From motion frames to grammar: a usage-based model of construction learning

Usage-based approaches to language acquisition assume that all aspects of the problem — including the input to learning, the pre-existing capacities of the learner, and the target structures to be learned — should broaden the traditional scope of inquiry to encompass meaning and communicative function. But the inclusion of such factors can present a mixed blessing: the more information is available to the learner, the more noise may complicate learning, especially in such rich and unbounded domains. Thus, while the introduction of meaning and function may reflect a more realistic view of the child's learning situation, it is not by itself guaranteed to make the learning problem more tractable. Rather, a more explanatory and tractable account of learning depends on the amount of useful structure in the new information, as well as the learner's ability to exploit such structure.

This paper identifies two structural conditions on linguistic representation that play a critical role in facilitating a usage-based model of how phrasal and grammatical structures are learned. First, linguistic meaning are taken to include schematic representations of specific situation types that define its associated set of participants and conceptual roles. These schematic structures are inspired by *semantic frames* [1] and the related literature on image schemas and other embodied schematic structures [2, 3, 4, 5]. Second, linguistic units at all levels are taken to consist of form-meaning pairings; that is, they are *constructional* in nature [6, 7, 8]. Both conditions are consistent with proposals in the developmental literature about the kinds of meanings acquired crosslinguistically for children's earliest word combinations [9, 10]. They also serve as foundational requirements for a usage-based computational model of grammar learning [11]: both input data and the target grammar representation include representations of both the form and meaning domains. The presence of relational structure within each domain, along with structural correspondences across the two domains, provides a rich representational substrate crucial for learning relational and grammatical constructions.

More concretely, the model described in this work takes as its representational basis Embodied Construction Grammar [12], a formalism designed to support two processes: language understanding, which uses constructions to interpret utterances in context; and language learning, which makes judicious changes to the current grammar to improve comprehension. The model has been applied to the acquisition of English motion expressions, using input sentences annotated with motion-based frames along with their associated role-filler pairs. The learner exploits the inherent cross-domain structure available in the input to propose both lexically specific constructions [10] (e.g., the *put*-Thing-*here* and *put*-Thing-*down* constructions, with mappings between word order relations and frame role-filler relations) and more general constructions with greater syntactic and semantic variation (e.g., *put*-Thing-Place or the Caused Motion argument structure construction). The acquisition of such constructions demonstrate the importance of structure — both frame-based semantic structure and cross-domain constructional structure — for putting meaning to effective use in grammar learning.

(472 words)

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