Understanding and Analyzing Software Execution Behavior

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Motivation

- Debugging
- Performance Enhancements
- Feature Location
- Change Impact Analysis
- Reverse Engineering
- Behavior Anomaly Detection
- White-box Testing
- *etc.*
public boolean addAll(int index, Collection c) {
    if (c.isEmpty()) {
        return false;
    } else if (size == index || size == 0) {
        return addAll(c);
    } else {
        Listable succ = getListableAt(index);
        Listable pred = (null == succ) ? null : succ.prev();
        Iterator it = c.iterator();
        while (it.hasNext()) {
            pred = insertListable(pred, succ, it.next());
        }
        return true;
    }
}
Tarantula
Cerebro

Vijay Palepu

J.Y. Ku
Execution Phases

• Goal: Abstract a large, detailed execution trace into high-level behavioral phases
Execution Phases

• Millions of execution events are logged and must be abstracted

• First challenge is where to draw preliminary boundaries
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• With preliminary phases, we perform a number of steps:
  • Duplicate detection
  • Clustering
  • Sequential Pattern Mining
Execution Phases

• Final stage is to apply **textual labels** to the phases
Sage
Actual Results from Java Compiler (javac)
Sage
Results on Javac

• Original trace: 1 million method call events

• Abstract behavior phases: 57 phases
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