Karlsruhe Institute of Technology

Online Neural Network-based Language Identification

Master's Thesis of

Daniel H. Draper

at the Department of Informatics
Institute for Anthropomatics and Robotics

Reviewer:	Dr.-Ing. Sebastian Stüker
Second reviewer:	
Advisor:	M.Sc. Markus Müller

12. December 2016 – 11. May 2017

Karlsruher Institut für Technologie
Fakultät für Informatik
Postfach 6980
76128 Karlsruhe

I declare that I have developed and written the enclosed thesis completely by myself, and have not used sources or means without declaration in the text.

Karlsruhe, 12th of May, 2017

. . . . . .

(Daniel H. Draper)

Abstract

Zusammenfassung

Contents

List of Figures

List of Tables

1 Introduction

2 Preliminary Definitions

In the following chapter we want to define and explain terms, models and logic used throughout this thesis. We skip the explanation of first-order logic, which we presume to be known by the reader.

3 Conclusion

Bibliography

[ABH+07] Wolfgang Ahrendt, Bernhard Beckert, Reiner Hähnle, Philipp Rümmer, and Peter H. Schmitt. Verifying object-oriented programs with KeY: A tutorial. In *5th International Symposium on Formal Methods for Components and Objects, Amsterdam, The Netherlands*, volume 4709 of *LNCS*, pages 70–101. Springer, 2007.

[AD94] Rajeev Alur and David L. Dill. A Theory of Timed Automata. *Theoretical Computer Science*, 126:183–235, 1994.

[BHS07] Bernhard Beckert, Reiner Hähnle, and Peter H. Schmitt, editors. *Verification of Object-Oriented Software: The KeY Approach.* LNCS 4334. Springer-Verlag, 2007.

[CFH+03] Edmund Clarke, Ansgar Fehnker, Zhi Han, Bruce Krogh, Olaf Stursberg, and Michael Theobald. Verification of Hybrid Systems Based on Counterexample-Guided Abstraction Refinement. In Hubert Garavel and John Hatcliff, editors, *Tools and Algorithms for the Construction and Analysis of Systems*, volume 2619 of *Lecture Notes in Computer Science*, pages 192–207. Springer Berlin Heidelberg, 2003.

[CW98] Ana Cavalcanti and Jim Woodcock. ZRC – A Refinement Calculus for Z. *Formal Aspects of Computing*, 10(3):267–289, 1998.

[DB14] John Derrick and Eerke A. Boiten. *Refinement in Z and Object-Z.* Springer London, 2014.

[GZ14] Bin Gu and Liang Zou. A refinement calculus for hybrid systems. In *Engineering of Complex Computer Systems (ICECCS), 2014 19th International Conference on*, pages 176–185, Aug 2014.

[Hen00] Thomas A. Henzinger. The theory of hybrid automata. In M.Kemal Inan and RobertP. Kurshan, editors, *Verification of Digital and Hybrid Systems*, volume 170 of *NATO ASI Series*, pages 265–292. Springer Berlin Heidelberg, 2000.

[MLP12] Stefan Mitsch, Sarah M. Loos, and André Platzer. Towards formal verification of freeway traffic control. In Chenyang Lu, editor, *ICCPS*, pages 171–180. IEEE, 2012.

[MV92] Carroll Morgan and Trevor Vickers. *On the Refinement Calculus.* Springer London, 1992.

[Pla08] André Platzer. Differential dynamic logic for hybrid systems. *Journal of Automated Reasoning*, 41(2):143–189, 2008.

[Pla10] André Platzer. *Logical Analysis of Hybrid Systems*. Springer, Pittsburgh, 2010.

[Pla15a] André Platzer. Guide for Keymaera Hybrid Systems Verification Tool. http://symbolaris.com/info/KeYmaera-guide.html, 2015.

[Pla15b] André Platzer. KeYmaera: A Hybrid Theorem Prover for Hybrid Systems. http://symbolaris.com/info/KeYmaera.html, 2015.

[RT13] Matthias Rungger and Paulo Tabuada. Abstracting and refining robustness for cyber-physical systems. *CoRR*, abs/1310.5199, 2013.

[RyS96] Jean-François Raskin and Pierre yves Schobbens. State Clock Logic: a Decidable Real-Time Logic. In *HART'97, LNCS 1201*, pages 33–47. Springer-Verlag, 1996.

[STW14] Steve Schneider, Helen Treharne, and Heike Wehrheim. The behavioural semantics of Event-B refinement. *Formal Aspects of Computing*, 26(2):251–280, 2014.

[Wol] Wolfram Research, Inc. Mathematica. https://www.wolfram.com.