

Commentary on Kaplan and Kay

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Anyone with a fundamental interest in morphology and phonology, either from a scientific or a computational perspective, will want to study this long-awaited paper carefully.

Kaplan and Kay (henceforth K&K) announce two goals: "to provide the core of a mathematical framework for phonology" and "to establish a solid basis for computation in the domain of phonological and orthographic systems." They show how the algebra of regular relations, with their corresponding automata, can be used to compile systems of phonological rules in the style of *SPE*, including directionality, optionality, and ordering. They sketch mechanisms for incorporating a lexicon and for dealing with exceptional forms, thus providing a complete treatment in a unified framework.

This accomplishment in itself will not compel the attention of many working phonologists, who have found good reasons to replace the *SPE* framework (see Kenstowicz [1994] for a survey of modern practice), and whose efforts since 1975 have been aimed mainly at finding representational primitives to explain typological generalizations, support accounts of learning, generalization and change, and provide one end of the mapping between symbols and speech. In this effort, there has been little emphasis on *SPE*'s goal of giving phonological descriptions an algorithmically specified denotation. Perhaps this paper, despite its superficial lack of connection to contemporary work in phonology, will set in motion a discussion that will ultimately redress the balance.

On the computational side, practitioners of practical NLP will be happy to make extensive use of the algebra of regular relations, since it provides a truly elegant engineering solution to a wide range of problems. However, although direct interpretation of some simple FSTs can be efficient (e.g. Feigenbaum et al. 1991), and although Koskenniemi has documented efficient implementation techniques for his two-level systems, the overall architecture presented in this paper is not practically usable as written, because of either the size of the resulting automata or the time needed for (unwisely implemented) nondeterminism, or both.

A range of well-known techniques enable programs based on the algebraic combination of (unary) FSAs to make efficient use of both time and space. Although these methods do not apply to FSTs in general, we may presume that K&K have developed analogous techniques for the crucial range of cases. With the growing interest in this technology, we can expect that either K&K will publish their work or others will recapitulate it, so that the algebra of regular relations can take its proper and prominent place in the toolkit of computational linguistics.

References

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