**XNL-Soar, Incremental Parsing, and the Minimalist Program**

Deryle Lonsdale, LaReina Hingson, Jamison Cooper-Leavitt, Warren Casbeer, Rebecca Madsen

BYU Department of Linguistics

---

**Abstract**

The object is a new incremental language modeling parser

Systeematic experimentation based on the Minimalist Program (Chomsky 1981)

Unified theory of cognition

The framework

- Syntax, lexicon, and declarative organizational modeling (Saelig 1988)
- Machine learning applications (Laal et al. 1991)
- Models for incremental human language processing

The goal: explore MP correlations with prior psycholinguistic findings in human language processing (Levi 1991)

The object: a new incremental language modeling parser

- Incremental operational mapping of syntax/semantics and discourse/conversation components
- Linearized operation over on-line linguistic input

- Building MP syntactic rules via projection, merge, and move operations
- Construct operators using sub-language and hierarchical information
- Allow strategies for building lexical structural constraints for approximate ambiguity

**Background: Soar**

- General theory of human problem-solving
- Cognition: language, action, performance (in all their various)
- Observable measurable, time course of behavior, deliberation
- Knowledge levels and their use
- Simulate the model as computational system
- Support content-based retrieval
- Support discourse-driven problem specification

- Machine learning

- Applications: robot, video games and simulations, tutorial dialogues, etc.
- NL-based natural language processing engine built on Soar

**Background: NL-Soar**

- Sear extensions for modeling language use
- Unified theory of cognition
- Sear cognitive modeling system
- NL components
- Unified cognitive architectures for model cognition including NLP
- Used specifically to model language use: acquisition, language use, language-based problem-solving
- Different modalities supported

<table>
<thead>
<tr>
<th>Operator trace (partial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: lexaccess(third)</td>
</tr>
<tr>
<td>3: lexaccess(noun)</td>
</tr>
<tr>
<td>2: movehead(adj)</td>
</tr>
<tr>
<td>4: movehead(adjective)</td>
</tr>
<tr>
<td>5: merge2(P)</td>
</tr>
<tr>
<td>7: movehead(verb)</td>
</tr>
<tr>
<td>6: movehead(subject)</td>
</tr>
</tbody>
</table>

**References:**

- University of Chicago Press.
- Cambridge, MA.

**Related issues:**

- General theory of human problem-solving
- Cognition: language, action, performance (in all their various)
- Observable measurable, time course of behavior, deliberation

---

**Similar Work**

- Incremental parsing in general (Philip 2013)
- Unified theory of cognition
- Sear extensions for modeling language use

- The object: a new incremental language modeling parser

---

**For more information:**

- on Soar: http://soarproject.arc.arc.nasa.gov
- on XNL-Soar: http://linguistics.byu.edu/xnlsoar