

Fronts of language replacement

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One of the negative consequences of the improvements in communications and education in the recent centuries is the loss of linguistic diversity and a tendency toward language uniformity around the world. Indeed, linguists estimate that 90% of the linguistic diversity might become extinct or endangered within the course of a century [1]. This situation has yielded in the recent years the development of several mathematical models of language shift [2–5].

Here we present firstly a non-spatial model to account for the evolution over time of the fraction of speakers of two languages present within a given society, one of which is regarded as the population of being socially or economically more advantageous [5]. Applying our model to census linguistic data series for four societies where a minority language is being replaced by a stronger one [2], we obtain that it can successfully describe the evolution over time.

Many instances of language replacement are the result of the interaction with a neighboring language, thus adding as well a distinctive spatial aspect to the process and yielding the apparition of a moving linguistic border. To account for this geographical aspect, we implement our new non-spatial model as an interaction term into a reaction-diffusion model [5]. We now can estimate the measured speed of retreat of the Welsh-English border in the UK before the application of linguistic policies [4], obtaining a good agreement between data and model.

Therefore, here we present a model that can describe satisfactorily the temporal and spatial evolution of the fraction of speakers of an endangered language in contact with a stronger language. Such model could be applied to assess the level of endangerment of a minority language, but it might also be extrapolated to model other instances of cultural shift.

References

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