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ForTheL language and linguistic aspects of the SAD

Evidence Algorithm

- Task: computer-aided mathematics
- Form: mathematical text processing
- Research:
  - Formal languages for mathematical text's presentation
  - Deductive routines as a measure of "evidence" in proofs
  - Information environment, a base of mathematical knowledge
  - Interactive proof search
- Principles:
  - Closeness to a natural language
  - Closeness to a natural reasoning
- Developed:
  - Formal Theory Language (ForTheL)
  - First-order goal driven sequent calculi (GD1,GD2,LPCT)

The result is the **System for Automated Deduction (SAD)**

Formal Theory Language

Basic features:

- Allows to write definitions, axioms, theorems, proofs
- Imitates constructions of a human language (English)
- Has a formally defined syntax (context-free grammar)
- Has a formally defined semantics (first-order language)
- Extensional number of syntactic primitives

ForTheL text is a collection of sentences grouped in sections. There are four types of such sections:

- **top-level: axioms, definitions, theorems**
- **low-level: proofs, blocks**
- **Case analysis , leading to contradiction, induction**
- **Dynamic (in-text) extension of current vocabulary**

An example

Example: All humans are mortal. Confucius is a human. Hence he is mortal.

FOF: $(\forall x)(aHuman(x) \rightarrow isMortal(x))$

$aHuman(Confucius)$

$isMortal(Confucius) - ?$

ForTheL:

[the confucius][a human][x is mortal]

Axiom. Every human is mortal.

Axiom. Confucius is a human.

Proposition. **Confucius is mortal.**

Further developments

- Extend ForTeL with commonly used constructions, to made it more convenient for user:

$$(\exists! x)A(x) \Leftrightarrow (\exists x)(A(x) \,\&\, \forall x \forall y(A(x) \,\&\, A(y) \rightarrow x = y))$$

ForTheL:

[a human]

***Axiom*. There exists human X.**

***Axiom*. There exists exactly one human X.**

[ForTheL] parsing successful:

***Axiom*. exists X aHuman(X).**

***Axiom*. (exists X aHuman(X) and forall X_1 forall X_2 ((aHuman(X_1) and aHuman(X_2)) implies X_1 = X_2)).**

- Describe and give theoretical foundation for techniques of formalization in number of mathematical branches

Further Information and Contacts

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