

Grammar as a Logic of Labeling: A Computer Model

Authors : Jacques Lamarche, Juhani Dickinson

Abstract : This paper introduces a computational model of a Grammar as Logic of Labeling (GLL), where the lexical primitives of morphosyntax are phonological matrixes, the form of words, understood as labels that apply to realities (or targets) assumed to be outside of grammar altogether. The hypothesis is that even though a lexical label relates to its target arbitrarily, this label in a complex (constituent) label is part of a labeling pattern which, depending on its value (i.e., N, V, Adj, etc.), imposes language-specific restrictions on what it targets outside of grammar (in the world/semantics or in cognitive knowledge). Lexical forms categorized as nouns, verbs, adjectives, etc., are effectively targets of labeling patterns in use. The paper illustrates GLL through a computer model of basic patterns in English NPs. A constituent label is a binary object that encodes: i) alignment of input forms so that labels occurring at different points in time are understood as applying at once; ii) endocentric structuring - every grammatical constituent has a head label that determines the target of the constituent, and a limiter label (the non-head) that restricts this target. The N or A values are restricted to limiter label, the two differing in terms of alignment with a head. Consider the head initial DP 'the dog': the label 'dog' gets an N value because it is a limiter that is evenly aligned with the head 'the', restricting application of the DP. Adapting a traditional analysis of 'the' to GLL - apply label to something familiar - the DP targets and identifies one reality familiar to participants by applying to it the label 'dog' (singular). Consider next the DP 'the large dog': 'large dog' is nominal by even alignment with 'the', as before, and since 'dog' is the head of (head final) 'large dog', it is also nominal. The label 'large', however, is adjectival by narrow alignment with the head 'dog': it doesn't target the head but targets a property of what dog applies to (a property or value of attribute). In other words, the internal composition of constituents determines that a form targets a property or a reality: 'large' and 'dog' happen to be valid targets to realize this constituent. In the presentation, the computer model of the analysis derives the 8 possible sequences of grammatical values with three labels after the determiner (the x y z): 1- D [N [N N]]; 2- D [A [N N]]; 3- D [N [A N]]; 4- D [A [A N]]; 5- D [[N N] N]; 5- D [[A N] N]; 6- D [[N A] N] 7- [[N A] N] 8- D [[Adv A] N]. This approach that suggests that a computer model of these grammatical patterns could be used to construct ontologies/knowledge using speakers' judgments about the validity of lexical meaning in grammatical patterns.

Keywords : syntactic theory, computational linguistics, logic and grammar, semantics, knowledge and grammar

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