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 $x \cdot y = y \cdot x$.

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., $\text{rev}(xs) = xs$) 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).