Π-Ware: An Embedded Hardware Description Language using Dependent Types

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Table of Contents

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Hardware Design

- Hardware acceleration has growing applicability
- Implementing algorithms in hardware is *harder*
  - Intel `FDIV`

Hardware Description Languages

- *De facto* industry standards: VHDL and Verilog
- Were intended for *simulation*, not modelling or synthesis
  - *Unsynthesizable* constructs
  - Widely variable tool support

Functional Programming

- Easier to *reason* about program properties
- Inherently *parallel* and *stateless* semantics
  - In contrast to imperative programming

Functional Hardware Description

- A functional program describes a circuit
- Several *functional* Hardware Description Languages (HDLs) during the 1980s
- For example, μFP [Sheeran, 1984]

Dependently-Typed Programming

Dependently-Typed Programming (DTP) är en programmationstechnik...

Research question

"What are the improvements that DTP can bring to hardware design?"

- Methodology
  - Develop a hardware Domain-Specific Language (DSL), *embedded* in a dependently-typed language (Agda), that allows for simulation, synthesis and verification

Background

Lorem ipsum...

Π-Ware

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Conclusion

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Future work

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Thank you!

Questions?

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References I

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