

A Computational Argument for Subjacency

Berwick R. & A. Weinberg, The Grammatical Basis of Linguistic Performance
Cambridge, MA: MIT Press, 1984.

(1) *Question:* What is the relationship between the grammar and the parser?

Kinds of answers: none;
input-output mimicry;
isomorphic (e.g. Derivational Theory of Complexity),
or merely homomorphic,
weaker correspondence theories ...

(2) The theory of grammar delimits the class of possible parsing algorithms because it specifies the function to be computed by the parser.

(3) **The Marcus Parser**

Marcus M. A theory of syntactic recognition for natural language Cambridge: MIT Press, 1980.

- (a) For every surface string, it associates the same annotated surface structure that would be paired with that sentence by a transformational grammar.
- (b) It explicitly respects certain principles of transformational grammar. E.g. subjacency, opacity conditions, etc.
- (c) It accesses lexical properties at every level of representation. I.e. a machine analogue of the projection principle.

(4) Critically, it is an **LR(*k*)** parser:

- (a) It parses left-to-right, essentially “undoing” transformations, with a small look-ahead (where *k* is the number of symbols it can look-ahead.)
- (b) It does so **deterministically**. It cannot build representations in parallel, or in pseudo-parallel (i.e. backtrack)
 - i. Nodes, features and attachment relationships are permanent.
 - ii. Any syntactic substructure created by the parser for some input must be in the output.
 - iii. The internal state can't encode any temporary syntactic structures.

(5) What information can it make use of?

- (a) the **left context:** * the most recent, uncompleted phrase;
* the most recent, uncompleted cyclic node.
- (b) a finite **look-ahead**

(6) *Why look-ahead is important.*

John couldn't believe **Λ** Bush **Λ** won the election.

believe [_{NP} Bush]
believe [_S [_{NP} Bush] ...

believe [s' \emptyset [s [NP Bush] ...

- (7) *Inserting a trace can be decided completely locally in many cases.*
What did John devour with a spoon?

devour [NP ____]

- (8) *But local information isn't always sufficient.*
What did John eat with a spoon?
Did John eat with a spoon?

We must rely on the left context.

- (9) *Rules in the parser's control table must be finitely representable.*

<i>If</i>	[s' Wh [s NP [VP V	<i>then</i>	INSERT t	<i>OK</i>
<i>If</i>	[s' Wh ... [VP eat	<i>then</i>	INSERT t	<i>not OK</i>

- (10) Subjacency, then, can be seen as the adaptation of the parser to ambiguity.

- (11) Outstanding conceptual questions:

(a) Why *subjacent*?

(b) Why shouldn't the following distinction obtain:

v. What did John believe the claim Harry would like to devour?
*What did John believe the claim Harry would like to eat?