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Binary coding with language models for EEG-based access methods
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Short Abstract

Computational language modeling and its contribution to speed of communication has not received adequate attention by the AAC research community. Language modeling is important when considering binary response typing interfaces, such as AAC spelling grids and alternative access methods. At OHSU, we are designing a communication system based on comprehensive language models and a brain-computer interface (BCI) for people who are functionally locked in. We have collected simulation data on two binary coding strategies: Optimal Huffman coding, which assigns binary codes with the minimum expected bits (keystrokes) per character; and linear binary coding, in which every symbol's code consists of zeros followed by a single one. Interest in the linear coding strategy is driven by our interest in a Rapid Serial Visual Presentation (RSVP) keyboard, where symbols are presented one at a time, thus precluding optimal Huffman coding. Simulations were run on the models described above without error, as well as with random errors. Data suggest that, as the probability of error increases, the keystrokes required with linear binary coding strategies approaches that of the optimal Huffman code. This information informs design of a binary choice AAC system we are developing for an RSVP keyboard interface.