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Topic: Modelling physical properties of speech production

Title: **On synchronisation of F0 events and articulatory gestures in German speech**

Current phonetic analyses of tonal alignment are generally based on the assumption that F0 landmarks are temporally synchronised with segment or syllable boundaries (such as vowel or syllable onset). Atterer & Ladd (in press) investigated prenuclear rising accents in German and showed a robust alignment between the F0 minimum and the onset consonant of the accented syllable for Northern German. In Southern German the F0 minimum is anchored later than in Northern German, i.e. the onset of the accented vowel serves for F0 anchoring (instead of the preceding consonant). The phonological status of variation in alignment is quite unclear. In the case of German it depends on the investigator's interpretation whether the observed variation is considered a matter of gradient phonetic realisation or a categorical phonological distinction, because it involves different syllable domains serving for F0 anchoring (although the contrast is rather small), see Grice and Harrington (2003).

Since the variation reported below may be partially influenced by differing degrees of vowel-consonant articulation across the two German varieties (coordination of laryngeal with supralaryngeal gestures), the synchronisation of F0 events and articulatory gestures should be additionally taken into account. A first attempt to align gestures to F0 targets was made by D'Imperio et al (2003). Based on optoelectronic data they investigated H pitch targets in Neapolitan Italian questions and their relationship to orofacial movements. Their study in fact showed a closer relationship between F0 and lip aperture (in their case between the F0 maximum and the inter-lip distance minimum) than between F0 and segmental landmarks in the acoustic signal (F0 maximum and onset of the stressed vowel). The present study takes another look at Atterer and Ladd's work on German in the light of this gestural approach to tonal alignment, focussing on methodological aspects of exploring gestural anchoring. We recorded two German speakers from the North of the Benrather isogloss, using a Carstens system for electromagnetic articulography (EMA). The speakers read a subset of the Atterer/Ladd material which elicits German prenuclear rising accents at normal and fast speaking rates. Since we were investigating vocalic *and* consonantal gestures for F0 anchoring, we placed transducers on the related articulators jaw and tongue dorsum and alternatively on lips and tongue tip. To enable us to use one more sensor for tracking articulatory movements, we multiplexed the reference signals. We labelled degrees of constriction of articulator positions (minima and maxima) as well as F0 landmarks and segment boundaries (as in the Atterer/Ladd study), both using the EMU Speech Database System (Harrington and Cassidy 2001). Since EMU processes the data file format SSFF (Simple Signal File Format) a converter was developed which makes EMA data accessible for EMU. Results from prosodic and segmental labelling will be presented at the summer school.

## References

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- Harrington, J. & S. Cassidy, 2001. Multi-level annotation in the Emu speech database management system. In: *Speech Communication* 33, 61-77.