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Abstract

An investigation is carried out for speaker-independent acoustic-to-articulatory mapping for fricative utterances using simultaneously acquired speech signals and articulatory data. The relation of the place of articulation with the spectral characteristics is examined using several earlier reported spectral features and six proposed spectral features (maximum-sum segment centroid, normalized sum of absolute spectral slopes, and four spectral energy features). A method is presented for estimating the place of articulation using a feedforward neural network. It is evaluated using a dataset comprising utterances with a mix of phonetic contexts and from multiple speakers, five-fold cross-validation, and networks with different hidden layers and neurons. The six proposed spectral features used as the input feature set resulted in the lowest estimation error and low sensitivity to the training data size. Estimation using this feature set with an optimal network provided a correlation coefficient of 0.978 and an RMS error of 2.54 mm. The errors were smaller than the differences between the adjacent places, indicating that the method may be helpful in providing visual feedback of articulatory efforts in speech training aids.

Keywords: Fricatives · Place of articulation · Spectral features · Speech training