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# PHONETICS AND PHONOLOGY OF THE SWEDISH DIALECTS – A PROJECT PRESENTATION AND A DATABASE DEMONSTRATOR

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## ABSTRACT

A searchable database of speech samples from more than 100 Swedish dialects is being established for use in research and education. Each dialect is represented by at least 12 speakers. Recordings are made of spontaneous speech as well as words and phrases elicited with a number of specific research goals in mind. This paper summarizes one of these goals, a prosodic typology for the Swedish dialects. The current database prototype was designed as a tool in this research. Its use in accessing, representing and analyzing the relevant data is described.

## 1. INTRODUCTION

Whereas there is a rich dialectological literature from around the last turn of the century, phonetic studies of the Swedish dialects have been rare during the last few decades. Recently, however, a nation-wide research initiative has been launched to record and analyze comparable speech samples from more than 100 Swedish dialect areas in Sweden and Finland (*Phonetics and phonology of the Swedish dialects around the year 2000*, or *SWEDIA 2000* for short; <http://www.swedia.nu>). Each dialect is represented by at least 12 speakers with one female and one male group of elderly speakers, and one female and one male group of younger speakers. Recordings are made of spontaneous speech as well as words and phrases elicited with a number of specific research questions in mind; those questions concern, e.g., tonal word accents and intonation, quantity contrasts, and vowel and consonant inventories.

The project is designed to serve several theoretical as well as practical purposes. The theoretical objectives include the definition of criteria on which phonetic and phonological typologies can be based, the analysis of the geographical distribution of dialect features, and sociolinguistically oriented problems such as levelling tendencies in the two age groups and sexes. In particular, the database material will be used to characterize the Swedish dialects in a global phonetic-typological perspective, and to provide a basis for the study of historical sound change. For example, the phonetic ‘microvariation’ represented by dialects of ‘the same language’ can be seen as the result of relatively few diachronic steps affecting a common vocabulary. Thus, a careful phonetic study of the dialects can make possible detailed and reliable inferences as to which sound changes must have taken place. These inferences can provide a valuable ‘answer key’ against which it is possible to evaluate hypotheses concerning areal, perceptual or articulatory constraints on diachronic processes.

The practical objective of the project is to establish a searchable database that can be put to use in both education and research. In particular, the project aims at offering linguistics a solid and well-documented source of information on the phonetic and phonological features of the Swedish dialects spoken around the upcoming turn of the century. The database material will thus provide a reference for future studies of the phonetic and phonological development of the Swedish dialects.

## 2. A PROSODIC DIALECT TYPOLOGY

Gårding’s accent typology for the Swedish dialects [6], which is based on Meyer’s [7] tonal data base with citation forms of the word accents (accent I/accent II), uses the number of pitch peaks and their timing in relation to syllables as criteria. This typology gives us a division into five prosodic dialect types: two ‘single-peaked’ dialect types with a distinction in the timing of pitch peaks for both accent I and accent II (SOUTH, CENTRAL) and two ‘double-peaked’ dialect types, also with a distinctive timing of pitch peaks (EAST, WEST). The fifth type is single-peaked but with no word accent distinction (FAR EAST, i.e., Finland Swedish).

Within the project *Swedish prosody* [5], this accent typology was developed into a more extensive prosodic dialect typology [2]. The ideological starting point of this extended typology is the communicative functions of the different contributions to the pitch contours from phrasing, focus and accentuation (accent I/accent II). The database used in the project *Swedish prosody* contained phonetically balanced utterances with a systematic variation of (besides accent I/accent II) placement of focus, final/non-final phrase position, and simplex/compound words. A main feature of this typology was the pitch realisation of focus [1]. Factoring out the contribution of focus to the pitch contours we arrived at a new interpretation of single-peaked/double-peaked dialects. Another characteristic of the typology was the recognition of the pitch patterns of compounds as a criterion of prosodic dialect type. Critical parameters of the Bruce and Gårding intonation model were the following:

- 1) Timing of pitch accent gesture
  - a) earlier for accent I than for accent II
  - b) dialect-dependent distinctive timing for each accent
- 2) Pitch realisation of focus
  - a) as a wider range of the pitch accent gesture
  - b) as an extra pitch gesture after the word accent gesture
- 3) Pitch patterns of compounds
  - a) no distinction between compounds/simplex words

b) secondary stress - relevant pitch synchronization

The distinction between accent I and accent II (in the varieties of Swedish that have the difference) is, according to this model, a difference in the timing of the accent gesture (in unfocussed position), so that the pitch gesture for accent I is earlier than for accent II independent of dialect. The timing of the accent gesture is a relevant parameter not only for the word accent distinction (accent I/acc II) but also for each of the word accents in an inter-dialectal comparison. In this way, there appears to be a distinct order of the four dialect types from early to late timing: EAST, WEST, SOUTH, CENTRAL.

The identification of the contribution of focus to the pitch contour as either a wider range of the word accent gesture or as an extra pitch gesture added after the pitch gesture of the word accent itself was a confirmation of the division into single-peaked dialect types (SOUTH, CENTRAL) and double-peaked types (EAST, WEST).

Yet another decision in the dialect typology is whether the pitch patterns of compounds are distinct from those of simplex words. Whereas there appears to be no distinction in terms of the pitch patterns of compounds as opposed to simplex words in WEST and SOUTH, secondary stress can be shown to be a relevant synchronization point of pitch gestures for EAST and CENTRAL. The secondary stress is a trigger of the focal accent pitch rise in EAST, whereas in CENTRAL, it is a synchronization point for the pitch fall in accent II compounds.

A possible extension of the prosodic dialect typology is to recognize NORTH Swedish as a prosodic dialect type distinct from EAST Swedish. These dialects are prosodically similar in several respects, but the stress distribution in compounds is different particularly in the far north Swedish dialects. Whereas in most Swedish dialects, compound words are characterized by two stresses, i.e., an early primary stress and a late secondary stress, many compounds in far NORTH Swedish have only one (primary) stress located in the final element of the compound.

To illustrate the importance of intonation for dialect identity and to test our prosodic dialect typology, we have made an attempt to simulate the different dialect types using resynthesis of intonation. A phonetically balanced and dialect neutral test utterance was chosen for the resynthesis: *de' e' en syntetisk dialekt som datatekniken fixat (It's a synthetic dialect that was fixed by computer technique)*. Variables in the intonation model were different timings of the accent gesture (several points on a scale early-late), simultaneous/separate focus gesture, and same/different pitch pattern for simplex and compound words. The following diagram shows the parameter values that have been chosen for the simulation of six different prosodic dialect types of Swedish.

	<i>Accent</i>	<i>Focus</i>	<i>Compound</i>
SOUTH	late timing	simultaneous	not distinct
CENTRAL	v. late timing	simultaneous	sec. stress relev.
EAST	early timing	separate	sec. stress relev.
WEST	central timing	separate	not distinct
NORTH	v. early timing	separate	final stress
FAR EAST	late timing	simultaneous	not distinct

(no acc I/acc II, timing of accent like in acc II)

No formal testing of the synthetic versions of the different dialect types has been undertaken so far, but the reactions among those exposed to the synthetic dialects show rather unanimously that the simulation of half of the dialects is successful whereas, for the other half, the simulation is still prosodically incomplete. Our interpretation of this is that we have at least a partial knowledge of the prosodic variation among Swedish dialects, but extended research is needed for a more complete understanding of this variation.

In the SWEDIA 2000 project, our starting point is this intonational modelling of prosodic dialect types and later work in the area (cf. [3,4,8]). By using new data collected in the project we hope to be able to refine the prosodic dialect typology for Swedish dialects. An example of a hypothesis that will be tested on the SWEDIA 2000 database is the idea that prosody, in particular accentuation and intonation, varies little within major regional dialect areas, whereas other phonetic features such as vowel quality is more variable locally within such dialect areas.

The next section briefly describes the database tools currently available for evaluation of the above-mentioned prosodic schemes.

### 3. DATABASE TOOLS AND GRAPHIC INTERFACE FOR A PROSODIC ANALYSIS OF THE DIALECTS

As noted, the SWEDIA 2000 database will be a searchable database from which sound files and accompanying information, in the form of label files, may be extracted. The database will contain segmental as well as prosodic data. As noted, work is presently in progress to elaborate and refine its prosodic component. This section describes the current state of this aspect of the database.

The following word and sentence level parameters have been systematically varied in the prosodic part of the project's field recordings: word accent, focus, number of syllables in the word, and compound vs. simplex words. In addition, there are the following non-linguistic parameters: speakers' age and sex, and location of the recording, i.e., the dialect.

Using the database, digitized phrases complying with any combination of these parameters can be extracted. A desired parameter combination is chosen by entering the appropriate information in a dialogue box. For example, a search may begin by identifying one of the recording locations available in the database. These locations are given either alphabetically or by province in the Recording Location dialogue box illustrated in figure 1 (in which 'Lapland' is the name of a Swedish province). For example, selecting 'Sorsole' as the interesting local dialect returns the Prosodic Parameter dialogue box shown in figure 2. From that box, selecting 'older', 'man', 'plain (i.e., simplex) word', '2 syllables', 'accent type 2' and 'focus' amounts to specifying the intersection between those parameters, i.e., a phrase containing a bisyllabic accent 2 word with focal accent as produced by an elderly gentleman of the Sorsole dialect.

Once all the relevant selection criteria have been specified, there are, as shown, two options available for presenting the

results; the phrases complying with these specifications can either be played back by the user, or they can be sent to a new file. Thus, clicking 'Create Sound File' will result in a file containing all instances of the selected phrases. The contents of



Figure 1. Example of Recording Location dialog box.

this file can then be displayed for further analysis using accompanying broadband spectrograms or F0 plots as exemplified in figure 3. The accompanying label window will serve to identify the selected utterances. Additional features will be added to later versions of the database. For example, transcriptions will be provided to reflect the progress made in the phonetic and phonological analyses of the dialect material.

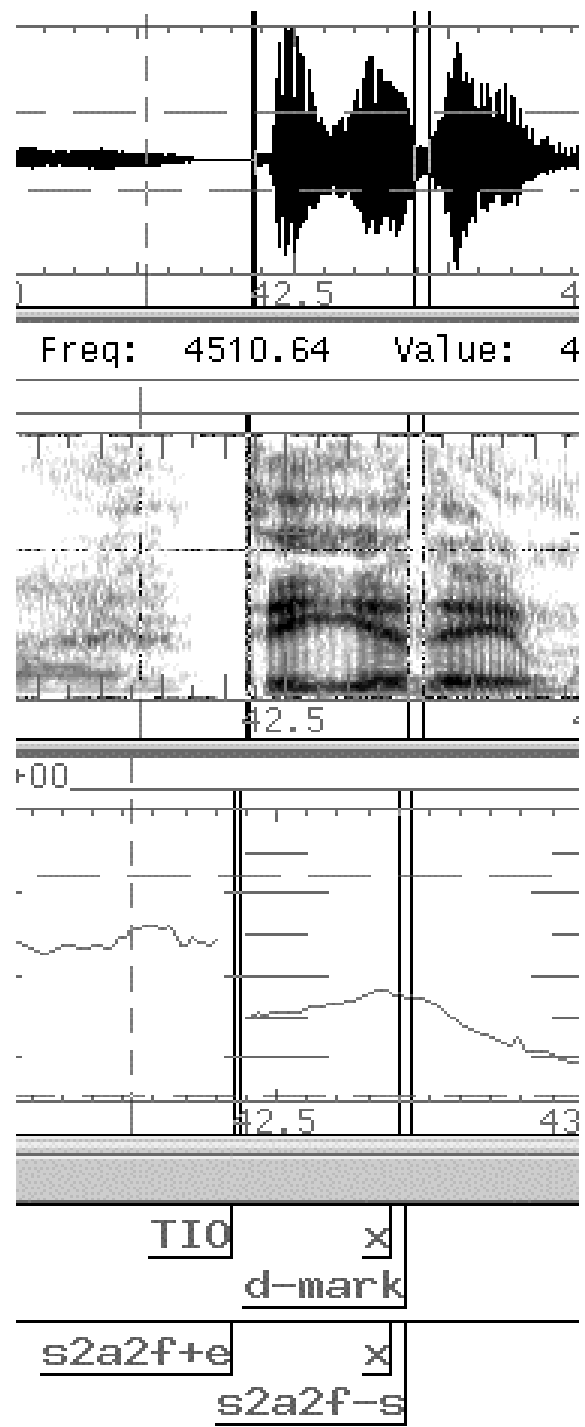


Figure 3. Speech waveform, broadband spectrogram, F0 contour and label window for the sequence [τ:Y δε:] (part of the utterance [τ:Y δε:μδρκ] 'ten D-Marks'). The first (brief) segment is the fricative burst for [t], the second segment is the remaining part of the word [τ:Y] 'ten', the third (brief) segment is the closure interval for [d], and the rightmost segment is the syllable [de:]. The utterance was produced by a male Sorsele speaker with focus accent on the word [τ:Y].

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