How to prove it

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In this note I compare the motivation of conventional theorem proving and proof planning and show that the methodology is influenced by gender.

In conventional theorem proving the aim is to control technique by verifying programs. The method which is used is implied by this motivation. The theorem prover is applied to a random selection of theorems and the search for a proof is pruned by crude heuristics which prefer winning branches to loosing ones. From the beginning of philosophical thought mathematics has been defined as the highest rational exercise. Conventional theorem proving builds upon this tradition and therefore I identify this as a male form of reasoning. As femaleness has been associated with what transcends male rationality, the concept of proof planning will be considered as female form of reasoning.

In contrast to conventional theorem provers proof planning is concerned with investigating the proof process and to make this transparent to the user. As proof planning enhances the understanding how it is possible to invent a proof, the final control is back to the user. Using classical proof planning the complete proof plan for a conjecture is computed prior to executing any tactic. No information about the history of the proof and previous steps in the proof plan are available to the *uninformed* planner.

These drawbacks are obsolete for *incremental proof planning*. In *incremental proof planning* the knowledge about the domain of application, i.e. the strategy, and about tactics is declaratively represented by *meta-rules*. Within incremental structured proof planning, the history of the proof is exploited in order to determine the next applicable meta-rule. The heuristics build on the experiences of the user. The modeled knowledge is context-dependent. Meta-rules can be structured in *meta-rule sets* providing a further level of abstraction. For instance, techniques for certain proof situations may be collected in some meta-rule sets. Changing the meta-rule set adopts the strategy to the current proof situation. The declarative representation of strategy knowledge eases the maintenance and development of the meta-reasoning component, since the meta-knowledge is no longer scattered over the proof planner. The proof planner can explain why a certain tactic has been applied or why the results have been rejected by the persistence condition. Thus the user may infer the reason for a failure of the proof which helps speculating a lemma or it might be a hint for a modification of the set of meta-rules.