

## Reconceptualizing the vowel space

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Characterization of the vowel system of a language in terms of the midpoint formant values of a relatively small set of "point" or "corner" vowels has been relatively common in phonetic research, even quite recently. See, for example, Chiung et al., 2012, who compared the vowel systems of three age groups and five languages using the F1 and F2 midpoint values for /i, u, a/. In an extensive project, Vorperian & Kent (2007) reanalyzed a set of published acoustic vowel data from speakers aged 4 through adulthood. Their study focused on vowel space development (including the F1-F2 area) based on the midpoints of the four vowels (/i, u, a, æ/) which comprise the "vowel quadrilateral." However, a limitation of this approach is the assumption that such point vowels are a valid measure of the boundaries of the speaker's vowel space although vowels are often produced outside this delimited area. Concentration on vowel formant values only at the midpoint also ignores vowel inherent spectral change which can differ as a function of both the age and dialect of the speaker (Jacewicz & Fox, 2013) and can be affected by sound change. Utilizing the formant values at a number of different locations for a wider range of individual vowels has significant implications for the size and shape of the resulting vowel space. Our recent approach to analyzing and conceptualizing the vowel space of a speaker (looking at variation in this space as a function of dialect and age) has been to define the boundaries of the vowel space on the basis of produced exemplars of all vowel categories in American English whose formant trajectories are sampled at multiple time points. We have explored different ways of defining the boundaries of the vowel space on the basis of these formant values. In addition, we considered variations in vowel "density" across this vowel space recognizing that vowels may be more concentrated and overlap more in some areas than in others (some of which may be very sparsely inhabited). We have found that the distribution of these dense areas also varies from dialect-to-dialect and generation-to-generation. We will describe the techniques used in this reconceptualization of the vowel space.