Is Syntactic Binding Rational?

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Constraints in TAG and MGs

Rational Constraints

A constraint is **rational**

- iff it can be defined by an MSO formula
- iff it is computed by a bottom-up tree automaton
- iff it defines a regular tree language.

- **Most powerful class** of constraints that can be added to TAGs and MGs without increasing strong generative capacity
- How much of syntax can be expressed in terms of rational constraints (and thus in vanilla TAGs and MGs)?
  Binding is known to be one of the hardest problems...

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Necessary Restrictions

A rational theory of binding can at most

- verify the **existence of some grammatical reading** (but not specific readings; cf. Rogers 1998), and
- handle **syntactic binding** (but not discourse binding; cf. Ristad 1993).

Given these restrictions, reflexives (Principle A) are easy. Only bound pronouns that need to be disjoint in reference (Principle B) are problematic.

Computing the Satisfiability of Principle B

The Checkbook Version of Principle B (Simplified)

- There are **obviation domains** and **possible antecedents**.
- Obviation domains incur one point of **debt** for each syntactically bound pronoun satisfying certain conditions.
- The entire **debt** must be "paid off" by **antecedents**.

Example

(1) a. * **Every patient** said that **he** should sedate **him**.

b. **Every patient** told **some doctor** that **he** should sedate **him** in front of him.

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Limited Obviation

The checkbook algorithm is rational iff **Limited Obviation** holds:

Limited Obviation

There is some k such that no obviation domain's debt exceeds k

$\Rightarrow$ only a bounded number of pronouns per obviation domain are mututally disjoint in reference.

No counterexamples to Limited Obviation in

- English,
- German,
- American Sign Language

$\Rightarrow$ **syntactic binding is rational**

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References

Ristad, Eric Sven. 1993. *The language complexity game*. Cambridge, Mass.: MIT Press.

Rogers, James. 1998. *A descriptive approach to language-theoretic complexity*. Stanford: CSLI.