

# Mathematical theorem proving, from Muscadet0 to Muscadet4, why and how ?

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We will present the ideas and the choices which have been made throughout the development of the Muscadet theorem prover. We will first see the principles and main ideas which lead to a first prover in the context of the time, influenced by a famous paper by Woody Bledsoe. This program used natural methods and was applied to set theory. It was then rewritten as a knowledge based-system where an inference engine applied rules, given or automatically built by metarules which expressed general or specific mathematical knowledge. It has been applied to some difficult problems. In order to allow more flexibility for expressing knowledge, it has been rewritten in Prolog, allowing the knowledge to be more or less declarative or procedural. To work with the TPTP Library the system had to work without knowing anything about mathematics except predicate calculus. All mathematical concepts had to be defined with mathematical statements, and the belonging relation handled as any other binary relation. To avoid translating knowledge to TPTP syntax, TPTP syntax has been used (this unfortunately forbade the use of some abbreviations mathematicians are comfortable with). Last but not least, the relevant trace has been extracted to give a proof easily read by anyone, except in the case of failure, when all steps may be displayed to understand (manually) the reasons for the failure. Muscadet has participated to CASC competitions. The results show its complementarity with regard to resolution-based provers.