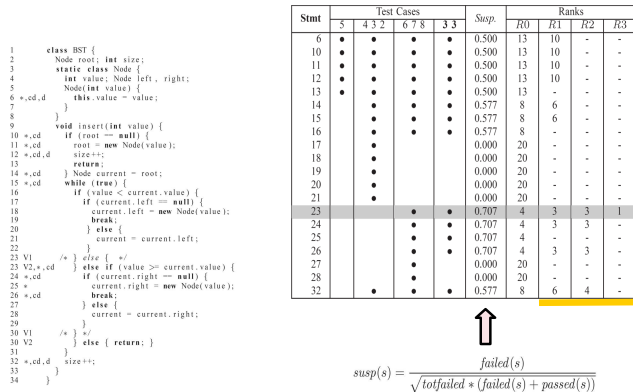


Fault-Localization Using Dynamic Slicing and Change Impact Analysis

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Goal

Improve spectrum-based fault-localization tools. For example, Tarantula [Jones et al., 2002]



✗ BST bst = new BST(); bst.insert(3);
 bst.insert(3); assert(bst.size==1);

Figure 1. The Tarantula approach.

Our Approach

Use program dependency and change data!

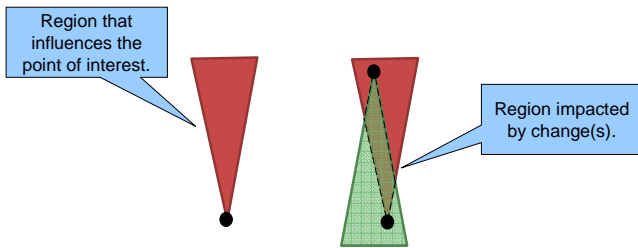
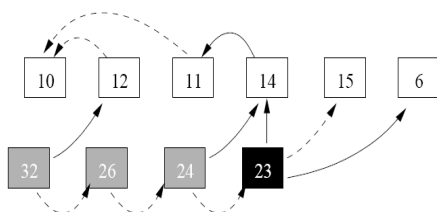


Figure 2. Program slices.

...and filter Tarantula's rank with this data.

Implemented backward and forward slicing in Java PathFinder and used DiffJ for finding code changes.

Example: (Test 3 3)



Results

Used subjects from Siemens and SIR benchmarks.

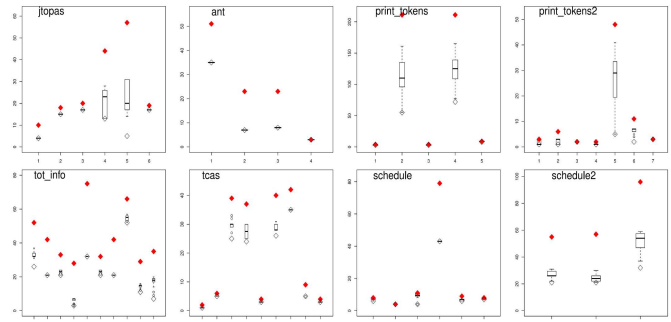


Figure 3. Improvement of Tarantula when using slice of one failing test.

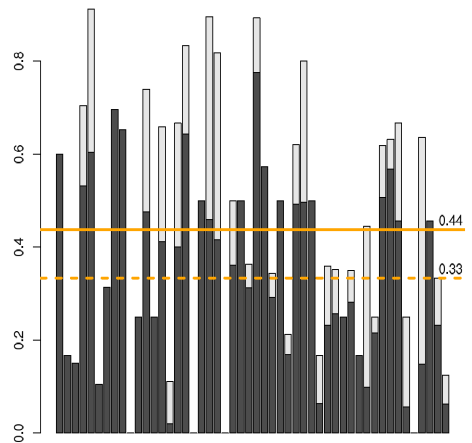


Figure 4. Using slices of multiple failing tests.

name	T+DS	T+CI (5%)	T+CI (10%)
print_tokens	117.32 (63.50)	103.99 (42.00)	101.96 (42.00)
print_tokens2	16.19 (3.50)	15.79 (3.50)	15.79 (3.50)
tot_info	24.61 (21.50)	10.20 (8.40)	14.34 (12.40)
tcas	30.30 (27.50)	10.59 (8.50)	12.97 (10.50)
schedule	26.19 (23.50)	21.19 (18.50)	23.69 (21.00)
schedule2	34.64 (24.67)	23.48 (6.67)	28.08 (17.00)

Figure 5. Dynamic slicing vs. Change-impact analysis for simulated scenarios of evolution.

References

- [1] F. Wotawa, "Fault localization based on dynamic slicing and hitting-set computation," in *QSIC*, 2010.
- [2] J. A. Jones, M. J. Harrold, and J. Stasko, "Visualization of test information to assist fault localization," in *ICSE*, 2002.
- [3] R. A. Santelices, J. A. Jones, Y. Yu, and M. J. Harrold, "Lightweight fault-localization using multiple coverage types," in *ICSE*, 2009.