Simulating Intonational Varieties of Swedish

Gösta Bruce¹, Björn Granström², Susanne Schötz¹
¹Dept. of Linguistics and Phonetics, Centre for Languages and Literature, Lund University
²Dept. of Speech, Music and Hearing, School of Computer Science and Communication, KTH

(gosta.bruce, susanne.schotz)@ling.lu.se, bjorn@speech.kth.se

ABSTRACT
The goal of the SIMULEKT project is to develop our knowledge about intonational variation in Swedish, using the Swedish prosody model and speech synthesis in different forms. We will focus on 7 major intonational varieties: South, Göta, Svea, Gotland, Dala-Bergslagen, North, and Finland Swedish. The significance of our project work will be within basic research and in speech technology applications.

1. Purpose
• Gain more precise and thorough knowledge about major intonational varieties of Swedish
• Develop the Swedish prosody model theoretically as well as experimentally
• Simulate the prosody of the major intonational varieties using speech synthesis

2. Speech Material
• SweDia 2000
  – ≈ 1200 speakers from >100 communities in Sweden & Swedish-speaking parts of Finland
  – elicited prosody material & spontaneous interviews
• SpeechDat
  – ≈ 5000 speakers (from different dialect areas)
  – read, telephone-transmitted speech
  – two prosodically interesting sentences

3. The Swedish Prosody Model
• Bruce & Gårding (1978)
• Bruce & Granström (1993)
• Updated and revised by Bruce (in press)

A tentative taxonomy of intonational varieties of Swedish:

<table>
<thead>
<tr>
<th>Prosodic feature:</th>
<th>Intonational variety:</th>
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<tr>
<td>Timing characteristics of word accents</td>
<td>South: late</td>
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<td>Göta: early</td>
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<td></td>
<td>Gotl-Dala: late</td>
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<tr>
<td>Pitch patterns of compound vs. simplex words</td>
<td>Svea: early</td>
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<td></td>
<td>Norrl: late</td>
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<td>Finl: no dist.</td>
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<td>Intonational prominence levels</td>
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<td></td>
<td>same</td>
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<td>dist.</td>
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<td>Concatenation patterns (phrase/compound)</td>
<td>one</td>
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<td>two</td>
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<td>low</td>
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4. Concatenation patterns

A. Low plateau concatenation (South)
taktäckaren, det var en tänkarkare (‘the roof tiler, he was a master sergeant’)  
B. High plateau concatenation (Svea)
forlänningar och sånt (‘ancient remains and the like’)  
C. Upslope concatenation (Göta)
självförsörjande för i tiden (‘self-sufficient in older times’)  
D. Downslope concatenation (North)
dom var där i skogen (‘they were there in the forest’)  

5. Method
• Analysis and description of prosody (tonal and temporal) patterns in natural speech
• Simulation of prosody using speech synthesis
  – resynthesis (parameter manipulation)
  – rule-based formant synthesis
  – hybrid synthesis (rule-modelled prosody)

6. Prosodic typology
• Focus on 7 intonational varieties: South, Göta, Gotland, Dala-Bergslagen, Svea, North, and Finland Swedish
• ‘Single-peaked’ intonational varieties: South, Gotland-Dala, North, (Finl-Sw.) = more “peripheral” regional varieties
  – One level of prominence
  – Late word accent timing
  – Concatenation low / down
• ‘Double-peaked’ intonational varieties: Svea, Göta = more “central” regional varieties
  – Two levels of prominence
  – Early word accent timing
  – Concatenation high / up

7. Significance
• Basic: Deepen our understanding of prosodic structuring related to dialectal variation
• Applied: Generate new knowledge to be used in speech synthesis
  = Pioneer work in the field of synthesizing regional varieties of a language

8. References