

Simultaneous Recording of Tongue Ultrasound and Oral Airflow

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Background: We are interested in how airflow fits in with previous results on delayed naming (Rastle et al., 2005; Palo et al., 2015) and speech initiation (Schaeffler et al., 2014). In this study, we show that simultaneous Oral Airflow (OAF) and Ultrasound Tongue Imaging (UTI) measurement is feasible and provide preliminary results.

Methods: We recorded one 40-year-old native Finnish speaking participant (the first author) in a delayed naming experiment which combined simultaneous acquisitions of audio, OAF, and UTI. Audio was recorded separately in synchrony with OAF and with UTI. Overall synchrony is provided by post-hoc synchronisation of the audio tracks.

OAF data was acquired using an EVA2 system (S.Q.Labs, Aix-en-Provence) and SESANE software running on a Lenovo Core-i5 notebook PC. The nasality sensor was removed from the EVA2 airflow device to allow access for the ultrasound probe. Ultrasonic and audio data were recorded using an Articulate Instruments/Teleded Echo Blaster 128 portable ultrasound scanner with a C3.5/20/128 Z-3 probe operating at 3 MHz. The scan depth was set to 90mm, and the field of view was reduced to approximately 70 % (88 scanlines) to give a frame rate of 78 fps. Audio data was collected using an Audio Technica AT8010 omnidirectional condenser microphone and a Focusrite Scarlett Solo2 USB interface, at 22kHz/16bit.



Figure 1: The participant speaking into the EVA mask while wearing the UTI headset.

Each trial began with the target word being displayed on a computer screen. The participant was instructed read the word internally while remaining at rest until he heard the go signal (50 ms long 1 kHz beep), which was played out after a random delay of 1.2-1.8 s from the beginning of the UTI recording. (For technical reasons the OAF recording was begun before the UTI

recording.) After he observed the beep, he was instructed to produce the target word as soon as possible. No instructions were given about breathing during the experiment.

Results and Discussion: Proof-of-concept is provided in Figure 2, which plots the oral airflow, pixel difference (Palo et al., 2014) and waveform from simultaneously recorded signals. More results will be available by the time of the conference.

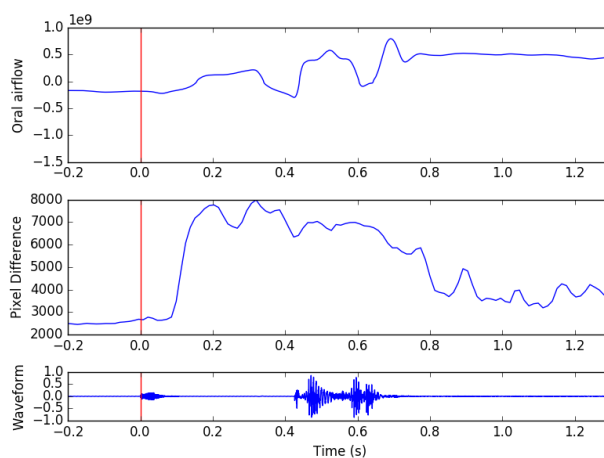


Figure 2: Oral airflow, pixel difference, and waveform of [kasa]. Go-signal onset is marked with a vertical, red line.

References

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Keywords: Methodological research, oral airflow, tongue ultrasound.