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Abstract

In this paper we show how effective a purely acoustic model can be for bootstrapping phonological words, by means of computer simulations using child-directed speech data. We do not posit any representational units standardly invoked in phonology, phonemes amongst others, but use acoustic features alone. The learner is alerted to the acoustically salient parts of the speech stream and guided solely by the recurrent signal patterns to find 'word-like units'. We report encouraging results, where some salient and recurrent words are successfully identified, pointing to the feasibility of acoustic-based approaches. The possibility of acoustic phonological bootstrapping, despite its potential as a learning strategy employed by pre-linguistic children since it only requires a general auditory capacity on them, has not been fully explored until recently. Following the work of Park (2008) and Aimetti et al. (2010), we use the Dynamic Time Warping method on its own, standardly required but only used in combination of non-acoustic (statistical or linguistic) models in the speech processing community. In this method, the vectors of acoustic features are extracted for each of the small slices (10 millisecond) of the stream, for comparing utterances to identify recurrent parts. In contrast to the aforementioned work, however, we add an important dimension: prosody in child-directed speech, which tends to be exaggerated. We first restrict the focus to acoustically (pitch, duration and intensity) prominent vowels to improve on the performance on one hand, and simulate the attention limited to vowels attested in psycholinguistic research (Bertoncini et al. 1988) on the other. We then broaden the focus from the identified prominent vowels bi-directionally to locate recurrent word-like (or holophrastic) fragments.