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Digital Acquisition of Ultrasound Imaging of the Tongue

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One of the goals of speech production research is to understand the functioning of the tongue in the production of overlapping lingual segments. This is especially important since all vocalic and most consonantal contrasts involve a tongue gesture. An obstacle to progress in this area has been the difficulty of observing tongue motion in enough spatial and temporal detail to develop theory on its linguistic functioning. Ultrasound has become increasingly popular in tongue imaging, since it allows the researcher to observe most of the tongue dynamically, while being clinically safe. However, a limitation of this technique is the slow 30 Hz rate of analog acquisition. We have developed a new method for digital acquisition of ultrasound data at over 100 Hz, with simultaneous synchronized acquisition of audio and Optotrak data. Acquisition of the ultrasound digital video data is externally triggered using a novel pulse sequence that is simultaneously captured by the audio and Optotrak acquisition device. We will illustrate the detail of the dynamics of the tongue in an experiment on the coproduction of rhotic and vocalic segments (7 American English subjects), where digital ultrasound was captured at 127 Hz (Funded by NIH DC-02717).