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Bruce, Gösta; Gårding, Eva

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LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

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A PROSODIC TYPOLOGY FOR SWEDISH DIALECTS

Gösta Bruce and Eva Gårding

INTRODUCTION

A typology for dialectal manifestations of Swedish accents, based on Meyer's classical collection of disyllabics in statement intonation (Meyer 1937, 1954) was proposed by Gårding (1970, 1973 with Lindblad, 1975). Five categories were singled out depending on the number and the location of the pitch peaks. These accent types are as follows:

Type	Accent 2[1]	Region	Prototype
0	-	far east, far north	Helsinki
1A	One peak, early	south	Malmö
1B	One peak, late	central	Dalarna
2A	Two peaks, early	east, north[2]	Stockholm
2B	Two peaks, late	west	Göteborg

The geographical distribution of the accent types is shown in Figure 1.

In a prosodically more complex material, covering the four dialect types, 1A, 1B, 2A, 2B, it was shown how the pitch patterns for one-word utterances could be generated by a set of rules representing both word and sentence prosody (Gårding and Lindblad 1973). This model was modified and elaborated by Bruce (1975, 1977) who made systematic use of the notion of focus (sentence accent) in an analysis of Stockholm Swedish. According to Bruce's analysis the second peak of a double-peaked bisyllabic Accent 2 is the result of a rising sentence accent contour and a falling terminal contour for statements. Outside the domain of focus only the first peak is present. These results called for a reexamination of the accent typology.

The purpose of the present paper is to show how the accent typology can be reinterpreted as a prosodic typology, i.e. a typology combining word and sentence prosody. This reinterpretation is based on an analysis of new material consisting of phrases with two or three accented syllables, elicited from speakers representing the four dialect types 1A, 1B, 2A and 2B. The following variables have been controlled: word accent, sentence accent and sentence intonation (statement/question). (For elicitation and technical procedures, see Bruce 1977.) Examples of pitch contours from this material are presented in Figure 2. The analysis of the new data will be given in terms of an into-

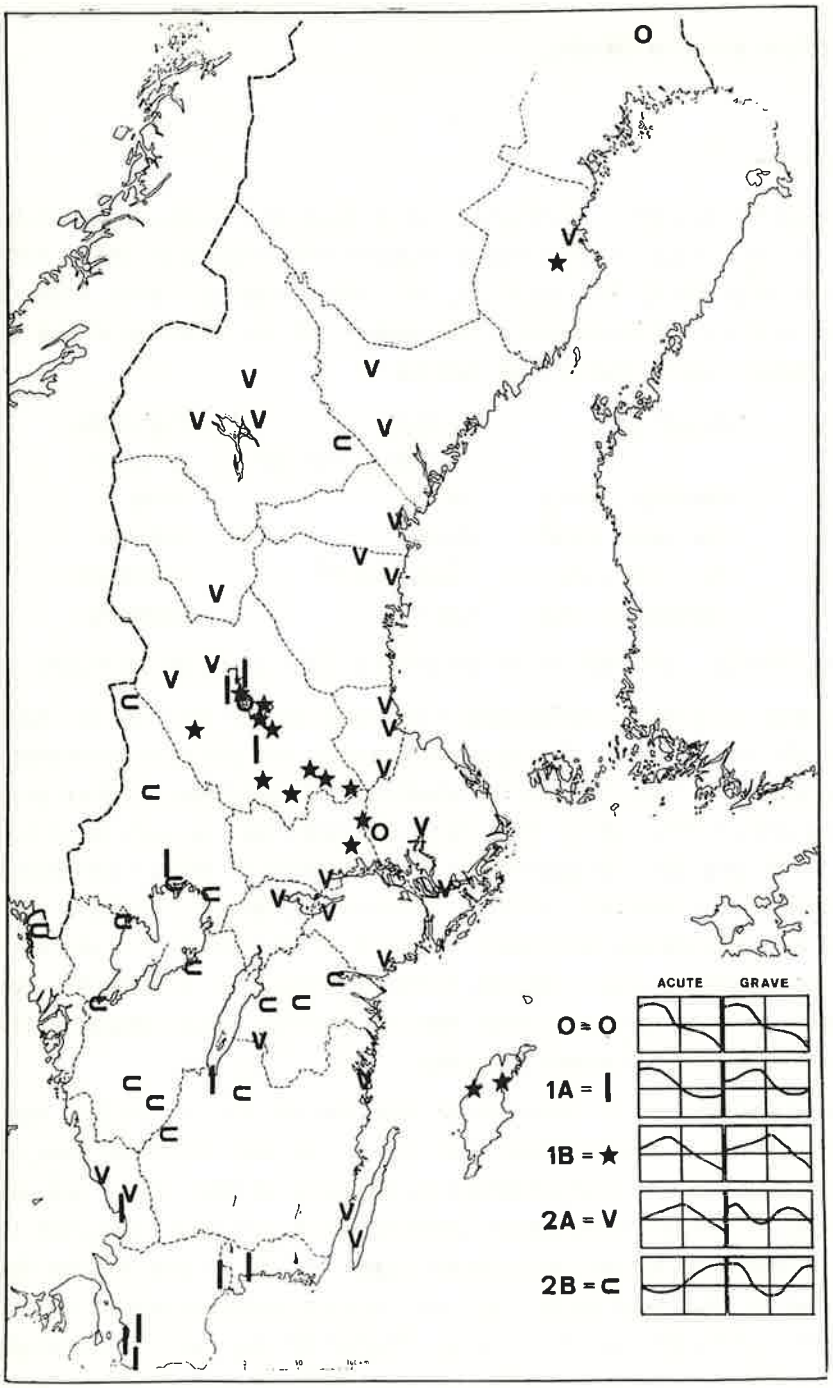

Figure 1. Geographical distribution of the accent types. From Gårding & Lindblad 1973.

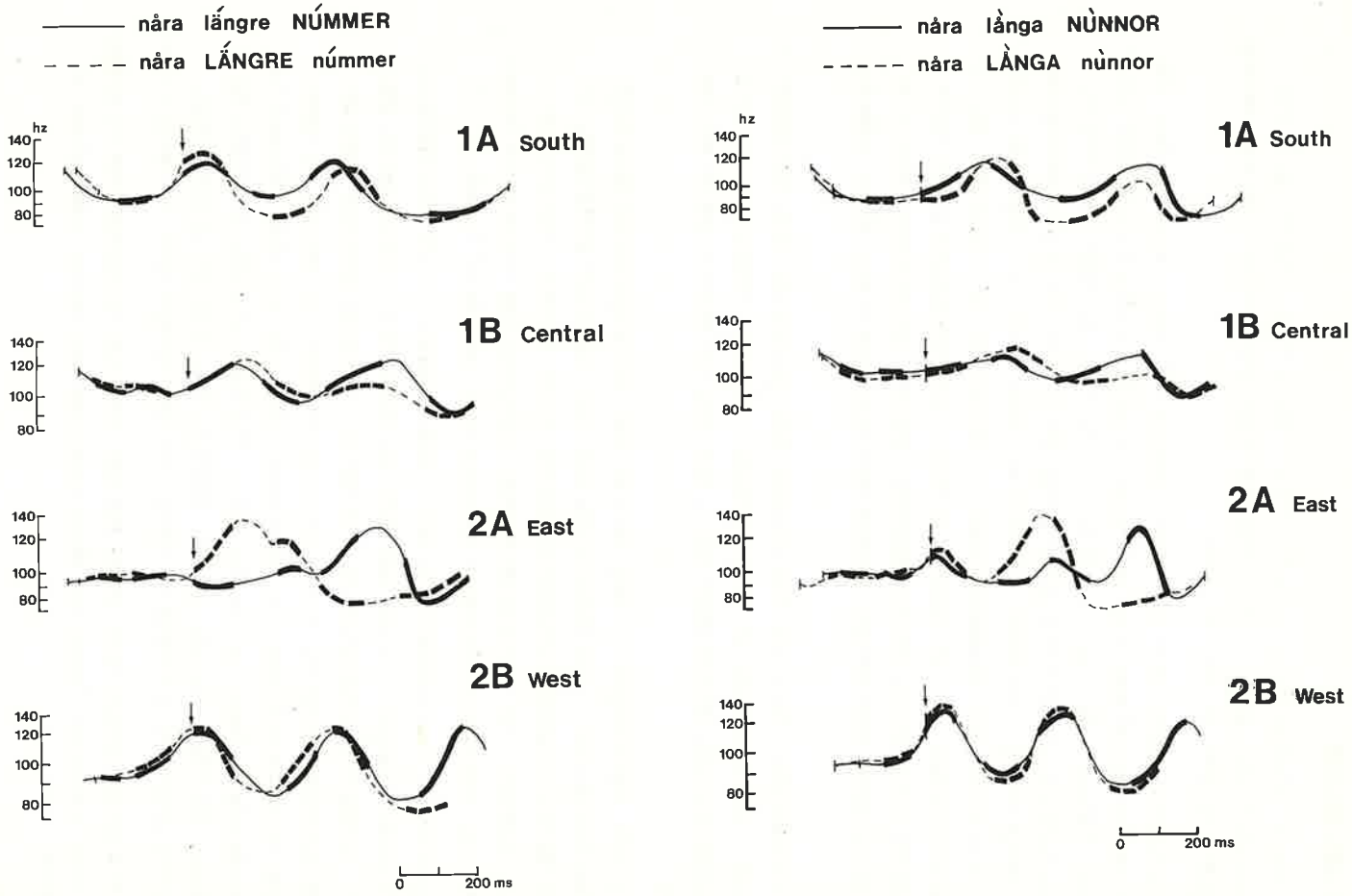

Figure 2. Statement contours from four prosodic dialect areas. For each pair of contours the sentence accent occurs in one of two positions. Contours to the left have Accents 1, those to the right have Accents 2. The arrow points to the CV-boundary of the first accented syllable.

nation model which combines features of models presented earlier (Gårding and Lindblad 1973, Bruce 1977, Gårding 1977a and 1977b). One novelty is the treatment of sentence intonation (see below).

ANALYSIS AND RESULTS

In addition to displaying our results in a summary form, Figures 3, 4 and the following Prescriptions illustrate the model used to describe and compare the prosodic systems of the dialects.

The input to this model is a string of segments and their relative durations with the following information: word accent, sentence accent, sentence intonation and dialect. The output is generated by a set of rules prescribing important turning points for a pitch curve and a rule for the interpolation between these points. The model consists of three parts, a linguistic part (Figure 3) with dialect-dependent representations for the linguistic variables, an algorithmic part (Figure 4) with dialect-independent pitch rules transforming the abstract representations into real pitch curves and, finally, a list of prescriptions and conventions which are also dialect independent.

Figure 3 shows that there are dialect-dependent representations for Accent 1 and Accent 2 and for Sentence Accent (Focus). Sentence Intonation, in this case statement, has, on the other hand, the same representation in all the dialects.

Common to all the dialects is that both accents are represented by a high and a low turning point but these Highs and Lows are timed differently in relation to the accented syllable depending on the dialect. For all the dialects, however, the High-Low of Accent 1 precedes the High-Low of Accent 2. Acctually, the High of Accent 2 cooccurs with the Low of Accent 1.

Sentence Accent is manifested by a wide pitch interval in all the dialects. But this wide interval is timed and obtained differently depending on the dialect. In the first two dialects, 1A and 1B, the wide interval cooccurs with the accented syllable, in the last two dialects, 2A and 2B, it comes after the accented syllable. In the southern dialects the wide interval is achieved mainly by lowering the low and in the central dialects mainly by heightening the high. For the eastern dialects the Sentence Accent comes immediately after the accented syllable, for the western ones it comes later.

Figure 4 with the pitch rules shows how the abstract representation is transformed into substance. There are three rules applied in the order given in the figure.

Swedish intonation model: Linguistic components

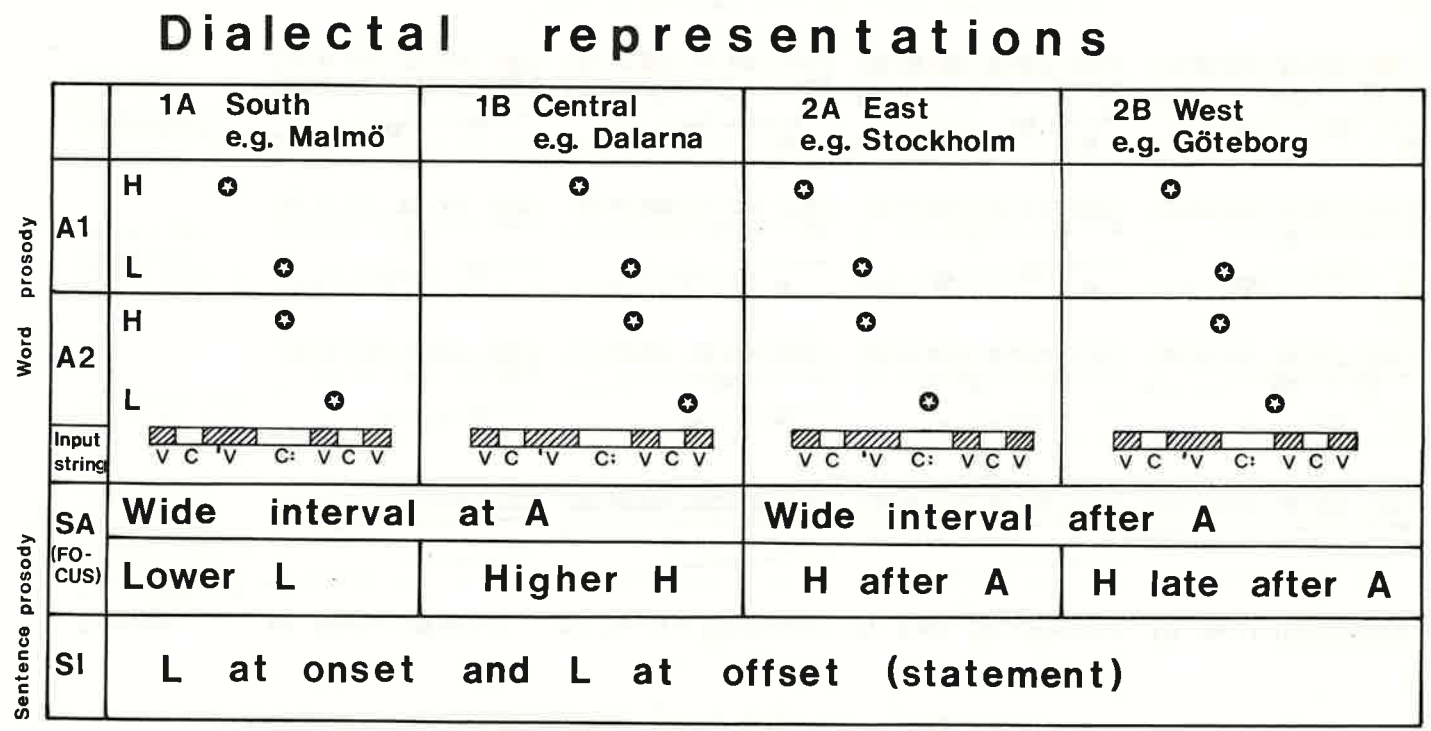

Figure 3. The linguistic part of the model.

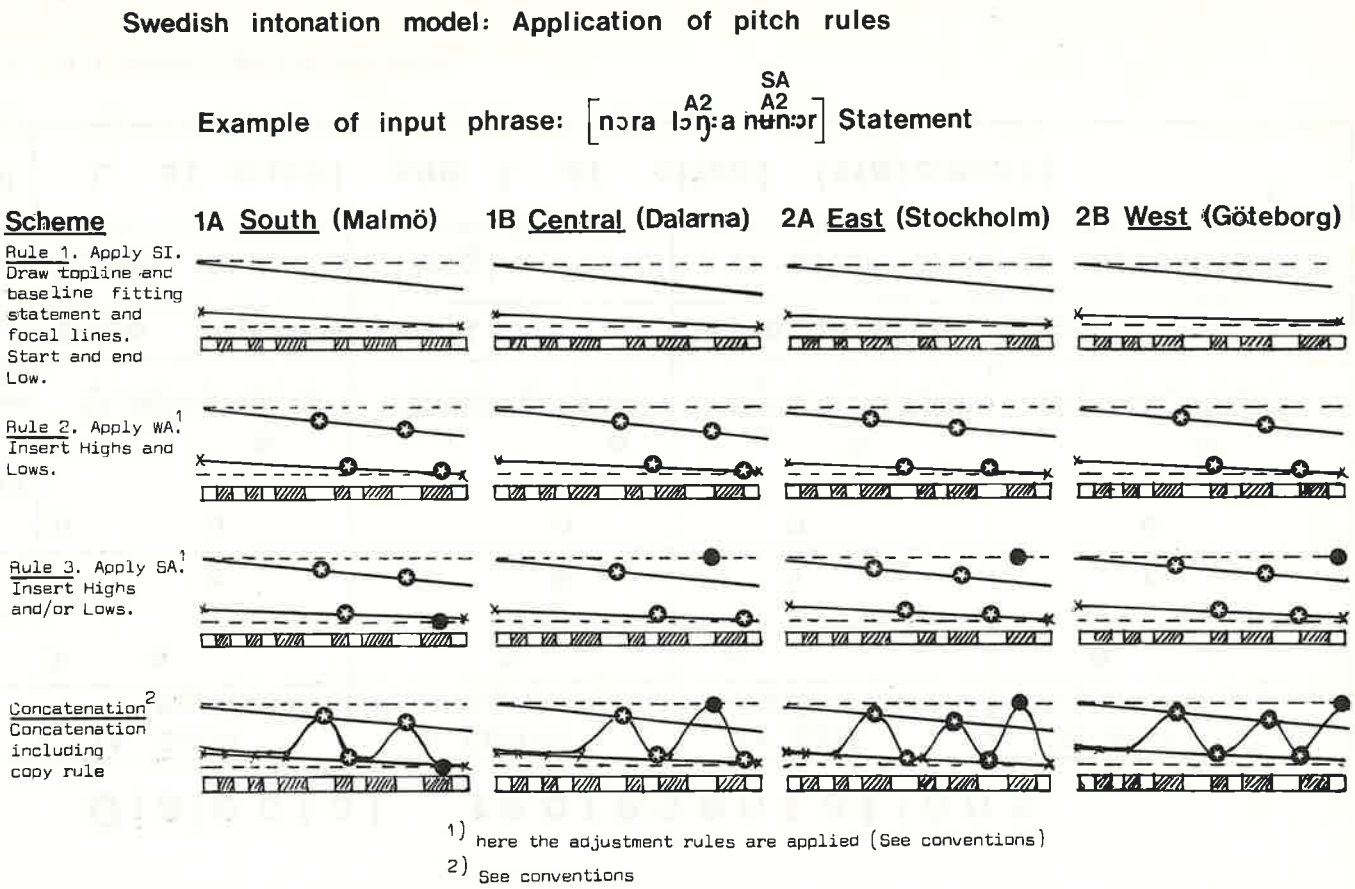

Figure 4. The algorithmic part of the model.

Prescriptions and conventions

Auxiliary lines expressing sentence intonation

Topline and baseline are approximately straight lines. The topline connects successive F_0 maxima outside the focus of a phrase. It starts and ends with the phrase. Its slope depends on the length of the phrase and the initial and final frequencies. These vary with sentence intonation but are otherwise rather constant depending on the individual speaker's pitch range. The baseline connecting successive F_0 minima is specified correspondingly. Focal lines connect focal maxima or minima in different sentence positions. These lines are nearly horizontal.

Conventions applying to the rules

WA Highs and Lows are on baseline and topline.

SA Highs and Lows are on focal line.

Example of an adjustment rule: If WA Low and SA High occur in final syllable, give priority to SA High.

Concatenation including copy rule: Copy the High and Low of a syllable onto the auxiliary line of the following syllable if nothing else is indicated. Join neighbouring points by straight lines.

Rule 1 gives us some auxiliary lines which can be regarded as the concrete gestalt of the sentence intonation. The upper straight line, the topline, connects pitch peaks in observed curves utside the focus of a phrase. The lower straight line, the baseline, connects pitch valleys, likewise outside the focus of a phrase. The hatched lines are the focal lines connecting peaks and valleys for accents in focus in different positions of the sentence. (Exactly how these auxiliary lines are obtained is expressed in the Prescriptions.)

The beginning and end points of the topline and baseline are nearly constant for a given context, a given speaker and a given sentence intonation. The slope, then, is determined by the length of the utterance. The focal lines, on the other hand, are horizontal.

Rule 2 inserts the Word Accent Highs and Lows. Notice how the timing varies with the dialect.

Rule 3 inserts the Sentence Accent Highs and Lows. Notice how the last Accent Low of Malmö (South) is replaced by a new Low on the focal line and how the last Accent High of Dalarna (Central) is replaced by a higher High. For Stockholm (East) a new point is added immediately after the accent Low and for Göteborg (West) this new point comes later.

With the completion of Rule 3 all the important turning points of an intonation curve are given. What remains now is to concatenate between these points. This is done at the last stage of the algorithm. (The interpolation procedure is described in the Prescriptions.)

The output of the algorithm above is a sentence with four different intonations, typical of statements in four different prosodic dialect areas. These intonations have been obtained by giving different timing rules for word accents and sentence accent to one common sentence intonation pattern.

There is an interesting correlation between the sentence accent timing and the word accent timing which we intend to come back to. This correlation is easiest to demonstrate in the last two dialects (2A and 2B), for which the correlation can be expressed: The later the timing of the sentence accent, the later the timing of the word accents. With this correlation it is possible to base our prosodic typology mainly on sentence accent as is shown by Figure 5.

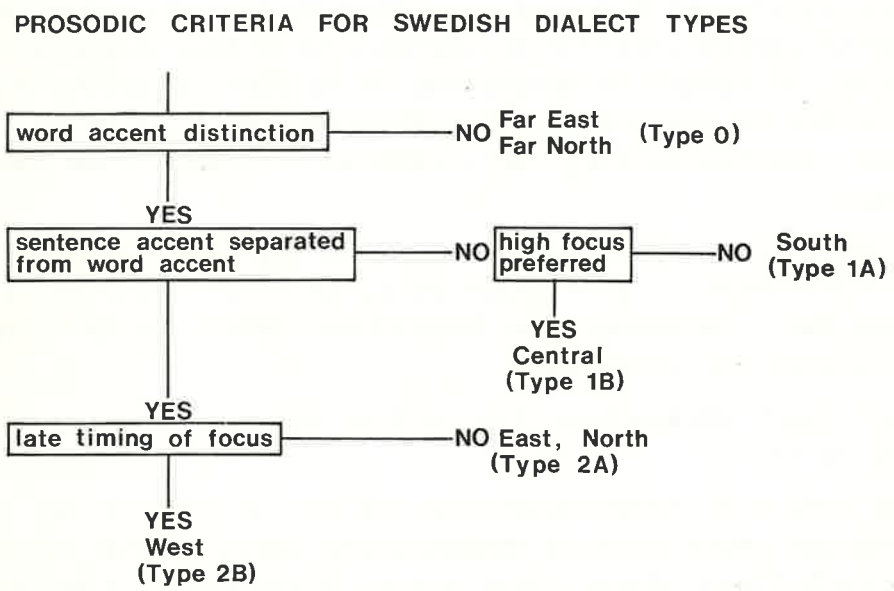

Figure 5.

Figure 5 shows in a diagram the prosodic criteria needed to separate the dialect types. Apart from the criterion that singles out type 0 (far east, far north), which has no word accent distinction, sentence accent may be regarded as the main criterion of the typology. The so called one-peaked dialects are characterized by a sentence accent which is not separated from the word accent. Within this group a low focus is preferred by the southern dialects and a high focus by the central ones. The two-peaked dialects have a sentence accent which is separated from the word accent. The dialects of the east have an early timing of focus, while in the dialects of the west the timing of focus is as late as possible.

SYNTHESIS

Four versions of the sentence man anämmar LÙNDAMODELLERNA 'they adopt the Lund models' were synthesized at the Phonetics Institute of Uppsala University. Since the purpose of the sentence is to reveal the prosodic dialect types, the form may be regarded as optimal. It combines Accent 1 and Accent 2, Sentence Accent and Sentence Intonation, and all these prosodic variables are prevented from overlapping by intervening unmarked syllables. The synthesis was obtained by a linear prediction system which gives an extremely natural sounding output. The four versions are intended to simulate the four dialect types, south, central, east and west. In all the synthesized versions the spectral composition and the durations of the vowels and the consonants are the same, more precisely, as they were pronounced by a speaker from Uppsala (dialect 2A). Only the pitch contour was varied according to the rules of our model. These four versions were played to the members of the symposium at the end of the presentation of our paper. The response was favourable. However, the experimenters are not quite satisfied with the simulation of the Göteborg dialect. We believe that the relative durations of vowels and consonants in this dialect differ in a significant way from the corresponding relations of the carrier phrase.

CONCLUSION

Our analysis shows that the accent typology is in fact a prosodic typology. With this reinterpretation the typology has been given a deeper linguistic motivation with a wide range of applications as we will try to show in future work.

ACKNOWLEDGEMENTS

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FOOTNOTES

1. A corresponding Accent 1 is in all cases one-peaked and the peak comes earlier than the last peak of Accent 2.

2. We called 2A 'central' in earlier papers.

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