

**ACOUSTICS2008/1677**  
**Letter sound and letter name recognition for automated literacy  
assessment of young children**

Shrikanth Narayanan<sup>a</sup>, A Kazemzadeh<sup>a</sup>, Matthew Black<sup>a</sup>, Joseph Tepperman<sup>a</sup>, Sungbok Lee<sup>a</sup> and Abeer Alwan<sup>b</sup>

<sup>a</sup>University of Southern California, 3740 McClintock Ave, EEB430, Los Angeles, CA 90089-2561, USA

<sup>b</sup>University of California, 405 Hilgard Ave, Los Angeles, CA 90095, USA

Evaluations of letter naming and letter sounding are commonly used to measure a young child's growing reading ability, since performance in them is well-correlated with future reading development. Assessing a child's oral reading skills requires teachers, as well as technologies that attempt to automate such assessment, to form an item-level accept/reject decision based on speech cues and prior knowledge of the child's literacy level and linguistic background. With data collected from 171 K-2 children, both learners and native speakers of American English, we designed and evaluated an automated letter naming assessment method using a simple word-loop HMM decoding for the word-level letter names. The automated accept/reject evaluation performance, 81.9%, approached the agreement of human raters, 83.2% (0.62 kappa). However, the task where children must produce the sound that the letter represents was more difficult: English orthography allows one-to-many letter-to-sound mapping, teachers showed less agreement in their assessment (80.9%, 0.55 kappa), and the brief durations of some of the letter sounds made it difficult to distinguish them from each other and from background noises. Phone-level HMM based evaluation accuracy was 58.2%. Preprocessing the recordings into speech, silence, and noise improved these results, especially for plosive sounds. [Supported by NSF]