

Project Proposal

Concepts of Program Design

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1 Background

- Reversible Computation
- Janus
- other languages
- a bit of theory

2 Problem

2.1 Experiment

2.2 Extensions

- Data structures (trees/sets/maps/ADTs)
- Prelude
- Syntactic sugar

2.3 Applications

- Pathfinding algorithms
- Encoding-Decoding
- Low-level bit manipulation (hamming error correction)
- [Optional] Reversible Debugger

2.4 Benchmarking

- Janus vs rFun
- LOC metrics

2.5 Formal verification

- Reversibility
- Verifying pre/post-conditions
- r-Turing Completeness

3 Methodology

- Template Haskell ¹
 - Embedding Janus
 - Compile-time guarantees
 - * Type-checking
 - * Variable usage
- GHC Profiling
 - Criterion package ²
- Liquid Haskell ³
 - Theorem proving

4 Planning

- Milestones
- Division of labour

¹https://wiki.haskell.org/Template_Haskell

²<http://hackage.haskell.org/package/criterion>

³<https://ucsd-progsys.github.io/liquidhaskell-blog/>