Scenario-based Models & Mutation Testing

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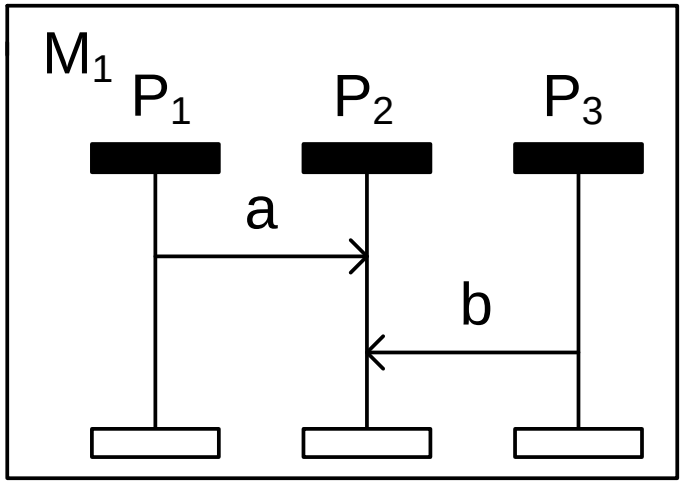
Myself

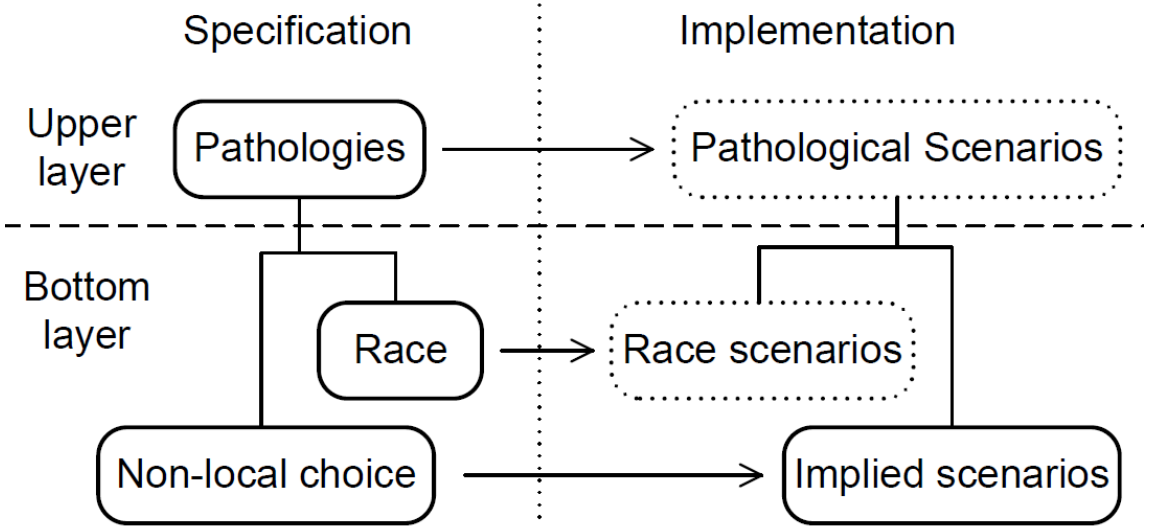
- Brunel University, Uxbridge, London UK
  - Ph.D. in Computing, 2005-2009
  - Dissertation Topic: “Resolving issues in scenario-based models"
  - Supervisor: Robert M. Hierons
- Brunel University, Uxbridge, London UK
  - Research Fellow, Semantic Mutation Testing, 2009-2013
  - Work on the EPSRC project “The Birth, Life and Death of Semantic Mutants”.
- CREST, UCL, London, UK
  - Current research focuses on applying program analysis to mutation testing, information theory based software metrics, and search-based testing.

Research on Scenario-based Models

•An analysis of concurrency pathologies on Message Sequence Charts (MSCs) [1].

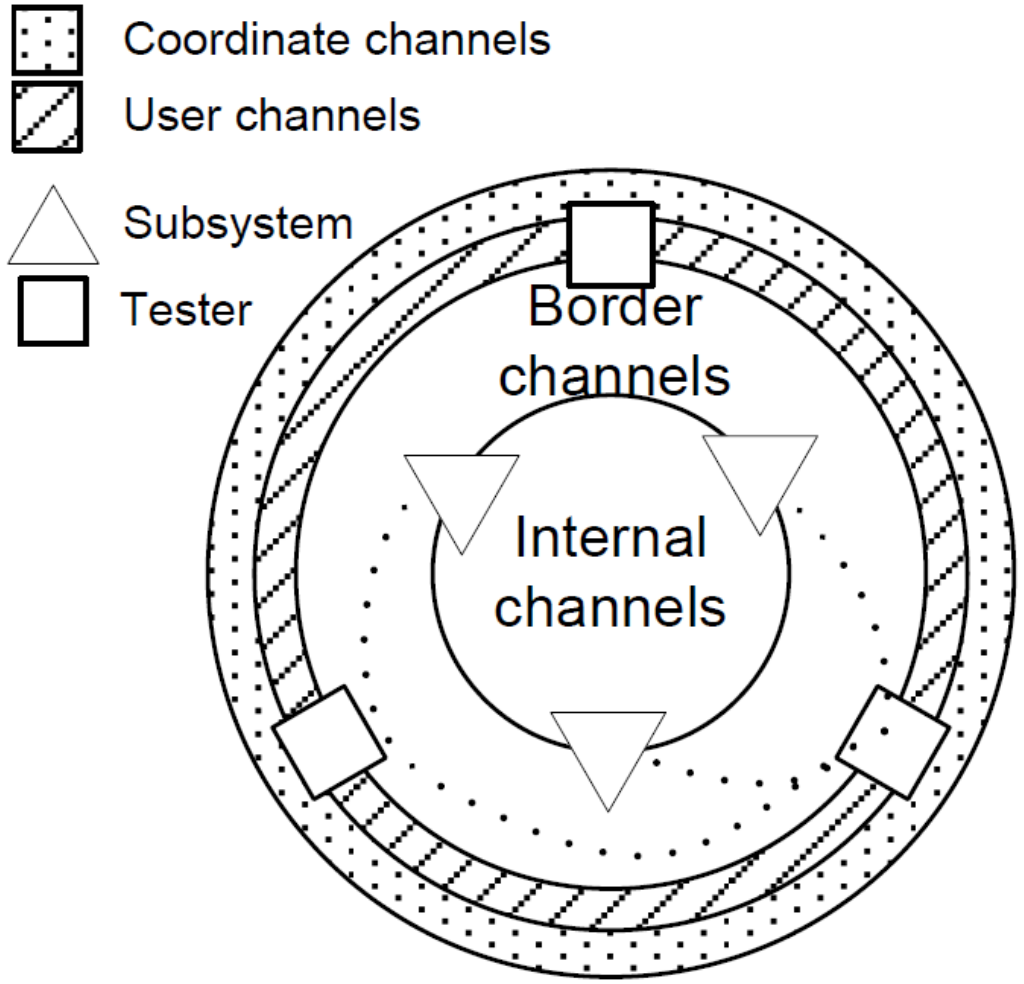


•Solve the chaotic situation by building a pathology framework [2].



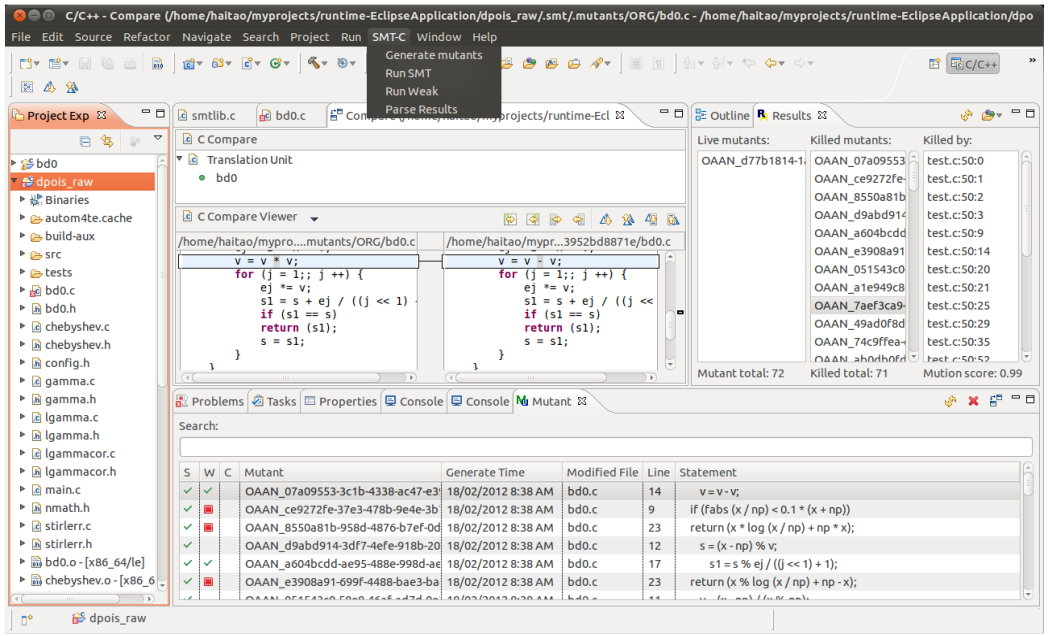
Research on Testing from MSCs

- A distributed test framework based on MSCs [3].
- Identify and solve the controllability problems in testing from MSCs [4].
- Tackle the ORACLE problem in testing from MSCs [5].



Research on Semantic Mutation Testing

- Help to develop Semantic Mutation Testing (SMT) [6, 7].
- Implement SMT-C: a SMT tool for C [8].



- An analysis of floating point comparison problem using SMT [9].

Others

- Information theory-based software metrics [10].
- Ongoing projects
  - Data dependence mutation.
  - Mutation analysis of memory related bugs.

References

[1] Haitao Dan, Robert M. Hierons, and Steve Counsell. “Non-local choices and implied scenarios”. In: Proceedings of the 8th IEEE International Conference on Software Engineering and Formal Methods. 2010, pp. 53-62.
[2] Haitao Dan, Robert M. Hierons, and Steve Counsell. “A framework for pathologies of message sequence charts”. Information and Software Technology 54.11 (2012), pp. 1283-1295.
[3] Haitao Dan and Robert M. Hierons. Conformance Testing from Message Sequence Charts. In: Proceedings of the 4th IEEE International Conference on Software Testing, Verification and Validation. 2011, pp. 279-288.
[4] Haitao Dan and Robert M. Hierons. “Controllability Problems in MSC-based Testing”. The Computer Journal 55.11 (2012), pp. 1270–1287.
[5] Haitao Dan and Robert M. Hierons. “The Oracle Problem When Testing from MSCs”. The Computer Journal 57.7 (2014), PP. 987–1001.

[6] John A. Clark, Haitao Dan, and Robert M. Hierons. “Semantic Mutation Testing”. In: Proceedings of the 3rd IEEE International Conference on Software Testing, Verification, and Validation Workshops. 2010, pp. 100 –109.
[7] John A. Clark, Haitao Dan, and Robert M. Hierons. “Semantic mutation testing”. Science of Computer Programming 78.4 (2013), pp. 345 –363.
[8] Haitao Dan and Robert M Hierons. “SMT-C: A Semantic Mutation Testing Tools for C”. In: 2012 IEEE Fifth International Conference on Software Testing, Verification and Validation. 2012, pp. 654–663.
[9] Haitao Dan and Robert M. Hierons. “Semantic Mutation Analysis of Floating-point Comparison”. In: Proceedings of the 5th IEEE International Conference on Software Testing, Verification and Validation. 2012, pp. 290–299.
[10] Kelly Androutsopoulos, David Clark, Haitao Dan, Robert M. Hierons and Mark Harman. “An Analysis of the Relationship between Conditional Entropy and Failed Error Propagation in Software Testing”. In: Proceedings. 36th International Conference on Software Engineering, 2014. pp. 573–583.