

## Techniques for field application of lingual ultrasound imaging

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### Abstract

Techniques are discussed for using ultrasound for lingual imaging in field-related applications. The greatest challenges we have faced distinguishing the field setting from the laboratory setting are the lack of controlled head/transducer movement, and the related issue of tissue compression. Two experiments are reported. First, a pilot study identifies important factors in controlling head/transducer movement in field settings. Second, an Optotrak/ultrasound study reports the range of head movement in an optimal field-like setting within and across varying phonetic contexts, as well as the effect of tongue tissue compression on tongue image data. Results suggest that with a simple arrangement involving a head rest or surface, a fixed transducer, and careful design and presentation of stimuli, reliable lingual ultrasound data can be collected in the field.

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Technological advances have enabled speech researchers and clinicians to measure directly the movements of the vocal tract during speech with ever-increasing detail and accuracy using a wide variety of tools. Ultrasonography has proven particularly useful for accessing new populations of subjects and patients, being safer and less invasive than many other imaging tools, and often readily available in hospitals and clinics. However, there have been very few attempts to extend ultrasound work beyond the laboratory or clinic, excluding a huge pool of potential participants, whether due to age, disability, remoteness, means, or simply inconvenience. Many sources are available that describe techniques that have been used for applying ultrasound technology to speech (see other papers in this issue; also, e.g., Stone, 1997), including one previous paper describing applications for phonetic fieldwork (Gick, 2002). While it is clear that ultrasound offers many advantages over other tools for speech imaging (non-invasiveness, safety, ease of data collection, instant feedback, relatively high sampling rate, portability, etc.), a central issue has persisted in determining methods used for ultrasound research in speech, in or out of the laboratory: the lack of absolute spatial reference in the signal. The present paper describes and evaluates some of the techniques recently used for ultrasound applications in field settings, with particular