A Motor- and Image-Schematic Analysis of Aspectual Composition

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Aspect has long been studied by linguists trying to ascertain how the internal shape of an event affects both acceptability and interpretation of event descriptions. Current work on embodied semantics suggests new solutions to these classic problems. **Acceptability** generally concerns what are traditionally considered syntactic phenomena: appearance without special interpretations in progressive form or present tense, and combination with temporal modifiers like *in an hour* and *for an hour* (*She ran for an hour* vs. **She ran in an hour*). More difficult, but certainly related, is the problem of determining what **interpretations** or inferences are licensed by a particular sentence, including such issues as whether the event is construed as stative or changing over time; whether the event exhibits internal homogeneity (*walking*) and/or repetition over some interval (*sneezing*); and whether the event has been finished (*She ran to the store*) or is still in progress (*She is running to the store*). Temporal modifiers add additional complexity by raising issues of attachment: whether the modified interval includes some significant event or goal achievement (*She read the book for an hour* vs. *She read the book in an hour*) or instead modifies some resulting state (*She left the room for an hour*), and also what happens at the end of the modified interval (*She loved him for five years* and *She ran for five minutes* imply a halting, while *She left for an hour* implies a reversal).

This work addresses the complexities involved in these judgments by focusing on their common source: aspectual composition. Aspect is a sentence-level phenomenon, not a verb-level one; judgments depend not only on inherent verb semantics but also on the presence and characteristics of both noun phrases and prepositional phrases, or more accurately on their semantic contributions. Aspect is also largely a matter of **construal**: how people perceive the presence of trajectors, landmarks, paths and goals; the persistence and reversibility of states; the use of effort and intention; the force dynamics and/or homogeneity of actions; the time scale of reasoning; and even such nominal features as animacy, boundedness (mass/count) and quantification — all of these interact to determine the most likely interpretation of even the simplest sentence. The complexity of the phenomenon thus requires a rich, active representation that accommodates the essentially dynamic nature of events and environment, as well as the cognitive factors affecting interpretation. Although the linguistic phenomena have been widely discussed, previous approaches to aspect have fallen short of providing a unified, compositional account that is not only descriptively adequate but also cognitively motivated.

I propose a framework for analyzing aspectual composition in which verbs, arguments and temporal modifiers are all characterized in terms of the conceptual features they impose or contribute. This approach owes much to foundational work in Langacker's Cognitive Grammar, but it also draws on observations from the wider linguistics literature to make some additional claims about the nature of inherent verbal semantics and its relation to both image schemas and compositionality. In particular, verbs are claimed to provide event structure templates that can be further elaborated by other sentence elements. With such templates we can, as in Langacker (1991), distinguish states and processes by change over time (*know* vs. *walk*), and perfective and imperfective processes by change over a second dimension to achieve a goal state (*walk* vs. *walk to the store*). We can also, however, categorize verbs as either **motor-schematic**, specifying some motor action but not necessarily any change in image-schematic relations (*walk*), or **image-schematic**, specifying some change in image schema without spelling out how the change takes place (*leave*).

Cognitive explanations of these event structure distinctions are made more concrete by illustration in the context of the Neural Theory of Language, as modeled by the L_0 language acquisition project at the International Computer Science Institute (Feldman *et al.* 1996). The active schema representation employed (Narayan 1997) captures resource usage and the dynamic nature of temporal events; it also provides a way to relate both motor-schematic and image-schematic verbal specifications, since particular image schemas can enable or activate the dynamic, motor-schematic components. Thus, for example, *leave* may be enabled if some image corresponding to a notion of *in* is present, activating some motor process which in turn cannot finish until some image corresponding to *out* is satisfied. The representation also illuminates the interaction between event structure and nominals, which can instantiate pieces of the image-schematic representation (e.g. by serving as a goal or landmark, as in *walk to the park* or *leave the office*) or otherwise constrain possible interpretations (e.g. by forcing a stative reading of *The moat surrounds the castle* or a processual reading of *Soldiers are surrounding the castle*). Modification by *in-* and *for-* adverbials and appearance in progressive tense is also dependent on the features of the event structure: *in-* adverbials require some clear goal state; *for-* adverbials require a relation (either state or process) to either halt (without attaining any goal) or reverse. Progressive form may require a similar notion of temporariness and the (haltable) expenditure of effort. The proposed framework makes explicit these and other notions concerning the relationship between image- and motor-schematic representations. It thus addresses at a level of detail amenable to computational modeling the issue of precisely how aspectual composition takes place, and accounts in a unified and cognitively motivated way for a number of well-known aspectual phenomena.

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