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OBERSEMINAR LOGIK UND SPRACHTHEORIE

VORTRAGSANKÜNDIGUNG

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Dialogue Systems and Type Theory

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Dialogue systems are systems that permit human-computer interaction with spoken language. To build a dialogue system involves almost all aspects of linguistics: phonology (speech recognition and synthesis), morphology, syntax, semantics, and pragmatics. Some recent systems are moreover multimodal: they enable user input combined from speech and other input devices (e.g. “I want to go from here to here” combined with two mouse clicks on a map). Dialogue systems are therefore complex and consist of tens of components, often written in several different programming languages and data formats.

Type theory, on the other hand, provides a method of specifying formal systems in a purely declarative, single-source manner. This method is implemented in Logical Frameworks, which have greatly simplified the task of implementing proof systems for different logics and calculi. Grammatical Framework, GF, is a grammar formalism based on a logical framework: it uses type theory for defining semantics, to which it adds a notation for defining translations between concrete languages and the type-theoretical semantics.

Thus GF extends the capacities of logical frameworks from formal systems to natural language processing systems. This makes it possible to derive most of the components of a dialogue system from a single, declarative GF source. This naturally includes user input parsing and system output generation, but also some less obvious components:

- speech recognition: deriving language models from grammars
- multimodal fusion: combining speech and mouse clicks to a semantic representation
- dialogue management: computing the system’s responses to user input
- localization: porting a dialogue system from one language to another

These techniques are not only theoretically interesting: they were put into practice within the European project TALK (Tools for Ambient Linguistic Knowledge) in 2004–2006.

The talk will give a brief introduction to GF using dialogue system examples, and then discuss some of the problems from the type-theoretical point of view. We will also show some demos of systems built using GF.