Walking Through My Thesis
Necessary Liberal Preconditions: A Proof System

Anran Wang

Department of Informatics
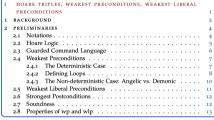Technical University of Munich

December 6, 2023

Agenda

1 Thesis Structure

2 Contribution

3 Current TODOs

Link to repository:
https://github.com/AnranW/wlp/blob/main/thesis/main-anran-ma.pdf

Overview: 3 Parts, 30 Pages, N Images

CONTENTS

Currently divided into three parts:

Part I Definitions, explanations, illustrations.

Part II Proposals, proofs, examples.

Part III Tables, figures, acronyms.

Part I: Hoare Triples, Weakest Preconditions, Weakest Liberal Preconditions

Chapter 1: Background

- Convince that proof systems are important
- Show the structure of the thesis

Chapter 2: Preliminaries

- Table of Notations
- Definitions of Hoare Triples, GCL, wp, wlp, sp
  - Explain the use of lfp and gfp
- Soundness: semantics of wp, wlp, sp
- Properties of wp and wlp that will be used in part II

Part II: Necessary Liberal Preconditions

Chapter 3: A Proof System

- Literature review: the similar triples that have been studied
- Studying a special G such that $wlp.C.F \implies G$: establish wlp with angelic non-determinism using G and sp.
- Studying G in general: proving things negatively

Chapter 4: Conclusion

- Conclusion
- Future work

Part III: Appendix

- Symbols and Acronyms
- Graphical illustration of predicate transformers (all combinations)

Contribution of My Thesis

- (Re-)Explanation of the use of least and greatest fixed points while defining predicate transformers, might be of pedagogic value.
- Establish wlp in angelic setting using wlp_d and sp, which might shed light on angelic and demonic views on non-determinism.
- A proof system that proves programs when negation is hard or impossible.

Current TODOs

Tons of refining and correcting, plus:

(Code: 🙂-happy for now, 🌗-halfway there, 🌑-to be continued)

Thank you!