Overview of the Matrix

What is the Matrix
Motivation
History and Use
Components of the Matrix
The Grammar Matrix

- An **open-source** starter kit of software for
- the **rapid development** of implementations of
- cross-linguistically **consistent**
- scalable **broad-coverage**
- **precision** grammars
Motivation for the Matrix

- Foundations of grammar need to be solid
- Past experience helps to avoid bad choices
- Common architecture simplifies exchange of analyses among groups
- Common semantics speeds multi-lingual application construction
Expected Benefits

- Grammar matrix supports bottom-up approach to developing language universals
- Central role of types enables modularization and specialization that is linguistically sound
- Common semantic representation for multiple languages is good for applications
- Removing early hurdles may inspire more development of solid, useful grammars
History

- April 2002: Start, from grammars for English, Japanese (word order, negation, inversion, yes-no questions) [Bender et al., 2002]
- June 2002: Improved support for lexical rules
- March 2003: Standardized semantic composition of MRS
- August 2003: Further refinement of architecture for MRS
- October 2003: Bug fixes in rules, based on first uses
- April 2004: Added lexical types
- September 2004: Added inventory of HEAD types [Bender and Flickinger, 2005]
- 2005: First customization script
  www.delph-in.net/matrix/customize
- 2007: Coordination
- 2009: Tense-Aspect
Grammars using the Matrix

- Norwegian
- Modern Greek
- Korean
- Spanish
- Portuguese
- Mandarin
- Bulgarian
Basic type hierarchy

- Signs: lexemes, words, phrases, lexical rules
- Architecture of feature structure (standard HPSG)
- Mechanisms for semantic composition
- Rules and types for coordination
Lexical types

- Closed-class and basic open-class
- Part of speech (and associated semantic generalizations)
- Subcategorization
- Inflectional morphology (possibly external)
- Amalgamation of non-local features
- Values for the semantic HOOK features
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Syntactic rules

- Head-subject rules
- Head-complement rules
- Head-specifier rules
- Head-modifier rules
- Head-filler rules
Architecture of the sign

\[
\begin{align*}
\text{SIGN} & \quad \text{SYNSEM} \quad \text{LOCAL} \\
\text{HEAD} & \quad \text{CAT} \quad \text{VAL} \\
\text{MOD} & \quad \text{SUBJ} \\
\text{SPR} & \quad \text{COMPS} \\
\text{LTOP} & \quad \text{INDEX} \quad \text{handle} \\
\text{RELH} & \quad \text{HCONS} \\
\text{SLASH} & \quad \text{ARGS} \quad \ldots \\
\end{align*}
\]
References I

The Grammar Matrix: an open-source starter-kit for the rapid development of cross-linguistically consistent broad-coverage precision grammars.
In Proceedings of the Workshop on Grammar Engineering and Evaluation at the 19th International Conference on Computational Linguistics, pages 8–14, Taipei, Taiwan.

Rapid prototyping of scalable grammars: Towards modularity in extensions to a language-independent core.
In Proceedings of the 2nd International Joint Conference on Natural Language Processing IJCNLP-05 (Posters/Demos), Jeju Island, Korea.