Relational Reasoning
(Relationel ræsonnement)

Mathias Pedersen, 201808137

Bachelor Report (15 ECTS) in Computer Science
Advisor: Amin Timany
Department of Computer Science, Aarhus University
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AARHUS
UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE

Abstract

►in English…◄

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Contents

Chapter 1

Introduction

►motivate and explain the problem to be addressed◄
►example of a citation: [1]◄ ►get your bibtex entries from `https://dblp.org/`◄

Chapter 2

Definition of Language

►**create draft**◄

Syntax

$$
\begin{array}{lll}
e ::= () \mid & & \text{(unit value)} \\
\quad x \mid & & \text{(variables)} \\
\quad \overline{n} \mid e + e \mid e - e \mid e \leq e \mid e < e \mid e = e \mid & & \text{(natural??? numbers)} \\
\quad \mathsf{true} \mid \mathsf{false} \mid \mathsf{if}\ e\ \mathsf{then}\ e\ \mathsf{else}\ e \mid & & \text{(booleans)} \\
\quad (e,e) \mid \mathsf{fst}\ e \mid \mathsf{snd}\ e \mid & & \text{(products/pairs???)} \\
\quad \mathsf{inj}_1\ e \mid \mathsf{inj}_2\ e \mid \mathsf{match}\ e\ \mathsf{with}\ \mathsf{inj}_1\ x \Rightarrow e \mid \mathsf{inj}_2\ x \Rightarrow e\ \mathsf{end} \mid & & \text{(sums)} \\
\quad \mathsf{rec}\ f(x) := e \mid e\ e & & \text{(recursive functions)} \\
\quad \Lambda\, e \mid e\ \_ & & \text{(polymorphism)}
\end{array}
$$

$$
x ::= () \mid \overline{n} \mid \mathsf{true} \mid \mathsf{false} \mid (v,v) \mid \mathsf{inj}_1\ v \mid \mathsf{inj}_2\ v \mid \mathsf{rec}\ f(x) := e \mid \Lambda\, e \qquad \text{(values)}
$$

$$
\tau ::= \mathsf{Unit} \mid \mathbb{N} \mid \mathbb{B} \mid \tau \times \tau \mid \tau + \tau \mid \tau \to \tau \mid \forall X.\, \tau \qquad \text{(types)}
$$

$$
\begin{array}{lll}
K ::= [] \mid K + e \mid v + K \mid K - e \mid v - K \mid K \leq e \mid v \leq K \mid K < e \mid v < K \mid & & \text{(evaluation context)} \\
\quad K = e \mid v = K \mid \mathsf{if}\ K\ \mathsf{then}\ e\ \mathsf{else}\ e \mid (K,e) \mid (v,K) \mid \mathsf{fst}\ K \mid \mathsf{snd}\ K \mid & & \\
\quad \mathsf{inj}_1\ K \mid \mathsf{inj}_2\ K \mid \mathsf{match}\ K\ \mathsf{with}\ \mathsf{inj}_1\ x \Rightarrow e \mid \mathsf{inj}_2\ x \Rightarrow e\ \mathsf{end} \mid K\ e \mid v\ K \mid K\ \_ & &
\end{array}
$$

Typing rules

$$\text{T-VAR}\ \frac{(x:\tau)\in\Gamma}{\Xi\mid\Gamma\vdash x:\tau} \qquad \text{T-UNIT}\ \frac{}{\Xi\mid\Gamma\vdash():\mathsf{Unit}} \qquad \text{T-NAT}\ \frac{}{\Xi\mid\Gamma\vdash\overline{n}:\mathbb{N}}$$

$$\text{T-ADD}\ \frac{\Xi\mid\Gamma\vdash e_1:\mathbb{N}\qquad\Xi\mid\Gamma\vdash e_2:\mathbb{N}}{\Xi\mid\Gamma\vdash e_1+e_2:\mathbb{N}} \qquad \text{T-SUB}\ \frac{\Xi\mid\Gamma\vdash e_1:\mathbb{N}\qquad\Xi\mid\Gamma\vdash e_2:\mathbb{N}}{\Xi\mid\Gamma\vdash e_1-e_2:\mathbb{N}}$$

$$\text{T-LE}\ \frac{\Xi\mid\Gamma\vdash e_1:\mathbb{N}\qquad\Xi\mid\Gamma\vdash e_2:\mathbb{N}}{\Xi\mid\Gamma\vdash e_1\leq e_2:\mathbb{B}} \qquad \text{T-LT}\ \frac{\Xi\mid\Gamma\vdash e_1:\mathbb{N}\qquad\Xi\mid\Gamma\vdash e_2:\mathbb{N}}{\Xi\mid\Gamma\vdash e_1<e_2:\mathbb{B}}$$

$$\text{T-EQ}\ \frac{\Xi\mid\Gamma\vdash e_1:\mathbb{N}\qquad\Xi\mid\Gamma\vdash e_2:\mathbb{N}}{\Xi\mid\Gamma\vdash e_1=e_2:\mathbb{B}} \qquad \text{T-TRUE}\ \frac{}{\Xi\mid\Gamma\vdash\mathsf{true}:\mathbb{B}} \qquad \text{T-FALSE}\ \frac{}{\Xi\mid\Gamma\vdash\mathsf{false}:\mathbb{B}}$$

$$\text{T-IF}\ \frac{\Xi\mid\Gamma\vdash e_1:\mathbb{N}\qquad\Xi\mid\Gamma\vdash e_2:\mathbb{N}}{\Xi\mid\Gamma\vdash\mathsf{if}\ e_1\ \mathsf{then}\ e_2\ \mathsf{else}\ e_3:\tau}$$

►finish typing rules◄

►write in dynamics (step rules)◄

Chapter 3

Contextual Equivalence

►draft◄

Chapter 4

Logical Relations for Contextual Equivalence

►draft◄

Chapter 5

Examples of Application of Contextual Equivalence

►draft◄

Chapter 6

Comparison to Other Work and Ideas for Future Work

►draft◄

Chapter 7

Conclusion

►conclude on the problem statement from the introduction◄

Acknowledgments

►…◄

Bibliography

[1] Aske Simon Christensen, Anders Møller, and Michael I. Schwartzbach. Precise analysis of string expressions. In Radhia Cousot, editor, *Static Analysis, 10th International Symposium, SAS 2003, San Diego, CA, USA, June 11-13, 2003, Proceedings*, volume 2694 of *Lecture Notes in Computer Science*, pages 1–18. Springer, 2003.

Appendix A

The Technical Details

►...◄