Department of Intelligent Systems (DITS)   Academic year 2020/2021

Master's Thesis Specification

24198

Student: **Zárybnický Jakub, Bc.**

Programme: Information Technology

Field of study: Intelligent Systems

Title: **Just-in-Time Compilation of Dependently-Typed Lambda Calculus**

Category: Compiler Construction

Assignment:

1. Investigate dependent types, simply-typed and dependently-typed lambda calculus, and their evaluation models (push/enter, eval/apply).
2. Get familiar with the Graal virtual machine and the Truffle language implementation framework.
3. Create a parser and an interpreter for a selected language based on dependently-typed lambda calculus.
4. Propose a method of normalization-by-evaluation for dependent types and implement it for the selected language.
5. Create a just-in-time (JIT) compiler for the language using the Truffle API.
6. Compare the runtime characteristics of the interpreter and the JIT compiler, evaluate the results.

Recommended literature:

- https://www.graalvm.org/
- Löh, Andres, Conor McBride, and Wouter Swierstra. "A tutorial implementation of a dependently typed lambda calculus." Fundamenta Informaticae 21 (2001): 1001-1031.
- Marlow, Simon, and Simon Peyton Jones. "Making a fast curry: push/enter vs. eval/apply for higher-order languages." Journal of Functional Programming 16.4-5 (2006): 415-449.

Requirements for the semestral defence:

- Items 1 to 3.

Detailed formal requirements can be found at https://www.fit.vut.cz/study/theses/

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Beginning of work: November 1, 2020

Submission deadline: May 19, 2021

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