Techniques for Efficient Automated Elimination of False Positives

20th IEEE International Working Conference on Source Code Analysis and Manipulation

September 27-September 28, 2020 - Adelaide, Australia

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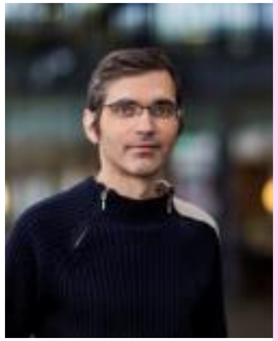

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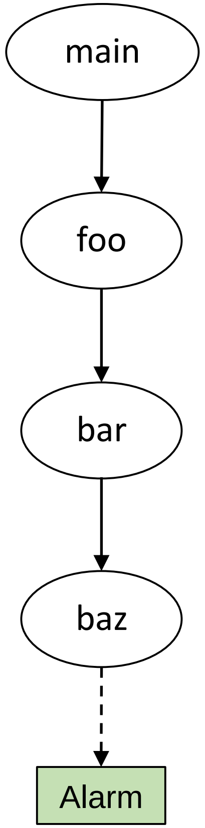
Motivation

- Static analysis – large number of alarms
- Automated false positives elimination (AFPE)
  - Postprocessing using model checkers
- Techniques combined for scalability
  - Application-level slicing
  - Verification using context expansion
  - Verification context-level slicing
- The combination
  - Useful
  - Time taken is a major concern

  (too many slicing and model checking calls)

4 slicing calls and 3 model checking calls*



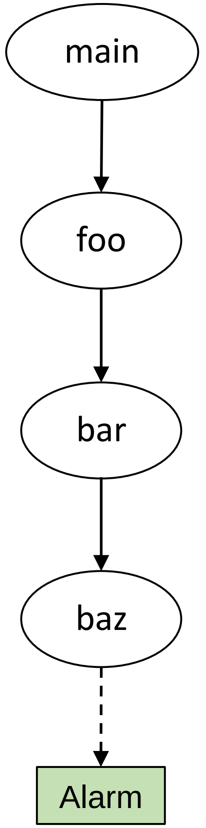
1. Slicing with “main” as entry-point
2. Slicing with “baz” as entry-point, and then model checking
3. Slicing with “bar” as entry-point, and then model checking
4. Slicing with “foo” as entry-point, and then model checking

*It is under assumption that first two model checking calls result in counter-example and the third call times out/proves that the assertion holds.

Technique 1 - Identification of Redundant Slicing Calls

Highlighted calls can be redundant!

- ❑ Observation
  - Many context-level slicing calls are redundant
- ❑ Contribution – sound technique
  - based on data dependencies
  - Implementation using PDGs
- ❑ Under evaluation



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Technique 2 - Redundant Calls on Partitioned-code

❑ Code partitioning to scale static analysis

- Breaks the system into multiple modules

❑ Observation

- Context-level slicing and model checking calls can be repetitive (redundant)

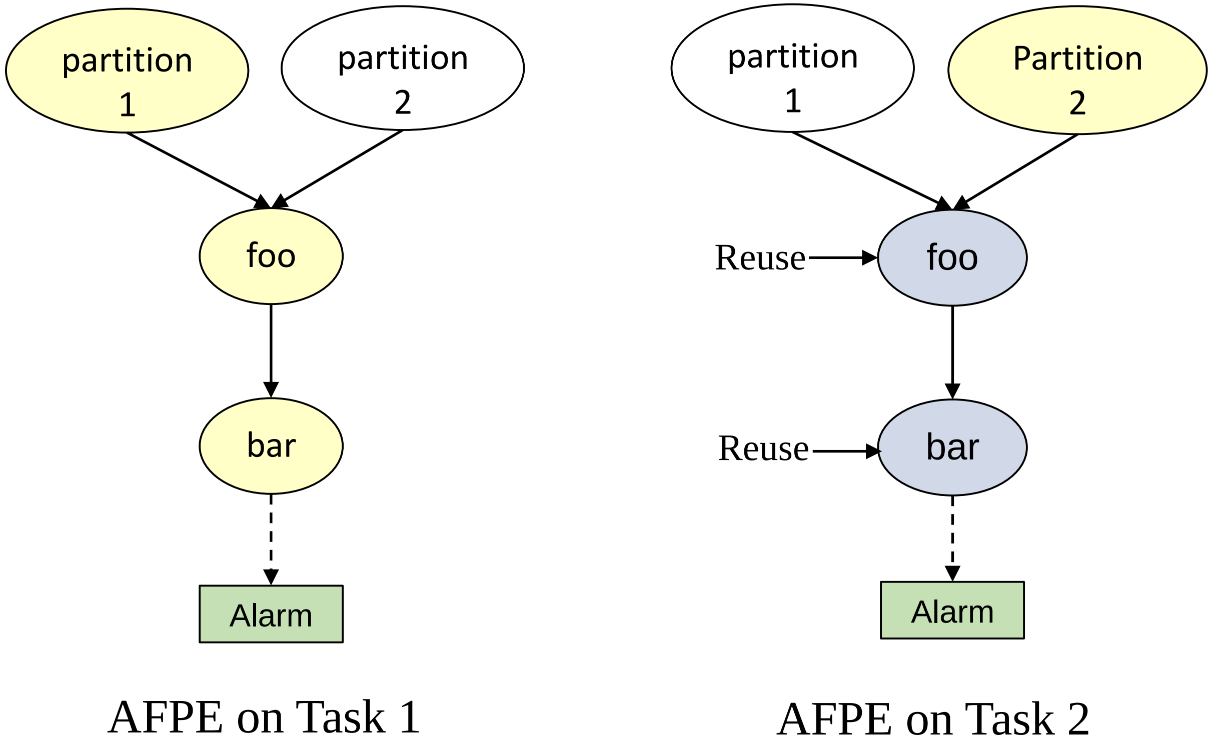
❑ Memoization-based technique

- Reuses results across partitions

❑ Initial evaluation

- Using 5 applications
- AFPE time reduction – by up to 56%, median 12%

Calls with “foo” and “bar” as entry-points are repetitive*



*It is under assumption that no model checking call times out or proves that the assertion holds.

Conclusions & Future work

❑ Conclusion

- Reducing redundancy in AFPE helps to improve its efficiency
- Design of more such techniques is required

❑ Future work

- Evaluate the two techniques
- Improve technique 1 to identify more redundant slicing calls
- Design technique to skip calls based on the history of model checking calls

Provoking Questions

❑ Are developers from industry really using the software engineering practices and techniques being researched by us?

❑ With the hype in machine learning, are we sometimes unnecessarily using it in tasks in source code analysis and manipulation, and even in software engineering?