

# Project proposal

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## 1 Propositional dynamic logic solver

The idea of the project is to implement a solver for propositional dynamic logic (PDL). The input would be a formula in PDL and optionally a kripke structure for that formula. The output result is either *unsat*, *sat* or *unknown*. If a kripke structure is given, the result scope would be restricted to this kripke structure. Otherwise, the result scope would be all possible kripke structures.

## 2 Implementation

The project is primarily code and would use the SMT solver CVC4 as a back end and apply the relation theory to implement the semantics of PDL. The project would import CVC4 abstract syntax tree (AST) for relations from another project that I am working on (Alloy2SMT translator<sup>1</sup>) which supports type checking and SMT models parsing. For this project I would write a translator from PDL AST to CVC4 AST and display back the SMT models returned from CVC4 as Kripke structures and dot files for visualization using software like graphvis.

## 3 Progress so far

Since the imported CVC4 AST is written in Java, I have created a java project for PDL using gradle<sup>2</sup>. I have written an ANTLR4 grammar for PDL following the syntax in chapter 5 in [1]. Lastly I prepared classes for PDL AST for formulas and programs. Next tasks are parsing PDL formulas into PDL AST and translating this AST into CVC4 AST.

## 4 Preferences for presentation day

I prefer April 30 for my presentation day.

## References

- [1] D. Harel, D. Kozen, and J. Tiuryn. *Dynamic Logic*. Foundations of computing. MIT Press, 2000.

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<sup>1</sup><https://github.com/CVC4/org.alloytools.alloy/tree/cvc4/alloy2smt>

<sup>2</sup><https://github.com/mudathirmahgoub/pdl>