

Logical reasoning and programming, lab session XIII

(January 7, 2019)

The goal of this final lab session is to play a bit with proof assistants. We use Isabelle (used during labs), which has a brief tutorial available here. Another reasonable option is Lean with an online tutorial available here.

- XIII.1** Open theory `Isabelle2018/src/HOL/ex/Sqrt.thy` (HTML version) and play with it. It is possible to prove various steps using `try0`, `try`, and `sledgehammer`. Try them!
- XIII.2** Open theory `Isabelle2018/src/HOL/Isar_Examples/Group.thy` (HTML version) and play with it. You can try to use automation for the proofs and also find counter-examples (`quickcheck` and `nitpick`). You can go through examples that we discussed at previous labs like $x * y = y * x$.
- XIII.3** Open theory `Isabelle2018/src/Doc/Tutorial/ToyList/ToyList.thy` (HTML version) and play with inductive proofs there. You can also try to break things by stating false theorems (e.g., `rev(xs) = xs`) and try to find counter-examples for them. You can also try to prove claims by automation tools like `sledgehammer`. Although it fails (why?), try to solve sub-goals created by induction automatically.
- XIII.4** For example, you can also check a simplified model of Unix filesystem in `Isabelle2018/src/HOL/Unix/Unix.thy` (HTML version).