`dependently-typed`

A programming languages club at Georgia Tech

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Slides and proposal can be found at
https://github.com/dependently-typed/coc-proposal

Outline

What is `dependently-typed`?

About the club

- Programming languages (PL) and compilers club
- Open to undergraduate, graduate, and PhD students
- Named after Richard Eisenberg's *Dependent types in Haskell: Theory and practice* [4]

Motivation

- Important to understand what makes programming languages tick
- Form an important layer of abstraction above hardware
- Lots of exciting work in the field
- Couldn't find a club/community on campus that specifically addressed PL and compiler enthusiasts

Exciting work in the field

Formal Verification

- Project Everest from Microsoft: Use F* to build formally verified computing stacks. Network protocols like QUIC, cryptography primitives
- MIT PLV: Koika [2], fscq [3]

Systems Programming

- Modern languages like Rust and Zig aim to democratize systems programming and eliminate common-place bugs
- SSLab at Georgia Tech recently published RUDRA [1]. Won distinguished artifact at SOSP'21

Exciting work in the field (contd)

ML frameworks

- PyTorch, TensorFlow, and JAX use a Just-in-time (JIT) compiler to synthesize and run workloads
- Sam Gross authored an implementation of Python that gets rid of the GIL [5]
- Development of typed array programming languages like Dex [6]

What do we do?

- Talks, workshops, and paper reading sessions
- Projects
- Networking and community building

Why do we want to be a CoC org?

Why CoC?

- Target audience largely resides in the student body of the CoC
- CoC can help with organizing initiatives like a hackathon, sending students to conferences, and networking sessions
- Have a positive impact on the community

Governance

How goes it?

- Elect a board to manage and run the club
- Prioritize the community over personal incentives
- Major decisions are driven through community deliberation

Board Structure

Titles

- Overall Director
- Director of Operations
- Director of Finance
- Director of Communication

Advisor

Dr. Qirun Zhang (qrzhang@gatech.edu)

Code of Conduct

- https://dtyped-wiki.netlify.app/about/code-of-conduct/
- Violations will be handled case-by-case

State of the org and future plans

State of the org

- Active Discord community (over a 100 members)
- Hosted several talks and workshops (documented in the wiki)
- Attending conferences (Eg: LLVM dev conf)

Future plans (next semester)

- Maintain a blog documenting some of our technical work
- Organize a langjam (we have a committee for it)
- Have a professor/engineer give a tech talk, and host a networking session thereafter

Future plans (long term)

- Empower the next generation of innovators in the field
- Collaborate with research labs on campus to engage in novel research
- Develop and maintain a mainstream piece of OSS software

Questions

- Website: https://dtyped.netlify.app
- Wiki: https://dtyped-wiki.netlify.app

Bibliography I

[1] Yechan Bae et al. “Rudra: Finding Memory Safety Bugs in Rust at the Ecosystem Scale”. In: Oct. 2021.

[2] Thomas Bourgeat et al. “The Essence of Bluespec: A Core Language for Rule-Based Hardware Design”. In: *Proceedings of the 41st ACM SIGPLAN Conference on Programming Language Design and Implementation*. PLDI 2020. London, UK: Association for Computing Machinery, 2020, pp. 243–257.

[3] Haogang Chen et al. “Using Crash Hoare logic for certifying the FSCQ file system”. In: *Proceedings of the 25th Symposium on Operating Systems Principles*. 2015, pp. 18–37.

[4] Richard A Eisenberg. *Dependent types in Haskell: Theory and practice*. University of Pennsylvania, 2016.

Bibliography II

[5] Sam Gross. *Multithreaded Python without the GIL*. 2021.

[6] Adam Paszke et al. “Getting to the Point: Index Sets and Parallelism-Preserving Autodiff for Pointful Array Programming”. In: *Proceedings of the ACM on Programming Languages* 5 (Aug. 2021).