2017 IEEE International Conference on Software Testing, Verification and Validation Workshops (ICSTW 2017)

Tokyo, Japan
13-17 March 2017
# 10th IEEE International Conference on Software Testing, Verification and Validation Workshops

## ICSTW 2017

## Table of Contents

**Conference Sponsors**...xii

---

### The 12th Workshop on Testing: Academia-Industry Collaboration, Practice, and Research Techniques (TAIC PART 2017)

**Message from the TAIC PART 2017 Chairs**...1

_Takashi Kitamura, Emil Alégroth, and Rudolf Ramler_

**Coverage-Based Reduction of Test Execution Time: Lessons from a Very Large Industrial Project**...3

_Thomas Bach, Artur Andrzejak, and Ralf Pannemans_

**Are CISQ Reliability Measures Practical? A Research Perspective**...13

_Johannes Bräuer, Reinhold Plösch, and Manuel Windhager_

**Impact of Education and Experience Level on the Effectiveness of Exploratory Testing: An Industrial Case Study**...23

_Ceren Şahin Gebizli and Hasan Sözer_

**A Test Case Recommendation Method Based on Morphological Analysis, Clustering and the Mahalanobis-Taguchi Method**...29

_Hirohisa Aman, Takashi Nakano, Hidetaka Ogasawara, and Minoru Kawahara_

**Results of a Comparative Study of Code Coverage Tools in Computer Vision**...36

_Iulia Nica, Gerhard Jakob, Kathrin Juhart, and Franz Wotawa_

**Test Case Generation and Prioritization: A Process-Mining Approach**...38

_Andrea Janes_

**Software Testing in Industry and Academia: A View of Both Sides in Japan**...40

_Satoshi Masuda_
PART 2017 .................................................................................................................................................42
Takashi Kitamura, Emil Alégroth, and Rudolf Ramler

Message from the ITEQS 2017 Chairs .......................................................................................................44
Mehrdad Saadatmand, Birgitta Lindström, and Markus Bohlin
A Process for Sound Conformance Testing of Cyber-Physical Systems .......................................................46
Hugo Araujo, Gustavo Carvalho, Augusto Sampaio, Mohammad Reza Mousavi, and Masoumeh Taromirad
Testing Cache Side-Channel Leakage ...........................................................................................................51
Tiyash Basu and Sudipta Chattopadhyay
Simulation-Based Safety Testing Brake-by-Wire ........................................................................................61
Nils Müllner, Saifullah Khan, Md Habibur Rahman, Wasif Afzal, and Mehrdad Saadatmand
Targeted Mutation: Efficient Mutation Analysis for Testing Non-Functional Properties ................................65
Björn Lisper, Birgitta Lindström, Pasqualina Potena, Mehrdad Saadatmand, and Markus Bohlin
Automatic Test Generation for Energy Consumption of Embedded Systems Modeled in EAST-ADL ............69
Raluca Marinescu, Eduard Enoiu, Cristina Seceleanu, and Daniel Sundmark
Runtime Verification for Detecting Suspension Bugs in Multicore and Parallel Software ................................77
Sara Abbaspour Asadollah, Daniel Sundmark, and Hans Hansson
Generating Controllably Invalid and Atypical Inputs for Robustness Testing ............................................81
Simon Poulding and Robert Feldt

The 12th International Workshop on Mutation Analysis (Mutation 2017)
Message from the Mutation 2017 Chairs .....................................................................................................85
Jens Krinke, Nan Li, and José Miguel Rojas
MutRex: A Mutation-Based Generator of Fault Detecting Strings for Regular Expressions .............................87
Paolo Arcaini, Angelo Gargantini, and Elvinia Riccobene
Towards Security-Aware Mutation Testing ..................................................................................................97
Thomas Loise, Xavier Devroey, Gilles Perrouin, Mike Papadakis, and Patrick Heymans
Speeding-Up Mutation Testing via Data Compression and State Infection ........................................ 103
Qianqian Zhu, Annibale Panichella, and Andy Zaidman

Applying Mutation Analysis on Kernel Test Suites: An Experience Report ........................................ 110
Iftekhar Ahmed, Carlos Jensen, Alex Groce, and Paul E. McKenney

Mutation Patterns for Temporal Requirements of Reactive Systems .................................................. 116
Mark Trakhtenbrot

How Good Are Your Types? Using Mutation Analysis to Evaluate the Effectiveness of Type Annotations ............................................................. 122
Rahul Gopinath and Eric Walkingshaw

Reducing Mutants with Mutant Killable Precondition ...................................................................... 128
Chihiro Iida and Shingo Takada

Finding Redundancy in Web Mutation Operators .............................................................................. 134
Upsorn Praphamongkripong and Jeff Offutt

An Architecture for the Development of Mutation Operators ............................................................ 143
Macario Polo Usaola, Gonzalo Rojas, Isyed Rodriguez, and Suilen Hernández

Are Deletion Mutants Easier to Identify Manually? .......................................................................... 149
Vinicius H. S. Durelli, Nilton M. De Souza, and Marcio E. Delamaro

6th International Workshop on Combinatorial Testing (IWCT 2017)

General Message from the IWCT Workshop Chairs ............................................................................. 159
Dimitris Simos and Rachel Tzoref-Brill

IWCT 2017 Organizers .......................................................................................................................... 161
Dimitris Simos and Rachel Tzoref-Brill

Test Case Generation & Quality Assessment

A Model for T-Way Fault Profile Evolution during Testing ................................................................. 162
D. Richard Kuhn, Raghu N. Kacker, and Yu Lei

Mutation Score, Coverage, Model Inference: Quality Assessment for T-Way Combinatorial Test-Suites ......................................................................................................................... 171
Hermann Felbinger, Franz Wotawa, and Mihai Nica

Optimizing IPOG's Vertical Growth with Constraints Based on Hypergraph Coloring ................................................................. 181
Feng Duan, Yu Lei, Linbin Yu, Raghu N. Kacker, and D. Richard Kuhn

Test Case Generation with Regular Expressions and Combinatorial Techniques ........................................ 189
Macario Polo Usaola, Francisco Ruiz Romero,
Rosana Rodriguez-Bobada Aranda, and Ignacio García Rodríguez
Applications of Combinatorial Testing: I
Applying Combinatorial Testing to High-Speed Railway Track Circuit Receiver ...........................................199
Chang Rao, Jin Guo, Nan Li, Yu Lei, Yadong Zhang, Yao Li, and Yaxin Cao

Applications of Practical Combinatorial Testing Methods at Siemens Industry Inc., Building Technologies Division ..................................................................................................................208
Murat Ozcan

Using Timed Base-Choice Coverage Criterion for Testing Industrial Control Software .............................................................................................................................................216
Henning Bergström and Eduard Paul Enoiu

Modelling
Building Combinatorial Test Input Model from Use Case Artefacts .................................................................220
Preeti S., Milind B., Medhini S. Narayan, and Krishnan Rangarajan

Combinatorial Methods for Modelling Composed Software Systems ..............................................................229
Ludwig Kampel, Bernhard Garn, and Dimitris E. Simos

Combinatorial Interaction Testing for Automated Constraint Repair .................................................................239
Angelo Gargantini, Justyna Petke, and Marco Radavelli

A Composition-Based Method for Combinatorial Test Design .............................................................................249
Anna Zamansky, Amir Shwartz, Seri Khoury, and Eitan Farchi

Applications of Combinatorial Testing: II
Applying Combinatorial Testing to Data Mining Algorithms ..............................................................................253
Jaganmohan Chandrasekaran, Huadong Feng, Yu Lei, D. Richard Kuhn, and Raghu Kacker

Combinatorial Testing on Implementations of HTML5 Support ..........................................................................262
Xi Deng, Tianyong Wu, Jun Yan, and Jian Zhang

Combinatorial Testing on MP3 for Audio Players .................................................................................................272
Shaojiang Wang, Tianyong Wu, Yuan Yao, Beihong Jin, and Liping Ding

Poster Session
Finding Minimum Locating Arrays Using a SAT Solver ..............................................................................................276
Tatsuya Konishi, Hideharu Kojima, Hiroyuki Nakagawa, and Tatsuhiro Tsuchiya

Test Optimization Using Combinatorial Test Design: Real-World Experience in Deployment of Combinatorial Testing at Scale ..................................................................................................278
Saritha Route
4th International Workshop on Software Test Architecture (InSTA 2017)

Messages from the InSTA 2017 Chairs ........................................................................................................280
  Satoshi Masuda

Research

Analysing Test Basis and Deriving Test Cases Based on Data Design
Documents ................................................................................................................................................281
  Tsuyoshi Yumoto, Tohru Matsuodani, and Kazuhiko Tsuda

Improvement of Description for Reusable Test Type by Using Test Frame ...........................................289
  Keiji Uetsuki and Mitsuru Yamamoto

Emerging

Suggestion of Practical Quantification Measuring Method of Test Design
Which Can Represent the Current Status .................................................................................................294
  Sunil Chon and Jihwan Park

Software Testing Design Techniques Used in Automated Vehicle Simulations ........................................300
  Satoshi Masuda

Closing the Gap between Unit Test Code and Documentation .................................................................304
  Karsten Stöcker, Hironori Washizaki, and Yoshiaki Fukazawa

Test Conglomeration - Proposal for Test Design Notation Like Class Diagram ......................................309
  Noriyuki Mizuno, Makoto Nakakuki, and Yoshinori Seino

Defining the Phrase “Software Test Architecture” Emerging Idea ..........................................................313
  Jon D. Hagar

13th Workshop on Advances in Model Based Testing (A-MOST 2017)

Message from the A-MOST 2017 Chairs ......................................................................................................317
  Paolo Arcaini, Xavier Devroey, and Shuai Wang

Functional MBT

Mutation-Based Test-Case Generation with Ecdar ....................................................................................319
  Kim G. Larsen, Florian Lorber, Brian Nielsen, and Ulrik M. Nyman

Reducing the Concretization Effort in FSM-Based Testing of Software Product
Lines .........................................................................................................................................................329
  Vanderson Hafemann Fragal, Adenilso Simao, André Takeshi Endo, and Mohammad Reza Mousavi
Property-Based Testing with External Test-Case Generators .................................................................337
Bernhard K. Aichernig, Silvio Marcovic, and Richard Schumi

Non-Functional MBT
Planning-Based Security Testing of the SSL/TLS Protocol ...........................................................................347
Josip Bozic, Kristoffer Kleine, Dimitris E. Simos, and Franz Wotawa
Towards Decentralized Conformance Checking in Model-Based Testing of Distributed Systems ........................................................356
Bruno Miguel Carvalhido Lima and João Carlos Pascoal Faria
Pattern-Based Usability Testing ..........................................................................................................................366
Fernando Dias and Ana C. R. Paiva

10th IEEE International Conference on Software Testing, Verification and Validation - Posters Track (ICST 2017 Posters)
A Mechanism of Reliable and Standalone Script Generator on Android ...........................................................372
Kuei-Chun Liu, Yu-Yu Lai, and Ching-Hong Wu
EarthCube Software Testing and Assessment Framework ..................................................................................375
Emily Law
Using Model-Checking for Timing Verification in Industrial System Design ....................................................377
Laurent Rioux, Rafik Henia, and Nicolas Sordon
Challenges of Operationalizing Spectrum-Based Fault Localization from a Data-Centric Perspective ..........................................................379
Mojdeh Golagha and Alexander Pretschner
Towards a Gamified Equivalent Mutants Detection Platform ..........................................................................382
Thomas Laurent, Laura Guillot, Motomichi Toyama, Ross Smith, Dan Bean, and Anthony Ventresque
Cloud API Testing ..................................................................................................................................................385
Junyi Wang, Xiaoying Bai, Haoran Ma, Linyi Li, and Zhicheng Ji
Automated A/B Testing with Declarative Variability Expressions .....................................................................387
Keisuke Watanabe, Takuya Fukamachi, Naoyasu Ubayashi, and Yasutaka Kamei
Weighting for Combinatorial Testing by Bayesian Inference ..............................................................................389
Eun-Hye Choi, Tsuyoshi Fujiwara, and Osamu Mizuno
Impact of Static and Dynamic Coverage on Test-Case Prioritization: An Empirical Study ........................................392
Jianyi Zhou and Dan Hao
BDTest, a System to Test Big Data Frameworks ..................................................................................................395
Alexandre Langeois, Eduardo Cunha De Almeida, and Anthony Ventresque
What You See Is What You Test - Augmenting Software Testing with Computer Vision ................................................................. 398
   Rudolf Ramler and Thomas Ziebermayr

Framework for Model-Based Design and Verification of Human-in-the-Loop Cyber-Physical Systems ......................................................... 401
   Filip Cuckov, Grant Rudd, and Liam Daly

Automated Test Case Generation from OTS/CafeOBJ Specifications by Specification Translation ..................................................... 403
   Ryusei Mori and Masaki Nakamura

Author Index ................................................................................................................................................................................. 405