Model-Based Testing for Embedded Systems

EDITED BY Justyna Zander, Ina Schieferdecker, and Pieter J. Mosterman
Contents

Preface ix
Editors xi
MATLAB Statement xiv
Contributors xv
Technical Review Committee xix
Book Introduction xxi

Part I Introduction

1 A Taxonomy of Model-Based Testing for Embedded Systems from Multiple Industry Domains
   Justyna Zander, Ina Schieferdecker, and Pieter J. Mosterman 3

2 Behavioral System Models versus Models of Testing Strategies in Functional Test Generation
   Antti Huima 23

3 Test Framework Architectures for Model-Based Embedded System Testing
   Stephen P. Masticola and Michael Gall 49

Part II Automatic Test Generation

4 Automatic Model-Based Test Generation from UML State Machines
   Stephan Weißleder and Holger Schlingloff 77

5 Automated Statistical Testing for Embedded Systems
   Jesse H. Poore, Lan Lin, Robert Eschbach,
   and Thomas Bauer 111

6 How to Design Extended Finite State Machine Test Models in Java
   Mark Utting 147

7 Automatic Testing of Lustre/SCADE Programs
   Virginia Papailiopoulos, Besnik Seljimi, and Ioannis Parissis 171

8 Test Generation Using Symbolic Animation of Models
   Frédéric Dadeau, Fabien Peureux, Bruno Legeard, Régis Tissot,
   Jacques Julliand, Pierre-Alain Masson, and Fabrice Bouquet 195
Part III  Integration and Multilevel Testing

9 Model-Based Integration Testing with Communication Sequence Graphs
Fevzi Belli, Axel Hollmann, and Sascha Padberg 223

10 A Model-Based View onto Testing: Criteria for the Derivation of Entry Tests for Integration Testing
Manfred Broy and Alexander Pretschner 245

11 Multilevel Testing for Embedded Systems
Abel Marrero Pérez and Stefan Kaiser 269

12 Model-Based X-in-the-Loop Testing
Jürgen Großmann, Philip Makedonski, Hans-Werner Wiesbrock, Jaroslav Svacina, Ina Schieferdecker, and Jens Grabowski 299

Part IV  Specific Approaches

13 A Survey of Model-Based Software Product Lines Testing
Sebastian Oster, Andreas Wübbeke, Gregor Engels, and Andy Schürr 339

14 Model-Based Testing of Hybrid Systems
Thao Dang 383

15 Reactive Testing of Nondeterministic Systems by Test Purpose-Directed Tester
Jüri Vain, Andres Kull, Marko Käärmee, Maili Markvardt, and Kullo Raiend 425

16 Model-Based Passive Testing of Safety-Critical Components
Stefan Gruner and Bruce Watson 453

Part V  Testing in Industry

17 Applying Model-Based Testing in the Telecommunication Domain
Fredrik Abbors, Veli-Matti Aho, Jani Koivulainen, Risto Teittinen, and Dragos Truscan 487

18 Model-Based GUI Testing of Smartphone Applications: Case S60™ and Linux®
Antti Jääskeläinen, Tommi Takala, and Mika Katara 525

19 Model-Based Testing in Embedded Automotive Systems
Paweł Skruch, Miroslav Panek, and Bogdan Kowalczyk 545

Part VI  Testing at the Lower Levels of Development

20 Testing-Based Translation Validation of Generated Code
Mirko Conrad 579
Contents

21 Model-Based Testing of Analog Embedded Systems Components 601
Lee Barford

22 Dynamic Verification of SystemC Transactional Models 619
Laurence Pierre and Luca Ferro

Index 639