Interactive Graphical Software for Teaching the Formal Foundations of Head-Driven Phrase Structure Grammar

Frank Richter
Ekaterina Ovchinnikova
Beata Trawiński
W. Detmar Meurers

{fr, eo, trawinski}@sfs.uni-tuebingen.de, dm@ling.osu.edu.

The 7th Conference on Formal Grammar
Trento, Italy, 3-4 August 2002
Overview

- The Morph Moulder (MoMo)
- Context of Use
  - A System of Courses
  - Feature Structures as Unifying Theme
- The Origin of the MoMo Idea
- The Role of MoMo in our System of Courses
- Demo
- Didactical Thoughts
- Summary and Outlook
Introducing MoMo

The Morph Moulder (MoMo) is a graphical, interactive, educational software tool for

- learning the properties of feature structures
- introducing constraint languages
- exploring the meaning of descriptions in a domain of feature structures
- getting acquainted with formal notions of
  - a constraint-based grammar
  - models of constraint-based grammars
Context: A System of Courses

MoMo was conceived and realized within the context of a set of courses in *Grammar Formalisms and Parsing*:

- Formal foundations of linguistic theory (HPSG)
- Grammar development and implementation
- Constraint-based parsing
Feature Structures as Unifying Theme

A key idea behind the system of courses being developed currently is designing a teaching framework around a unifying theme. An attractive unifying focal point is surely the subject of feature structures since they:

- underly the most comprehensive and rigorous syntactic theorizing in linguistics (HPSG, LFG, TAG, ...),
- are used in most grammar implementation efforts and thereby allow discussion of algorithms involved in processing such grammars,
- have clear formal foundations.
The Origin of the MoMo Idea

First introduction to HPSG syntax in Tübingen, for students without prior knowledge in syntax, HPSG or logic.

Course focuses on the basic notions of syntax: parts of speech, phrase structure, agreement, raising, control, unbounded dependencies, binding.

Course starts by introducing a standardized version of the logical description language of HPSG, accompanied with problem sets that require the students to construct three dimensional feature structure models of toy grammars (using feature structures made of Styrofoam and wires).
The Role of MoMo in our Courses

The MoMo strategy of teaching the formal foundations of linguistic theory:

- MoMo projects the formality of its subject, the formal foundations of constraint languages over feature structures, onto a graphical level.

- Students gain a firm intuitive understanding of the subject before being confronted with abstract mathematical definitions.

- Students can draw on prior world knowledge when working in an interactive, graphical environment.

MoMo provides the mathematical underpinning to all three course modules mentioned above.
Teaching Strategy: Seminar-style Courses

The traditional seminar-style teaching method underlying courses with the three main subjects of our system of courses has a number of inherent problems:

- Seminar-style teaching format presupposes fairly coherent audience.
- Student/teacher ratio not scalable — computers only used as a medium to implement grammars.
- While theoretical material (overheads and research papers) is in electronic form, content not easily accessible without lectures.
- Lectures make little use of graphical and interactive visualization of formal topics.
- Course follows single path through material — difficult for student to adapt according to specific interests/background.
Teaching Strategy: Web-based Training

Online courses have several advantages compared to courses in a traditional seminar-style setting:

- They are better suited for a diverse audience with varying background and different prior knowledge, allowing students to find their own learning paths through the course materials.
- Courses become more independent of restrictions on place and time.
- They offer teaching/learning methods which are not accessible or accessible only to some degree for traditional seminar-style courses:
  - interactive and highly networked textual learning material; hyperlinks allow the transfer of knowledge among linguistic, computational, and mathematical sources,
  - learning by playing with interactive educational tools,
  - visualization of abstract concepts.
Summary and Outlook

- We discussed the design, use and purpose of MoMo.
- We discussed the unifying role that MoMo plays in a system of courses in
  - formal foundations of linguistic theory,
  - development and implementation of grammars,
  - constraint-based parsing.
- All course materials are integrated with the web-based learning platform ILIAS.
- We expect to conclude work on all modules by the end of 2003.