A Comparison of Vowel Format Normalisation Methods

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The process of normalising vowel formant data to permit accurate cross-speaker comparisons of vowel space layout, change and variation, is an issue that has grown in importance in the field of dialectology in recent years. A plethora of different methods and formulae for this purpose have now been proposed. However, there is still a lack of agreement over which available algorithm is the best to use.

Recent studies (e.g. Adank 2003, Adank et al. 2004, Clopper 2009, Fabricius et al. 2009) have compared techniques of normalisation and evaluated their effectiveness at normalising vowel formant data, but have varied considerably with respect to the number and range of methods tested and the criteria used to make the evaluations.

In this paper I provide a comprehensive comparison of twenty normalisation procedures, both older techniques and more recently-proposed methods. I evaluate the effectiveness of each procedure at normalising vowel formant data using a combination of visual, numerical and statistical methods.

My results are based on the normalisation under each procedure of a large dataset originally collected for a sociophonetic study, and recorded under conditions typical of sociolinguistic research.

I show that vowel-intrinsic scaling transformations perform poorly both overall and in the majority of the comparisons conducted, whether based on numerical calculations, statistical tests, or purely visual observations, suggesting that normalisation via procedures of this type is less than adequate for sociophonetic research.

I conclude that vowel-extrinsic, formant-intrinsic methods that normalise relative to the midpoint of a speaker’s vowel space perform the best at normalising the vowel formant data used, with a modified version of the Watt & Fabricius method (see Watt & Fabricius 2002, Fabricius et al. 2009) performing the best overall.

References


