Logic as a Path to Enlightenment

Work in Progress Report

Wolfgang Schreiner

Research Institute for Symbolic Computation (RISC)
Johannes Kepler University, Linz, Austria
Wolfgang.Schreiner@risc.jku.at

Enlightenment and Education

- Enlightenment: reject claims based on authority ("ipse [Aristotle] dixit")
  - Only two sources of truth acceptable:
    - Empirical evidence (observation)
    - Well-formed arguments (reasoning).
  - Stark contrast to pre- or even anti-modern views.
- Education: often claims accepted by authority ("ipse [the teacher] dixit")
  - Even in "rational" disciplines like mathematics or computer science.
    - Presentations of propositions, rules, methods, and algorithms (more often than not) lack proper justification.
  - Students educated to become "believers" (or, equally worse, "non-believers") rather than "rational skepticists".

Students should be provided a basis for rational discourse.

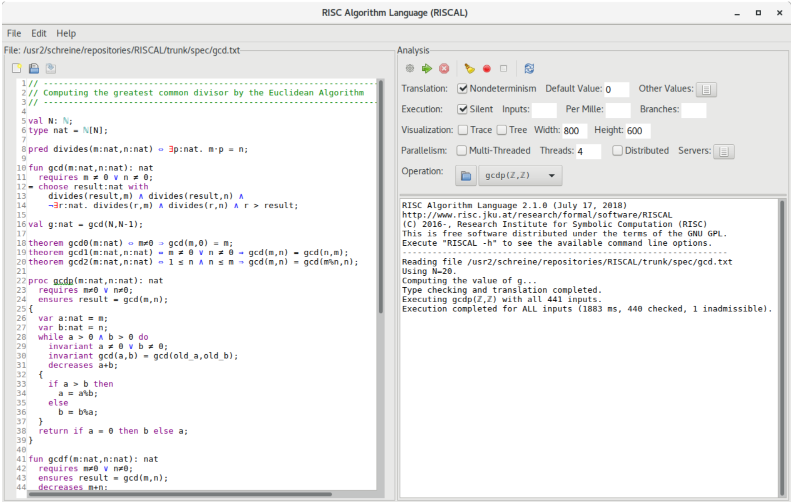
Logic as a Path to Enlightenment

Logic as the "science of reasoning" provides such a basis.

- Predicate logic: the "modern" logic of today.
  - Starting with Frege's "Begriffsschrift" in 1879.
  - Incorporates and supersedes Aristotle's term logic.
  - Rich enough to capture most of mathematics and much of natural language.
- Construct formal models of reality with precise meaning and reasoning rules.
  - State propositions as formal sentences.
  - Derive valid arguments that prove the propositions.
  - Judge whether such arguments are valid or not.

Should be taught as a practical "working language" for modeling and reasoning.

The RISCAL Software



Automatic checking of theorems, algorithms, and verification conditions.

Conclusions

- Goal: logic-based self-directed learning
  - Techer become "enablers" by providing basic knowledge and skills
  - Students "educate themselves" by solving problems.
    - (Voluntary) quizzes, (mandatory) assignments, possibly (graded) exams.
- Initial target: undergraduate university students.
  - Reachout both "up and down" to graduate students and to high-school students.
- Initial focus: computer science and mathematics.
  - First own courses on "Logic", "Formal Modeling", "Formal Methods"; later also others' introductory courses on algorithms and software development.

Towards "enlightenment" via "rational thinking" by "self-directed learning".