Resource Analysis: Problem Set 6

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Due before 1:30pm on Monday, March 14

6.1 (20 Points) Course Project Proposal

Write a 2-3 page proposal for a course project. A course project can be a presentation, a short paper, or an implementation. It should complement the material that has been discussed in the course. To pass the course, the project has to be completed before the last lecture (April 27).

All students will present their course projects in class. If the project is a presentation then the presentation should fill one lecture (80 minutes). Other presentations should be about 20 minutes.

You are encouraged to propose your own ideas for projects. It is good to be ambitious. However, keep time management in mind. The total time you spend with the project should be similar to the time you have spent with the weekly problem sets so far. Below are some suggestions for course projects.

a) Identify an interesting application area for resource bounds and implement a case study in Resource Aware ML

b) Implement a simple automatic solver for recurrence relations

c) Present the undecidability of type checking for System F [Wel99]

d) Implement Hofmann's type system for in-place computation [Hof02]

e) Write a paper about the design of a type system that mixes linear types and unrestricted types

f) Present the programming language Rust and the techniques that are used for memory management

g) Proof an interesting theorem that we discussed in the course with a proof assistant

h) Present one of the papers listed in the following bibliography

The first step of writing the project proposal is to discuss the project with the instructor. Start writing the proposal *after* you agreed with the instructor on a topic. Your proposal should include the following parts.

1) Title and project type (presentation, short paper, or implementation)

2) Motivation (Why are you interested in this project? How does it relate to the topics discussed in class?)

3) Technical presentation (Summarize the technical results that are most relevant for your project)

4) Project description (Outline the scope and goals of your project, e.g., a sketch of a presentation)

5) Team (Why are you in a good position to complete this project in time?)

6) Milestones and timeline (Define at least three milestones with dates that you need to complete for a successful project)

6.2 (2 Points) Points of Problem Set 2

Please email the number of points you received in problem set 2 to Jan.

References

[BH13]   Guy E. Blelloch and Robert Harper. Cache and I/O Efficent Functional Algorithms. In *40th ACM Symp. on Principles Prog. Langs. (POPL'13)*, pages 39–50, 2013.

[CHS15]   Quentin Carbonneaux, Jan Hoffmann, and Zhong Shao. Compositional Certified Resource Bounds. In *36th Conf. on Prog. Lang. Design and Impl. (PLDI'15)*, 2015.

[CW00]   Karl Crary and Stephanie Weirich. Resource Bound Certification. In *27th ACM Symp. on Principles of Prog. Langs. (POPL'00)*, pages 184–198, 2000.

[Hof02]   Martin Hofmann. The strength of non-size increasing computation. In *29th ACM Symposium on Principles of Programming Languages (POPL'02)*, pages 260–269, 2002.

[SVF$^+$12] Hugo R. Simōes, Pedro B. Vasconcelos, Mário Florido, Steffen Jost, and Kevin Hammond. Automatic Amortised Analysis of Dynamic Memory Allocation for Lazy Functional Programs. In *17th Int. Conf. on Funct. Prog. (ICFP'12)*, pages 165–176, 2012.

[Wel99]   J.B. Wells. Typability and type checking in System F are equivalent and undecidable. *Annals of Pure and Applied Logic*, 98(1–3):111 – 156, 1999.