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The Dual-Route Model of the English Past Tense :
Another Case Where Defaults Don't Help

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In recent years, inflectional morphology has become a testing ground for proponents of rule-based and associative accounts of language (Pinker, 1993; Plunkett & Marchman, 1993; Marcus, Brinkmann, Clahsen, Wiese, & Pinker, 1995). The respective advantages of pattern associator and rule-based models have led Pinker (Pinker, 1991) to propose a hybrid, dual-route model encompassing both a pattern associator and a symbolic rule component. The pattern associator component is motivated by the facts that English irregular past-tense forms come in groups or clusters exhibiting phonological subregularities (e.g., "string-strung", "sling-slung", "sting-stung") and that human subjects produce irregulars on pseudoword generalization tasks if the pseudoword is sufficiently similar to existing irregulars (e.g., "spling" – "splung"). The rule route is required to capture the fact that unusual sounding pseudowords (e.g., "ploamph") are regularized without problem; a fact assumed to be at odds with similarity-dependent pattern-associator accounts.

The dual-route account is presented as a general model which is not only applicable to other languages, but seen as crucial for languages with so-called minority defaults (Marcus et al., 1995). In these languages, such as German and Arabic, the regular constitutes the minority of forms in the language. The crucial role of the rule route stems from the supposed inability of pattern associators as statistical devices to extract the appropriate default regularity from the data. The comparative success of connectionist models of English relies on the contingency that, here, the default suffix /ed/ happens to be the most frequent plural type.

Recent modelling work has investigated these latter claims and found them wanting. Nakisa and Hahn (Nakisa & Hahn, 1996) implemented three associative models of the German plural system and compared their performances with their corresponding dual-route, associative + symbolic default models. Given that a dual-route model offers two computational resources rather than one, it was somewhat surprising to find that all three dual-route models performed *worse* than their single-route, purely associative counterparts. Furthermore, in testing the models on an artificial language, Nakisa and Hahn demonstrated that dual-route models require *particular distributions* of items in phonological space in order to generalise more accurately than purely associative models. Comparing the output of the simple and dual-route models, it was found that they differed in their predictions only for regulars that formed shells around clusters of irregulars. By maximising the number of these "interfacial" regulars relative to the other regulars, dual-route models start to outperform purely associative models. An analysis of the distribution of German nouns in phonological space revealed, contrary to the claims of Marcus et al. (1995), that these forms do not have the distribution required for the dual-route model to outperform the simple associative model on generalisation. Subsequently, the same result was found for the Arabic plural system, where, again, adding a rule-route leads to decreased generalisation performance (Plunkett & Nakisa, In press).

This current work presents new simulation results with English, which is the language for which the dual-route model was originally devised. We have found that single-route models generalised as well as the dual-route model, with single-route and dual-route models scoring about 95% correct for the Nosofsky generalised context model and three layer perceptron. Only for the simplest pattern associator — a nearest neighbour classifier — did the generalisation performance of the dual-route model exceed that of the single-route model.

References

Marcus, G., Brinkmann, U., Clahsen, H., Wiese, R., & Pinker, S. (1995). German inflection: The exception that proves the rule. *Cognitive Psychology*, *29*(3), 189–256.

Nakisa, R., & Hahn, U. (1996). Where defaults don't help: The case of the german plural system. In *Proceedings of the eighteenth annual conference of the cognitive science society* (pp. 177–182). 365 Broadway, Hillsdale, New Jersey 07642: Lawrence Erlbaum Associates, Inc.

Pinker, S. (1991). Rules of language. *Science*, *253*(5019), 530–535.

Pinker, S. (1993). Rules of language. In P. Bloom (Ed.), *Language acquisition: Core readings*. Harvester Wheatsheaf, New York; London.

Plunkett, K., & Marchman, V. (1993). From rote learning to system building: Acquiring verb morphology in children and connectionist nets. *Cognition*, *48*, 21–69.

Plunkett, K., & Nakisa, R. (In press). A connectionist model of the Arabic plural system. *Language and Cognitive Processes*.