Masters Final Oral Defense

Friday, April 14th, 2017
223 Atanasoff Hall at 10:00 a.m.

Ramanathan Ramu

A Hybrid Approach for Selecting and Optimizing Graph Traversal Strategy for Analyzing BigCode

Performance of program analysis expressed as traversals over graphs like control flow graph (CFG) heavily depends on the order of nodes visited during the traversals: {the traversal strategy}, more so in case of BigCode analysis that performs analysis over a large collection of input graphs. While, there exists several choices for traversal strategy, like depth-first, post-order, reverse post-order, etc., there exists no technique to choose the most time-efficient strategy for traversals. In this paper, we propose hybrid technique that utilizes the static properties of the analysis, and the dynamic properties of the input graphs to select a most time-efficient strategy for each traversal on a graph. Our contributions are: a system for expressing program analysis as traversals, a set of static and dynamic properties that influence the traversal strategy selection, a set of static analyses to compute the properties, and a decision tree that checks the properties to select and optimize the most time-efficient traversal strategy. Our evaluation shows that the hybrid technique successfully selected the most time-efficient traversal strategy for 99.99%--100% of the time and using the selected traversal strategy, the running times of the analyses on BigCode in our evaluation were considerably reduced by 23%--79%. The overhead imposed by collecting additional information for our hybrid approach is less than 0.2% of the total running time for a large dataset and less than 0.01% for an ultra-large dataset.

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