

Parsing advantage as the determinant of change and stability? Some problems of the variational model of language change

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The question of what factors trigger language change is inextricably paired with the dual question of what factors keep change from occurring: when change is *not* observed, what accounts for the stability of the language system? According to a recent but influential proposal in the domain of syntax – the variational model of learning and change (Yang 2000, 2002) – both change and stability are explained by the ability of different grammars to parse the input a learner encounters in his or her linguistic environment. In brief, learners “gravitate” towards the grammatical option that parses most input; when viewed on the level of diachrony, this grammatical option is a *stable fixed point*, to use dynamical-systems terminology. A stable fixed point cannot be escaped unless the parsing abilities themselves change, for example due to mixed input from language contact or phonetic erosion. Consequently, in this framework the triggers of change are equated with events which disturb the existing balance of parsing abilities and reverse the stability of diachronic fixed points.

The above has been mathematically demonstrated for the special case in which learners choose between just two competing grammatical options (see Yang 2000, in particular). Crucially, however, real-life learners have to operate in the (astronomically large) space of all humanly possible grammars, and to date there exists no consensus about how best to extend the variational model to more than two competing grammars. Yang (2002) proposes a generalization via a “Naive Parameter Learner”, which associates syntactic parameters with a vector of probabilities. While the intra-individual behaviour of this Naive Learner is reasonably well understood (Straus 2008), its diachronic, inter-generational properties remain uncharted to date. In this paper, we explore those properties by way of simple toy systems consisting of a handful – but more than two – grammars.

Specifically, we assume a toy system of two binary parameters, one controlling the order of noun and determiner (DN vs. ND, e.g. French vs. Thai), the other controlling whether determiners can be optionally omitted with common nouns ($\{\emptyset|D\}N$ or $N\{\emptyset|D\}$ vs. DN or ND; e.g. Serbo-Croatian vs. English). Assuming just these two elements D and N, this toy system gives rise to four possible grammars generating a variety of strings, the subscript 1 here denoting the “on” setting and the subscript 0 denoting the “off” setting for each parameter: G_{11} : N, DN; G_{10} : N, ND; G_{01} : DN; G_{00} : ND. Crucially for our argument, both G_{11} and G_{10} parse more input than their non-null-determiner counterparts G_{01} and G_{00} .

With computer simulations, we show that if the target grammar is G_{11} and therefore G_{11} produces 100% of the input for the following generation of learners, then this following generation eventually (given enough time to learn) sets the parameters correctly. However, if even 0.01% of the input comes from the other three grammars, there is no guarantee of convergence to the target grammar. As a result, diachronically, the system slides into a mixed state in which each of the four grammars is used essentially at random, and stays there; the fixed point corresponding to total use of the grammar with the highest parsing ability turns out to be *unstable*, under Naive Learning. The diachronic prediction, then, is that grammars allowing null determiners, such as Serbo-Croatian, ought to be impossible – since an unstable fixed point is (1) not attainable diachronically from any other initial state and (2) since the fixed point is at any rate not stable against random noise, which may at any time throw the system out of the diachronic fixed point. This goes against empirical fact, and we consequently conclude that (1) no empirically unproblematic generalization of variational learning to multiple grammars exists at the moment, or (2) determinants of change and stability other than parsing ability need to be postulated.

References

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