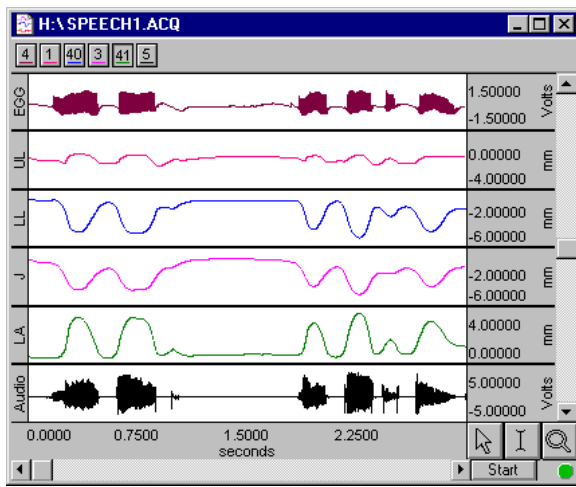


Application Note 169

Speech Motor Control



EGG - Electroglottography can be used to transduce vocal fold vibrations in order to determine the exact moments of onset and offset of phonation.

UL, LL, J - Movements of the upper lip, lower lip, and jaw can be recorded, as shown here during production of the utterances "My bob" (left) and "My bobby" (right).

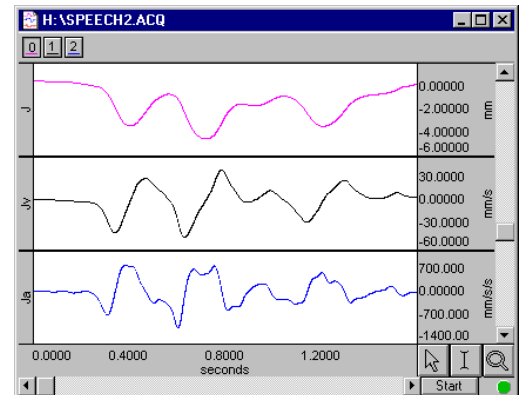
LA - Lip aperture, reflecting the distance between UL and LL, can be acquired as a calculation channel.

Audio - The signal of the acoustic speech output can be recorded with a microphone.

A BIOPAC Research System with *AcqKnowledge* allows the researcher to collect a number of different signals that are commonly acquired and analyzed in studies regarding the neuromotor processes underlying normal and disordered speech production (e.g., kinematic, electromyographic, and electroglottographic analyses). The system can be used to investigate processes of speech motor control in normal speech production, as well as in individuals with various types of speech disorders (e.g., stuttering, dysarthria, apraxia of speech). Movements can be transduced using a lightweight head-mounted strain gauge system. BIOPAC's *AcqKnowledge* software will allow you to output the audio signal via the STM100C; this will enable you to listen to this signal and determine the words that are spoken.

All channels were digitized with a sampling rate of 3,000 samples/second. The acquired movement signals may be further processed via the *AcqKnowledge* software to allow measurements of important movement characteristics. The data processing steps are illustrated for the jaw movements during "My bobby-pin."

1. The transduced displacement signal (**J**) was digitally low-pass filtered with a cut-off frequency of 20 Hz.
2. The filtered signal was then numerically differentiated (3-point central difference algorithm).
3. The differentiated signal was then smoothed (10 ms window) to obtain a signal of movement velocity (**Jv**).
4. The velocity signal was then differentiated again to obtain a signal reflecting movement acceleration (**Ja**).
5. The acceleration signal was smoothed (10 ms window).



BIOPAC's *AcqKnowledge* software will allow you to measure duration, displacement, peak velocity, peak velocity latency, latency of movement onset relative to jaw peak velocity associated with the preceding jaw closing movement and latency of peak velocity relative to jaw peak velocity associated with the same preceding articulatory event.

Equipment

BIOPAC MP System with *AcqKnowledge*
STM100C Stimulator
DA100C General Purpose Transducer Amp
TSD108 Physiological Sounds Microphone

Strain Gauge transducer (lightweight, head-mounted)

- For strain gauge suggestions and recording guidelines, please review [Clinical Management of Sensorimotor Speech Disorders](#), edited by Malcolm Ray McNeil (see page 115) or similar references.