test to 35 listeners. The results of both the acoustic analysis and the perception test showed the method was successful in consistently eliciting reduced sentences from 8 subjects, and citation and hyperarticulated sentences from all 10 subjects.

4aSC18. Automated head and transducer support (AHATS) system for ultrasound data collection. Andrew Jon Lundberg, Maureen Stone (Univ. of Maryland School of Medicine, 16 S. Eutaw St., Ste. 500, Baltimore, MD 21201), and Edward P. Davis (Paratek Microwave, Inc., Columbia, MD 21045)

Ultrasound has been shown to be a useful tool for measuring the vocal tract during speech. This is largely because ultrasound is noninvasive, safe, relatively inexpensive, and can capture 2-D images at video frame rates. In previous work, a head and transducer support (HATS) system was developed which allowed stable positioning of the subject and the ultrasound transducer, and led to improved measurement accuracy. We have now automated the system (AHATS), replacing the manually positioned transducer holder with a computer controlled robotic arm that supports automatic positioning and logging of the transducer holder. Computer controlled positioning of the data collection device increases the speed at which we can collect ultrasound data sets with multiple image planes. It also increases our confidence in the accuracy of combined 3-D data sets composed of multiple 2-D data collections within the 3-D space, and facilitates efficient 3-D reconstructions which require data collection positions to be optimized for individual subjects. [Supported by NIH-NIDCD DC01758 and Northrop Grumman, Inc.]


In previous works [J. Acoust. Soc. Am. 102, 3164–3165(A) (1997) and 105, 2(A), 1354(A) (1999)] the following problem was presented. Assuming that two-dimensional data (such as that obtained in most kinematic speech studies) are approximately linear with error terms about the mean coming from a quadratic—rather than a normal—distribution, then the regression analysis is best performed using a maximum likelihood stochastic linear regression methodology, instead of a least squares methodology. It was shown that one could expect, among other results, sharper confidence intervals about the mean. It remains to be determined if the distribution of error terms about the mean (for speech production data) is better described by a quadratic than by a normal distribution. Indeed, using the classical Kolmogorov–Smirnov test, it is shown that in many cases one can assume that the error terms follow a quadratic distribution and that at any reasonable confidence level one can reject the hypothesis that error terms follow a normal distribution. The result of this test substantiates the theoretical premise assumed in the earlier work.

4aSC20. Dialectal differences in vowel articulations in pre-consonantal contexts. Alice Turk (Univ. of Edinburgh, Edinburgh, UK), Jim Scobbie, and Nigel Hewlett (Queen Margaret Univ. College, Edinburgh, UK)

Many varieties of English show the well-known pattern of longer vowels before voiced consonants, at least in monosyllabic words. Scottish English, however, shows a different pattern of adjacent consonant conditioned vowel duration for the vowels /a, ai/. In this variety, short vowels are found before tautomorphemic voiceless stops, voiced oral and nasal stops, and voiceless fricatives. Long vowels are found before voiced fricatives and morpheme boundaries. For example, “bead,” “bean,” and “bea’t” and “peace” all contain short vowels, while “please,” “free,” and “freed” contain long vowels. This contextually conditioned durational pattern has been described by the Scottish vowel length rule (SVLR). We conducted an EMA study of the SVLR to examine the articulatory strategies speakers use to produce these well-documented acoustic durational patterns. We are particularly interested in (1) whether there is a single mechanism underlying all long duration vowels, i.e., those conditioned by tautomorphemic /t/ as compared to tautosyllabic but heteromorphemic /t/ and /d/, and (2) whether the strategy Scottish English speakers use to lengthen vowels in the SVLR conditioning environments is the same as that used by speakers of other varieties to produce longer vowels before voiced obstruents. [Work supported by ESRC.]

4aSC21. Lingual awareness and the description of isolated syllables of English: A distinctive features analysis. Patricia Lohman (Dept. of Speech and Hear. Sci., Ohio Univ., 218 Lindley Hall, Athens, OH 45701, p1206190@ohio.edu) and Donald Fucci (Ohio Univ., Athens, OH 45701)

The purpose of this investigation was to determine whether normal adult speakers of English could accurately describe tongue position within the oral cavity during the production of isolated English syllables. The phonemes were analyzed according to their distinctive features. The effects of training on this task were also examined. Sixty students, 30 majors in speech-language pathology (M age=22.7) and 30 non-majors (M age=18.8) participated in this study. The procedure involved asking participants to (a) imitate the production of a syllable, (b) respond to the question, “Where was your tongue?” and (c) answer four multiple-choice questions regarding tongue height, position, and contact with other structures within the oral cavity. Results indicated that the trained group had higher test scores on all phonemes (p<0.05) with the exception of r and sh (p=.05). The Trained group had the lowest scores on the phonemes with the greatest number of features (1–6 features; r,sh=5 features). The Untrained group had the most difficulty describing the phonemes k (3 features), s (5 features), and l (6 features). The results indicated training, as well as type and number of features significantly affected the task.

4aSC22. Fundamental frequency change as a result of repeated corrections. Caroline M. Menezes and Osamu Fujimura (Dept. of Speech & Hearing, The Ohio State Univ., Columbus, OH 43201-1002)

Articulatory and intonational patterns were studied, using a simulated discourse-like paradigm, in which subjects were asked to make repeated corrections of a three-digit sequence street address consisting of fives and nines and Pine. Articulatory and acoustic signals were collected using the x-ray microbeam system for four native American English speakers at the University of Wisconsin. Based on the C/D model, a linear pulse train representing the rhythm of a phrase can be inferred by analyzing jaw movements as syllable magnitude over time. Fundamental frequency contours were examined to study the effects of phrasing as a result of contrastive emphasis (digraph corrected is assumed to have contrasntive emphasis) and repeated corrections in the three-digit sequence. These patterns were then studied in relation to the jaw movement patterns. The data show that subjects change speech strategies when they need to make a correction or repeated corrections [Erickson et al. (1992)]. The word in particular that is corrected is made prominent from the rest of the utterance, in all repeated corrections. Effects of speaker variability will also be discussed. [This work has been supported in part by NSF (BCS-9977018) and ATR/MIC, Japan.]