

Incremental Processing and the Architecture of Grammar

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It is standardly assumed that mental systems for grammar and processing are separate and thus, the principles of grammar should not reflect the incrementality of either parsing or production, as this is a performance phenomenon. (See Phillips 1996 for exceptional view)

In this paper, we argue to the contrary that the time-linearity of parsing and growth of interpretation are essential to the articulation of the grammar formalism, with intonation providing important clues to the structural analysis to be provided. Thus data displaying the incrementality of parsing and production, including intonation, should be included as data for testing putative structural analyses. In particular, (fully) incremental parsing of head-final languages like Korean/Japanese confirms that underspecified structure is updated step-by-step along the time line across the languages as suggested in Dynamic Syntax (DS, Kempson et al 2001, Cann et al 2005).

Our particular concern lies in multiple long-distance dependency effects, which remain challenging to all orthodox grammar formalisms. In these, more than one term appears at the left periphery apparently extracted an arbitrary distance away from its source site at which it contributes to interpretation. There is however an additional constraint on such constructions that the two or more items so extracted have to be interpreted relative to each other. With long-distance dependency as a pairing of positions in a string in principle independently articulated and then correlated through some system of indexing/abstraction, there is no principled reason for this co-constraint across two such node-pairings. Adopting however a Dynamic Syntax perspective in which syntactic phenomena are analysed in terms of the progressive building up of semantic representations across a sequence of progressively enriched partial trees, there is a natural basis for explanation. DS articulates a range of forms of underspecification-plus-update both for content and for structure. In DS, a family of variant forms of structural underspecification are defined, with partial tree relations constructed that either have to be resolved locally or may be resolved non-locally. The former correspond to local scrambling for which nodes may be introduced as unfixed and resolved within a local domain (=immediate

or low attachment) and the latter corresponds to long-distance scrambling, which can be resolved within some larger domain, that of an individual tree (=non-immediate or high attachment). In both cases, the presumed process of update is essentially left-to-right, so that some initial structural underspecification is subsequently updated during the construction process. The feeding relation between these two update processes is, on this view, expected, and constitutes the basis of multiple long-distance dependency. In the incremental parse of a sequence of NPs, a ‘long-distance’ unfixed node can be constructed, from which the routine of building a local domain for a pair of argument nodes as induced by the local scrambling strategy can then be constructed. The prediction of relative locality of multiple long-distance dependency is immediately expected without any stipulation. Further evidence of this form of analysis comes from intonation. With appropriate intonation, Korean informants find these multiple long-distance dependency constructions relatively straightforward to parse far ahead of the verb; and with inappropriate intonation (eg splitting off one member of the paired scrambled item from the other) leads to severe garden path effects. This form of analysis is further buttressed by several psycholinguistic tests such as (i) off-line sentence completion with given partial prosodic input, (ii) on-line self-paced reading, and (iii) off-line auditory acceptability test. These tests support that processing a head-final language like Korean can be fully incremental by the use of (i) context, (ii) (constructive) case and (iii) (anticipatory) prosody. We thus argue that the evidence for evaluating competing grammar formalisms can no longer be restricted to judgements of acceptability, but must be extended to supposed performance data of this sort.

Experiments

- (1) Off-line Sentence Completion (with/without prosody)
 - (i) Off-line written sentence completion Expectation for the embedded verb
 NP-acc NP-dat NP-top NP-nom Adv ... (Transitive/Ditransitive Verb)
 - (ii) Auditory fragment completion: % refers to Intonational Phrase boundary
 Underscored verbs were observed mostly
 {NP-acc NP-dat}%{NP-top NP-nom Adv ... (Transitive/Ditransitive Verb)
 {NP-acc}%{NP-dat NP-top NP-nom Adv ... (Transitive/Ditransitive Verb)
- (2) On-line Self-Paced Reading Test results: TME at the underscored region
 - a. NP-acc NP-dat NP-top NP-nom Adv transitive Verb Verb
 - b. NP-acc NP-dat NP-top NP-nom Adv ditransitive Verb Verb
 - c. NP-acc NP-dat NP-top NP-nom Adv NP-dative ditransitive Verb Verb
 - d. NP-acc NP-dat NP-top NP-nom Adv ditransitive Verb NP-dative Verb

- (3) Off-line Prosodic Phrasing Test results:
% refers to Intonational Phrase boundary
- a. {NP-acc}%{NP-dat NP-top NP-nom Adv transitive Verb Verb
 - b. {NP-acc NP-dat}%{NP-top NP-nom Adv ditransitive Verb Verb
 - c. {NP-acc}%{ NP-dat NP-top NP-nom Adv NP-dative ditransitive Verb Verb
 - d. {NP-acc NP-dat}%{NP-top NP-nom Adv ditransitive Verb NP-dative Verb

References

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