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A Mathematical Agent-Based Model to Examine Two Patterns of Language Change

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Abstract : We use a mathematical model of language change to examine two recently observed patterns of language change: one in which most speakers change gradually, following the mean of the community change, and one in which most individuals use predominantly one variant or another, and change rapidly if they change at all. The model is based on Croft's Utterance Selection account of language change, which views language change as an evolutionary process, in which different variants (different 'ways of saying the same thing') compete for usage in a population of speakers. Language change occurs when a new variant replaces an older one as the convention within a given population. The present model extends a previous simpler model to include effects related to speaker aging and interspeaker variation in behaviour. The two patterns of individual change (one more centralized and the other more polarized) were recently observed in historical language changes, and it was further observed that slower changes were more associated with the centralized pattern, while quicker changes were more polarized. Our model suggests that the two patterns of change can be explained by different balances between the preference of speakers to use one variant over another and the degree of accommodation to (propensity to adapt towards) other speakers. The correlation with the rate of change appears naturally in our model, and results from the fact that both differential weighting of variants and the degree of accommodation affect the time for change to occur, while also determining the patterns of change. This work represents part of an ongoing effort to examine phenomena in language change through the use of mathematical models. This offers another way to evaluate qualitative explanations that cannot be practically tested (or cannot be tested at all) in a real-world, large-scale speech community.

Keywords : agent based modeling, cultural evolution, language change, social behavior modeling, social influence
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