

AUGUST 13 2005

Timing of upper lip protrusion gestures for the vowel /u/ FREE

J. S. Perkell; M. L. Matthies



J. Acoust. Soc. Am. 87, S123 (1990)

<https://doi.org/10.1121/1.2027902>



View
Online



Export
Citation

CrossMark



LEARN MORE

Advance your science and career as a member of the
Acoustical Society of America

viously reported [Smith *et al.*, *Biomedical Engineering V: Recent Developments*, edited by S. Saha (Pergamon, New York, 1986)]. However, while repeatability of this measurement has been well established, its accuracy has not been established due to the lack of an alternative, low-risk technique for comparison. Recently, magnetic resonance (MR) images have been used to obtain vocal tract measurements. [Lakshminarayanan *et al.*, *RSNA, Work in Progress—Physics 173(P)*, 411 (1989)]. In this study, the performance of both systems was evaluated and compared using three custom-made, tongue-palate spacers to hold the tongue steady at three different positions. Distances measured using the two systems were compared with direct measurements of the spacers. It was found that distances measured from the MR images were accurate to within 2 mm in the worst case, but the glossometer demonstrated some distance-dependent error, suggesting a more refined calibration scheme for the glossometer. The experimental procedure and the result will be presented.

WW24. Nonlinearity and phonetic segmentation. A. Marchal and N. Nguyen-Trong (Inst. de Phonétique, 29 Av. Robert Schuman, 13621 Aix en Provence, France)

ESPRIT II basic research action "ACCOR" aims at investigating the articulatory-acoustic correlations in coarticulatory processes in seven European languages (English, French, German, Italian, Irish, Spanish, and Swedish). In order to allow for cross-language comparisons, it is particularly important that partners in the project adopt a common methodology, i.e., standardized investigation tools and normalized measurement procedures at specified locations in the speech signals. The physiologic and acoustic database first needs to be segmented and labeled according to principles that do not preclude any theoretical interpretation. The usual phonetic discretization at segment boundaries that implicitly considers coarticulation as a phonological feature spreading process is rejected. On the contrary, a nonlinear annotation of the articulatory and acoustic events has been adopted, based on the evidence provided by the different channels of information: acoustic sound wave, airflow traces, linguo-palatal contact patterns, jaw and lips movement, etc. From a theoretical point of view, this approach has proven very productive and has given for the data a clear picture of coproduction processes, of the timing relationships among different submotor system activities, and of the dynamic properties of the articulatory gestures. It furthermore provides a sound basis for distinguishing between universal regularities and language-specific constraints. This nonlinear procedure enables a unified interpretation of contradicting results obtained from different scholarly oriented segmentation operations.

WW25. Electromagnetic articulography as a tool in the study of lingual coarticulation. Philip Hoole and Stefan Gfoerer (Inst. für Phonetik, Ludwig-Maximilians-Univ., Schellingstrasse 3, 8000 Munich 40, Federal Republic of Germany)

Two recent papers [Schönle *et al.*, *Biomedizinische Technik* 34, 126-130 (1989) and Shao *et al.*, *J. Acoust. Soc. Am. Suppl.* 1 86, S115 (1989)] have evaluated a commercially available electromagnetic system for articulatory measurements, the articulograph AG-100. The present investigation includes some complementary methodological studies followed by an analysis of vowel-to-vowel coarticulation in German speakers. Within the first area, discussion focuses on the problems encountered and the solutions chosen in adapting the system for large-scale data collection, relevant topics including sample rates, noise, extension of the standard calibration procedures, detection of corrupted data by means of appropriate control tasks, and synchronization with audio recordings. Preliminary work in the second area suggested that the spatial magnitude of vocalic carryover effects in VCV sequences exceeded that of anticipatory effects at the midpoint of the intervening consonants. This will be reviewed in the light of two recent recordings (totaling some 1500 logatomes of the form /bV1CV2/) using three lingual transducers, and one each on upper and lower incisors. Tongue-jaw interactions, as well as the problem of defining analysis points in lingual trajectories, will be discussed. [Work supported by ESPRIT/BRA.]

WW26. A simple model of consonant-vowel phasing. Judith G. Hochberg (Comput. and Commun. Div. and Ctr. for Nonlinear Studies, M. S. B-258, Los Alamos Natl. Lab., Los Alamos, NM 87545)

A consistent phasing relationship was found between movements of the lower lip and the tongue body in the nonsense words ['pipəpip], [pipə'pip], ['bibəbib], and [bibə'bib]. Data came from two native English speakers who were tape recorded while an x-ray microbeam tracked their articulatory movements. In an alternative model of phasing [C. P. Browman and L. Goldstein, *Haskins Labs. Stat. Rep. on Speech Res.*, SR-92, 1-30], vocalic (V) gestures are seen as sequentially covering the entire duration of a continuous utterance (i.e., each vowel's offset coincides with the next V's onset), and consonantal (C) gestures are phased with respect to this vocalic background. In the model proposed here, the sequential view of gestures is extended to consonants, and C and V are phased with respect to each other. Specifically, each C gesture begins when the immediately previous V gesture reaches its articulatory target. Likewise, each V gesture begins at the articulatory target of the ongoing C gesture. [Work supported by DOE Contract W-7405-ENG-36.]

WW27. The domain of laryngeal feature effects in Chonnam Korean. Sun-Ah Jun (Dept. of Linguistics, Ohio State Univ., 204 Cunz Hall, Columbus, OH 43210)

This paper investigates the domain of two aspects of laryngeal features in the Chonnam dialect of Korean. In Korean, voiceless lenis stops, /p,t,k/, sometimes become voiced between voiced segments. Traditionally, this voicing has been discussed as occurring "within words." However, word-initial lenis stops are sometimes voiced at fast tempo, suggesting that the domain is some prosodic unit such as the "accentual phrase" [S. A. Jun, *J. Acoust. Soc. Am. Suppl.* 1 85, S98 (1989)]. To test this, utterances of various constructions produced by three Chonnam speakers at three different tempi (slow, normal, fast) were recorded. An electroglotograph (EGG) was recorded simultaneously with the audio wave. In general, the audio waveform and EGG agreed: Either both showed voicing, or neither did. Only a few cases showed a discrepancy and, for almost all of these cases, the EGG data showed what was expected from the accentual phrasing. Since the number of accentual phrases within an utterance varied with the speech rate (the faster, the fewer), voicing also varied. Preliminary results of VOT measurements in aspirated stops show a similar effect of the accentual phrase boundary: VOT was longer at the beginning of an accentual phrase than medially. Thus the domain of all laryngeal feature effects seems to be the accentual phrase rather than the word.

WW28. Timing of upper lip protrusion gestures for the vowel /u/. J. S. Perkell and M. L. Matthies (Rm. 36-591, Res. Lab. of Electron., MIT, Cambridge, MA 02139)

Timing of upper lip protrusion gestures and accompanying acoustic events was examined for multiple repetitions of word pairs such as "lee coot" and "leaked coot" for three speakers of American English. The duration of the intervocalic consonant string was manipulated by using various combinations of /s,t,k,h,#/. Pairwise comparisons were made of times of acoustic /i/ offset to acoustic /u/ onset (consonant string duration), protrusion onset to acoustic /u/ onset (onset interval), maximum acceleration to acoustic /u/ onset (acceleration interval), and acoustic /u/ onset to protrusion offset (offset interval). In spite of considerable token-to-token and cross-speaker variation, several general observations were made. There were some consonant-specific effects, primarily for /s/. The non-s subset evidenced two modes of behavior. (1) The lip protrusion gesture for /u/ had a relatively invariant duration, but its timing varied with respect to the oral consonant gesture complex: The longer the consonant string, the earlier the lip protrusion gesture, or (2) the protrusion gesture duration correlated positively with consonant duration. The mode 1, which predominated, the slope of the timing relationship between oral and labial gestures differed across subjects. [Work supported by NIDCD.]