Preface

This volume contains the proceedings of the 7th Asian Symposium on Programming Languages and Systems (APLAS 2009) held in Seoul, Korea, December 14–16, 2009. The symposium was sponsored by the Asian Association for Foundation of Software (AAFS), Research on Software Analysis for Error-free Computing (ROSAEC) Center of Seoul National University, and SIGPL of Korean Institute of Information Scientists and Engineers.

Following our call for papers, 56 full submissions from 18 countries were received. Each paper was reviewed by at least three Program Committee members with the help of external reviewers. The Program Committee meeting was conducted electronically over a period of two weeks in August 2009. As a result of active discussions, 21 papers (37.5%) were selected. I would like to thank all the members of the APLAS 2009 Program Committee for the tremendous effort they put into their reviews and deliberations, and all the external reviewers for their invaluable contributions. The submission and review process was managed using the EasyChair system.

In addition to the 21 contributed papers, the symposium also featured three invited talks by Koen Claessen (Chalmers University of Technology, Sweden), Naoki Kobayashi (Tohoku University, Japan), and Armando Solar-Lezama (Massachusetts Institute of Technology, USA).

Many people helped to promote APLAS as a high-quality forum in Asia to serve program language researchers worldwide. Following a series of well-attended workshops that were held in Shanghai (2002), Daejeon (2001) and Singapore (2000), the past formal APLAS symposiums were successfully held in Bangalore (2008), Singapore (2007), Sydney (2006), Tsukuba (2005), Taipei (2004) and Beijing (2003). Proceedings of the past formal symposiums were published by Springer as LNCS 5356, 4807, 4279, 3780, 3302 and 2895.

I am grateful to the General Chair, Kwangkeun Yi, for his invaluable support and guidance that made our symposium in Seoul possible and enjoyable. I am also indebted to the local organizers, notably Gyesik Lee and Jungsuk Kang, for their considerable effort in planning and organizing the meeting itself. I thank Kiminori Matsuzaki for serving as the Poster Session Chair. Last but not least, I would like to thank the AAFS Chairs, Atsushi Ohori and Joxan Jaffar, and the Program Chairs of the past APLAS symposiums, especially Ganesan Ramalingam, for their advice.

December 2009

Zhenjiang Hu
Organization

General Chair

Kwangkeun Yi  Seoul National University, Korea

Program Chair

Zhenjiang Hu  National Institute of Informatics, Japan

Program Committee

Manuel M.T. Chakravarty  University of New South Wales, Australia
Wei-Ngan Chin  National University of Singapore, Singapore
Nate Foster  University of Pennsylvania, USA
Ralf Hinze  University of Oxford, UK
Zhenjiang Hu  National Institute of Informatics, Japan
Ik-Soon Kim  Electronics and Telecommunications Research Institute, Korea
Julia Lawall  DIKU, Denmark
Sebastian Maneth  NICTA/University of New South Wales, Australia
Sungwoo Park  Pohang University of Science and Technology, Korea
Ganesan Ramalingam  Microsoft Research, India
Chung-chieh Shan  Rutgers University, USA
Kazushige Terui  Kyoto University, Japan
Peter Thiemann  University of Freiburg, Germany
Kazunori Ueda  Waseda University, Japan
Janis Voigtländer  Technical University of Dresden, Germany
Bow-Yaw Wang  Academia Sinica, Taiwan
Jianjun Zhao  Shanghai Jiaotong University, China

Local Arrangements Chair

Gyesik Lee  Seoul National University, Korea

Poster Session Chair

Kiminori Matsuzaki  Kochi University of Technology, Japan
External Referees

Kazuyuki Asada  Neil Jones  Aditya Nori
Gilles Barthe  Gabriele Keller  Bruno C.D.S. Oliveira
Michele Basaldella  Andrew Kennedy  Scott Owens
Annette Bieniusa  Uday Khedker  Matthew Parkinson
Aaron Bohannon  Taeho Kim  Ross Paterson
Avik Chaudhuri  Oleg Kiselyov  Frank Pfenning
Florin Craciun  Naoki Kobayashi  Alexandre Pilkiewicz
Vijay D’silva  Rafal Kolanski  Andrew Pitts
Gabriel Ditu  Akash Lal  Corneliu Popeea
Derek Dreyer  Martin Lange  Maurizio Proietti
Patrick Eugster  Roman Leshchinskiy  Alan Schmitt
João Paulo Fernandes  Paul Levy  Tom Schrijvers
Chunfeng Gao  Guoqiang Li  Qiang Sun
Cristian Gherghina  Daniel R Licata  Josef Svenningsson
Paul Govereau  Yu-Seung Ma  Jeffrey Vaughan
Clemens Grelck  Andreas Maletti  Jérôme Vouillon
Bhargav Gulavani  Matthieu Martel  Meng Wang
Tom Harper  Karl Mazurak  Baltasar
Guanhua He  Trevor McDonell  Trancón-y-Widemann
Aquinas Hobor  Eric Monfroy  Simon Winwood
Petra Hofstedt  Kenichi Morita  Hongseok Yang
Hans Hütten  Keisuke Nakano  Taiichi Yuasa
Daniel James  Huu Hai Nguyen  Ping Zhu
Table of Contents

Invited Talks

The Twilight Zone: From Testing to Formal Specifications and Back
Again (Abstract) ................................. 1
  Koen Claessen

Types and Recursion Schemes for Higher-Order Program Verification
(Abstract) ........................................ 2
  Naoki Kobayashi

The Sketching Approach to Program Synthesis ...................... 4
  Armando Solar-Lezama

Program Analysis

Large Spurious Cycle in Global Static Analyses and Its Algorithmic
Mitigation ........................................ 14
  Hakjoo Oh

Abstract Transformers for Thread Correlation Analysis ............. 30
  Michal Segalov, Tal Lev-Ami, Roman Manevich,
  Ramalingam Ganesan, and Mooly Sagiv

Scalable Context-Sensitive Points-to Analysis Using Multi-dimensional
Bloom Filters ...................................... 47
  Rupesh Nasre, Kaushik Rajan, R. Govindarajan, and
  Uday P. Khedker

Transformation and Optimization

A Short Cut to Optimal Sequences ........................... 63
  Akimasa Morihata

A Skeletal Parallel Framework with Fusion Optimizer for GPGPU
Programming ....................................... 79
  Shigeyuki Sato and Hideya Iwasaki

Witnessing Purity, Constancy and Mutability .................... 95
  Ben Lippmeier

Type System

On the Decidability of Subtyping with Bounded Existential Types .. 111
  Stefan Wehr and Peter Thiemann

Fractional Ownerships for Safe Memory Deallocation ................ 128
  Kohei Suenaga and Naoki Kobayashi
<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ownership Downgrading for Ownership Types</td>
<td>Yi Lu, John Potter, and Jingling Xue</td>
<td>144</td>
</tr>
<tr>
<td>Separation Logic</td>
<td>A Fresh Look at Separation Algebras and Share Accounting</td>
<td>161</td>
</tr>
<tr>
<td></td>
<td>Robert Dockins, Aquinas Hobor, and Andrew W. Appel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Weak Updates and Separation Logic</td>
<td>178</td>
</tr>
<tr>
<td></td>
<td>Gang Tan, Zhong Shao, Xinyu Feng, and Hongxu Cai</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Proving Copyless Message Passing</td>
<td>194</td>
</tr>
<tr>
<td></td>
<td>Jules Villard, Étienne Lozes, and Cristiano Calcagno</td>
<td></td>
</tr>
<tr>
<td>Logic and Foundation Theory</td>
<td>On Stratified Regions</td>
<td>210</td>
</tr>
<tr>
<td></td>
<td>Roberto M. Amadio</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parallel Reduction in Resource Lambda-Calculus</td>
<td>226</td>
</tr>
<tr>
<td></td>
<td>Michele Pagani and Paolo Tranquilli</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Classical Natural Deduction for S4 Modal Logic</td>
<td>243</td>
</tr>
<tr>
<td></td>
<td>Daisuke Kimura and Yoshihiko Kakutani</td>
<td></td>
</tr>
<tr>
<td>Software Security and Verification</td>
<td>Bi-abductive Resource Invariant Synthesis</td>
<td>259</td>
</tr>
<tr>
<td></td>
<td>Cristiano Calcagno, Dino Distefano, and Viktor Vafeiadis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Certify Once, Trust Anywhere: Modular Certification of Bytecode Programs for Certified Virtual Machine</td>
<td>275</td>
</tr>
<tr>
<td></td>
<td>Yuan Dong, Kai Ren, Shengyuan Wang, and Suqin Zhang</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Asymptotic Resource Usage Bounds</td>
<td>294</td>
</tr>
<tr>
<td></td>
<td>Elvira Albert, Diego Alonso, Puri Arenas, Samir Genaim, and German Puebla</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Higher-Order, Call-by-Value Applied Pi-Calculus</td>
<td>311</td>
</tr>
<tr>
<td></td>
<td>Nobuyuki Sato and Eijiro Sumii</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Branching Bisimilarity between Finite-State Systems and BPA or Normed BPP Is Polynomial-Time Decidable</td>
<td>327</td>
</tr>
<tr>
<td></td>
<td>Hongfei Fu</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refining Abstract Interpretation-Based Static Analyses with Hints</td>
<td>343</td>
</tr>
<tr>
<td></td>
<td>Vincent Laviron and Francesco Logozzo</td>
<td></td>
</tr>
<tr>
<td>Author Index</td>
<td></td>
<td>359</td>
</tr>
</tbody>
</table>