all refer to possible ways of intoning the sentence Grootmoeder gaat met de kinderen naar het zwembad (Grandmother goes with the children to the swimming-pool).

In variant 1 the syllables groot- and zwem- are to be accented. This can be brought about by having the pitch go up on the syllable groot- and down on the syllable zwem-.

Since, apparently, it is possible to produce accent by a mere rise or fall, we might examine the case of variant 2, with a fall on the syllable groot- and a rise on the syllable zwem-. Such a contour can easily be constructed and made audible by means of a speech synthesizer or an Intonator. It appears that the contour of variant 2 sounds unacceptable to Dutch ears. This means that the choice of the kind of pitch movement that has to take care of accentuation is not free.

P1, then, is unsatisfactory since it does not account for the choice of the accent lending pitch movements. There is nothing in the nature of the accents themselves that would predict this choice. So, our suggestion is that the choice of the kind of accent-lending pitch movements is subordinate to the kind of intonation pattern that is to be realized.

An alternative: primacy to intonation

This suggestion of subordination is not reflected in the formulation of P1. On the contrary, P1 assumes a primacy in favour of the pitch movements needed for accentuation. A logical alternative would take the primacy of intonation as a starting-point. Basing ourselves on this primacy, we will first formulate an alternative principle, P2, and then try to present empirical support for it.

- P2
- (a) The nature and the order of all the pitch movements in an utterance are determined by the intonation pattern.
 - (b) Among the pitch movements of any intonation pattern there is at least one which possesses such phonetic properties as are necessary for bringing about a pitch accent.
 - (c) The location of the accent-lending pitch movement(s) is

determined by the position of the words that carry sentence stress, and more specifically, by the position of the lexically accented syllable in each of these words.

This formulation does not allow any movement to be entirely and exclusively related to accentuation. Therefore, the addition principle is abandoned.

Returning to variant 1, we would, on the basis of P2, interpret its pitch contour as follows: the intonation pattern which is realized consists essentially of an accent-lending rise and an accent-lending fall, in that order; their locations are in accordance with the accentual demands.

We will now check whether such an account would also be applicable to other accentual and (or) intonational variants.

P2 would predict that if the accentuation requirements change, the only change(s) will be in the location of the accent-lending pitch movements. Suppose, for instance, that the same intonation pattern as in variant 1 is used, but that instead of the syllable zwem-, the syllable kin- has to be accented. P2 will predict a rise and a fall in that order, the rise on groot- and the fall on kin-. This gives rise to variant 3, which is indeed a possible, and well-formed contour.

A special case is provided in sentences with only one accent. If still the same intonation pattern is to be used, then the rise and the fall must necessarily coincide on the one accented syllable. This accounts for the example Hij is naar Amerika geweest.

Yet another illustration of the same intonation pattern with different accentuation is shown in variant 4, where three accents are at stake. In such a case, the introduction of one additional accent-lending pitch movement would in principle be sufficient. However, since the essential property of the intonation pattern being used is "a rise followed by a fall", there is no other possibility than a repetition of these two movements. These may be combined on one of the accented syllables, but not just on any of them. Indeed, an intonational requirement in Dutch is that the separated rise and fall should only occur on the penultimate and the last accented syllable, respectively. This requirement is violated in variant 5, which is therefore unacceptable.

The rise and fall that were introduced in variant 4 to account

for the additional accent need not coincide on the same syllable. The accentuation requirement can also be met by means of a mere rise on the syllable groot-. The fall may then occur somewhat later, as in variant 6. In such a case it coincides with a word boundary (and more specifically with a major syntactic boundary). The fall at the word boundary cannot give rise to an additional pitch accent, due to its particular location, but it may serve another purpose, viz. the marking of a syntactic boundary.

All this goes to say that the intonational requirements are met in such a flexible way that the accentual (and sometimes also syntactic) demands are satisfied at the same time. P2 accounts for this flexibility.

We have shown before that P1 cannot account for the unacceptability of variant 2. P1 would be capable of accounting for the structure of variants 3, 4, 5 and 6. But it cannot explain why variant 5 is unacceptable, nor why variants 4 and 6 are melodically dissimilar, while remaining accentually identical.

If P1 is unsatisfactory to a limited extent in the case of a number of accentual variations in contours based on one intonation pattern, its complete failure becomes apparent whenever variations of the intonation pattern are at stake. This can be illustrated by means of variants 7 to 10, in which four different intonation patterns are used, again with accents on the syllables groot- en zwem- (and in variant 7 also on kin-). P2 accounts for the variants 7 to 10 by stating that when different intonation patterns are realized, some of their essential components fall into such places as is necessary to accommodate the pitch accents. P1, however, could never explain how the accent on e.g. the syllable zwem- is phonetically manifested in so many mutually exclusive ways. Again, if the location of one of the accents changes, the accent-lending pitch movement that figures among the indispensable components of the intonation pattern is shifted to a different position, as appears from the comparison of variant 11 to 8, and of 12 to 9.

Conclusion

The examples given show that pitch accents can have quite a number of different forms of appearance. If, according to P1, one would assume that the pitch movements associated with accentuation

are entirely autonomous and do not, in any respect, constitute a part of the essential components of the intonation pattern, this leads to the following difficulty: how will one predict for every single accent which type(s) of pitch movement should be used to realize it? The ability to make such predictions is a real necessity since the various kinds of pitch movement cannot follow one another in an arbitrary order in an utterance.

Therefore, the most satisfying way to account for the combinatory restrictions among pitch movements associated with accents is to assume that they are determined by the chosen intonation pattern. This is expressed by P2, in which, contrary to P1, accentuation is subordinate to intonation.

In our opinion, P2 also accounts for the interaction between pitch accents and intonation patterns in other "accent languages" without tonemes, such as English, German, and others.