SMT-based constraint solving in Lean 4

The cvc.lean library: safety and ergonomics

repository
github.com/anzenlang/cvc.lean

information, slides, and relevant links
anzenlang.io

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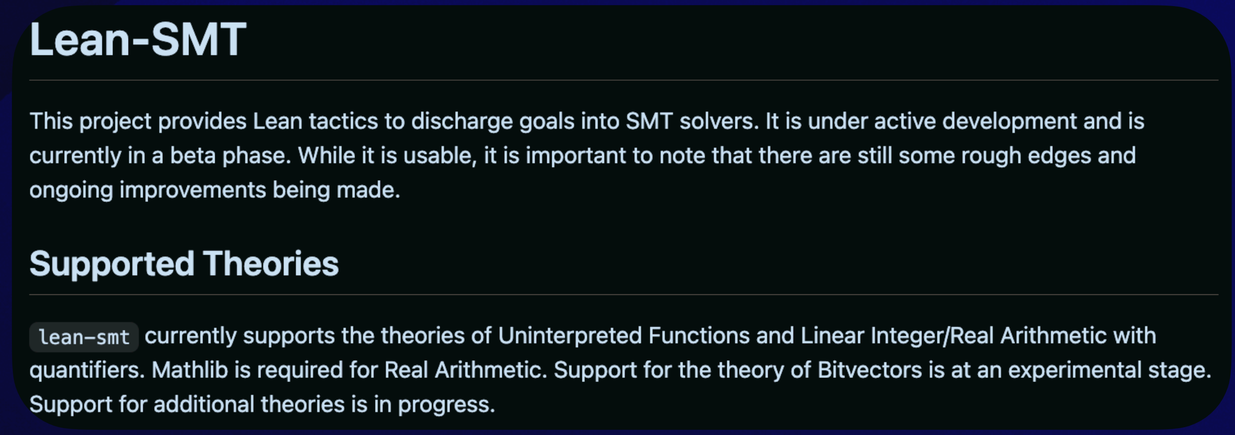
cvc.lean: context

- collaboration with *Cesare Tinelli* at the University of Iowa, and the cvc5 team
- Lean 4 library exposing the cvc5 (C++) SMT solver's API --- using C-level FFI
- focus on safety and ergonomics
- public but unstable, not officially released: everything can change (and will improve)
- offshoot of the lean-smt project:



Lean-SMT

This project provides Lean tactics to discharge goals into SMT solvers. It is under active development and is currently in a beta phase. While it is usable, it is important to note that there are still some rough edges and ongoing improvements being made.

Supported Theories

`lean-smt` currently supports the theories of Uninterpreted Functions and Linear Integer/Real Arithmetic with quantifiers. Mathlib is required for Real Arithmetic. Support for the theory of Bitvectors is at an experimental stage. Support for additional theories is in progress.

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Let's jump right into it

- **demo time**

- access the (documented) demo file here:

  github.com/anzenlang/cvc.lean/blob/demo_2025_02/CvcTest/Demo/February2025.lean

- or simply go to anzenlang.io/blog

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Advanced features

- interpolation
- quantifier-elimination
- partial information retrieval in *unknown* mode
- proof / unsat-core retrieval in *unsat* mode
- sat-core in *unsat* mode

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Thank you!

Useful links

- information, slides, relevant links for this talk: anzenlang.io
- cvc.lean: github.com/anzenlang/cvc.lean

- lean-cvc5 (very low-level cvc5 FFI): github.com/abdoo8080/lean-cvc5
- lean-smt: github.com/ufmg-smite/lean-smt

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