[12pt]report [a4paper, top=3cm, bottom=3cm]geometry [latin1]inputenc setspace fancyhdr tocloft titlesec hyperref amssymb url indentfirst graphicx listings amsmath [all]xy [font=footnotesize, labelfont=footnotesize,footno
margin=0cm]caption amsfonts fixltx2e hyperref stmaryrd

plain [] [] 0pt 2ex

2ex

bookmarks=true, unicode=false, pdftoolbar=true, pdfmenubar=true, pdffitwindow=false, pdfstartview=FitH, pdftitle=Quotient Containers in Homotopy Type Theory, pdfauthor=Jonathan Sherry, pdfnewwindow=true, colorlinks=true, linkcolor=black, citecolor=black, filecolor=black, urlcolor=black

[1]1 [1]1 [1]1 [1]1

0pt0pt0pt

document

page-100 Quotient Containers in

Jonathan E. Sherry

Submitted May 2014 in partial fulfilment of the conditions of

empty

fancy arabic [] []

Introduction

Abstract

This paper serves to introduce and explain the notions of Martin Löf Type Theory, Homotopy Type Theory, Containers and Differentiation of Data structures. Using ideas from each of these fields, Quotient Containers are introduced - specifically a multiset container and implmented in Agda. The veracity of the implementation is then tested through differentiating a multiset container and concluding that the implementation behaves as one would expect and is true to theory.

Acknowledgements This study would not have been made possible without the following: Thorsten

Research

Martin-Löf Type Theory Introduction Martin-Löf type theory is a form of constructive, intuitionistic type theory that is both a programming language and an alternative foundation of mathematics. Devised by Swedish mathematician and philosopher Per Martin-Löf in 1972, Martin-Löf type theory (MLTT) serves to provide a set of formal rules and type-theoretic connectives to perform mathematical reasoning. MLTT is said to be constructive and intuitionistic as it replaces the classical concept of Truth, with the notion of constructive provability. That is, construction of a mathematical object is proof of its existence. In MLTT, objects are classified by the basal notion of a type primitive — objects can have a certain type and are said to inhabit that type. These structured types can be used to provide a specification for the elements within it, providing a means to reason about objects of that type. For example, from a type: center $A \rightarrow B$