

SPARC three minute madness, January 2005

CnC: Check 'n' Crash

Combining static checking and testing

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Background: Testing with JCrasher _____

Automatically generate and execute many random test cases

Look for public methods that crash—throw a runtime exception

Simple heuristic: Some exceptions are mostly thrown by the Java runtime system to indicate abnormal termination of a Java language operation like class cast—likely to be real bugs

Found several bugs in undergraduate programming assignments

Christoph Csallner and Yannis Smaragdakis. JCrasher: An automatic robustness tester for Java. *Software—Practice and Experience*, 34(11):1025–1050, 2004.

Download JCrasher at: <http://www.cc.gatech.edu/jcrasher/>



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Directed Search with CnC

Use extended static checking of ESC/Java, which builds on the Simplify theorem prover

For each method m under test, ESC computes the weakest precondition $wp(m, \text{true})$ of method m terminating normally

ESC warns of the remaining start states, which are called counterexamples: here method m might not terminate normally (in true), but throw an unexpected runtime exception instead

CnC compiles each ESC warning to a test case, executes, and filters the test case with JCrasher's heuristic

CnC reports only cases in which an exception occurs, so it removes the unsoundness of ESC's static analysis. CnC suppresses ESC's false positives—counterexamples that can never occur in actual program execution



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CnC Results

For many people, a test case is easier to understand than hundreds of lines of theorem prover output

Found a superset of the bugs found with JCrasher using fewer test cases

Found bugs in realistic applications like JABA and the JMS component of JBoss 4.0 RC1. Hard to tell for sure as we have no formal and little informal specification. Thanks to Jim Jones and Alex Orso for helping with JABA

Christoph Csallner and Yannis Smaragdakis. Check 'n Crash: Combining static checking and testing. In *27th International Conference on Software Engineering*. 2005. To appear.

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