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Fine-phonetic variation in a computational model of word recognition

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There is now considerable evidence from psycholinguistic and phonetic research that fine-phonetic variation in the speech signal modulates human speech processing (HSP), and helps the listener segment a speech signal into syllables and words [e.g., Salverda et al., Cognition 90, 51-89 (2003)]. This kind of information also appears to help the human perceptual system distinguish short words (like 'ham') from the longer words in which they are embedded (like 'hamster'). Salverda et al. showed that the lexical interpretation of an embedded sequence is related to its duration; a longer sequence tends to be interpreted as a monosyllabic word more often than a shorter one. Until recently, no computational models of HSP existed that are able to model this fine-phonetic variation [Hawkins, J. of Phonetics 31, 373-405 (2003)]. In this paper, we present Fine-Tracker, a novel computational model of human word recognition that it is able to capture and use this fine-grained acoustic-phonetic variation during speech recognition. Simulations using the recordings from the listener experiments by Salverda et al. show that Fine-Tracker is able to capture and use duration variation in the speech signal to distinguish short words from the longer words in which they are embedded. [Research supported by NWO.]