

Logic as a Path to Enlightenment

Work in Progress Report

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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 skeptics”.

Students should be provided a basis for rational discourse.

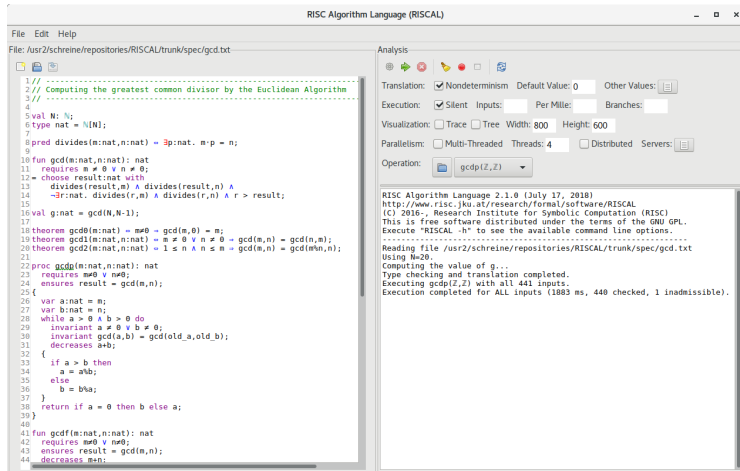
Logic as a Path to Enlightenment

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**
 - ▶ Teacher 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”.