PCODA

Session 2: Reverse Engineering

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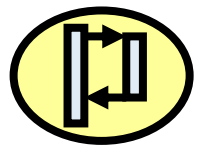
2nd International Workshop on
Program Comprehension through
Dynamic Analysis (PCODA) 2006
(colocated with 13th WCRE 2006)
Benevento, Italy
October 23rd 2006

Summary

1. Aiding the Comprehension of Testsuites

Bas Cornelissen,Arie van Deursen and Leon Moonen

Delft University of Technology, The Netherlands

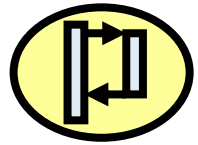


2. A Lightweight Approach to Determining the Adequacy of Tests as Documentation

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

Joris van Geet - University of Antwerp, Belgium

Andy Zaidman - Delft University of Technology, The Netherlands



Aiding the Comprehension of Testsuites

Bas Cornelissen,

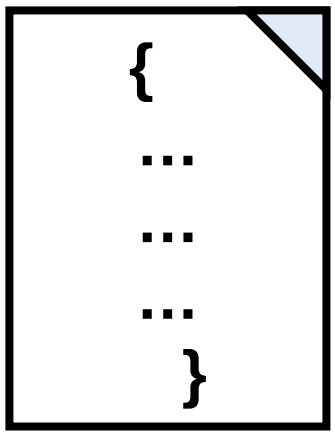
Arie van Deursen and

Leon Moonen*

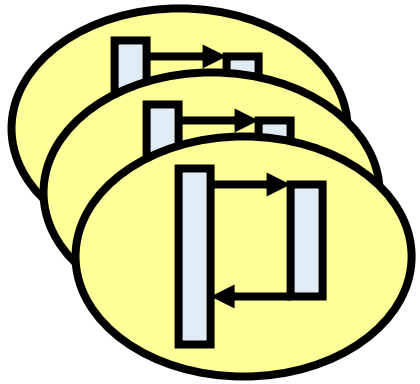
Delft University of Technology (and CWI*),

The Netherlands

Goal: Visual Comprehension of Testsuites using Scenario Diagrams



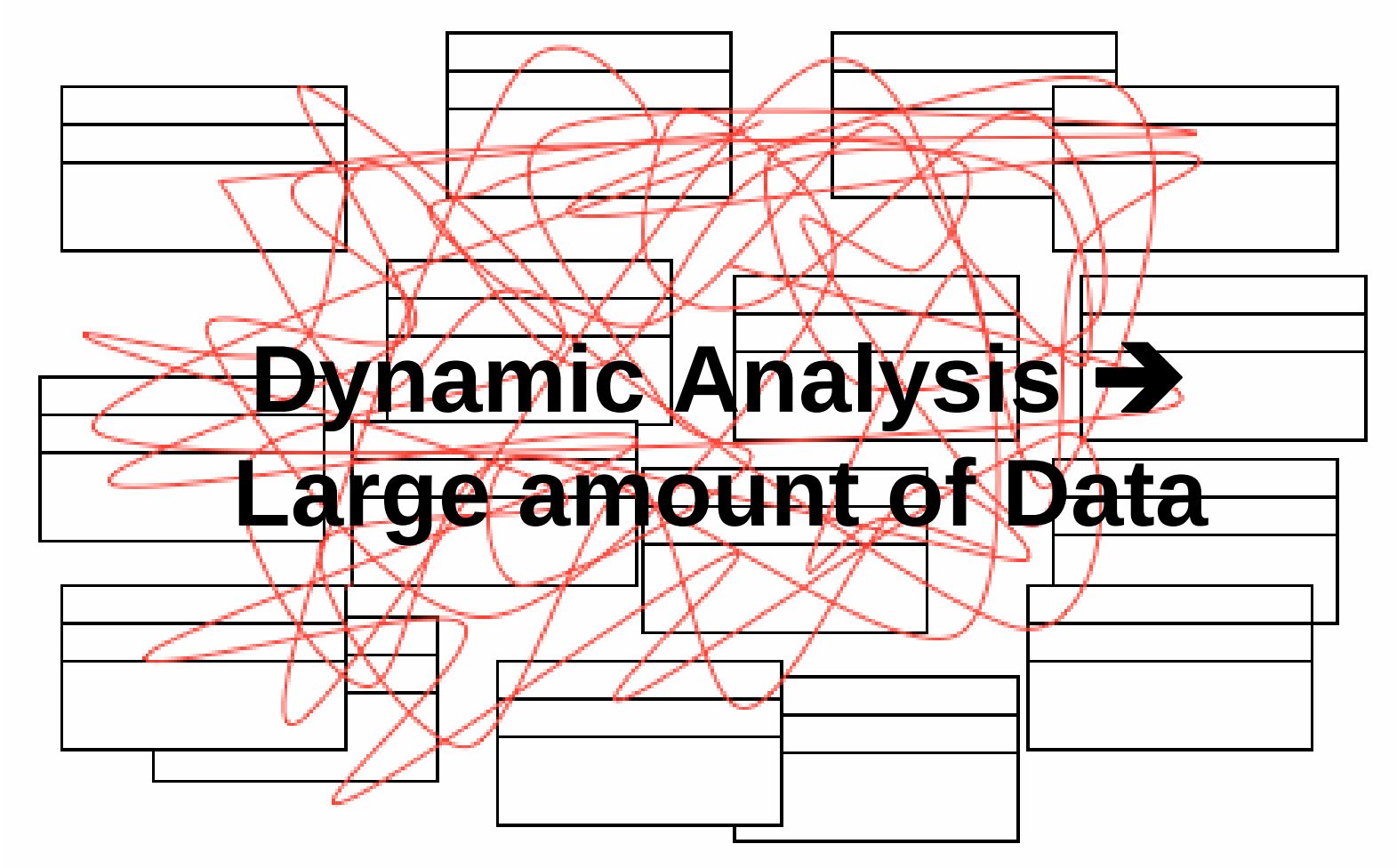
extract
execution traces



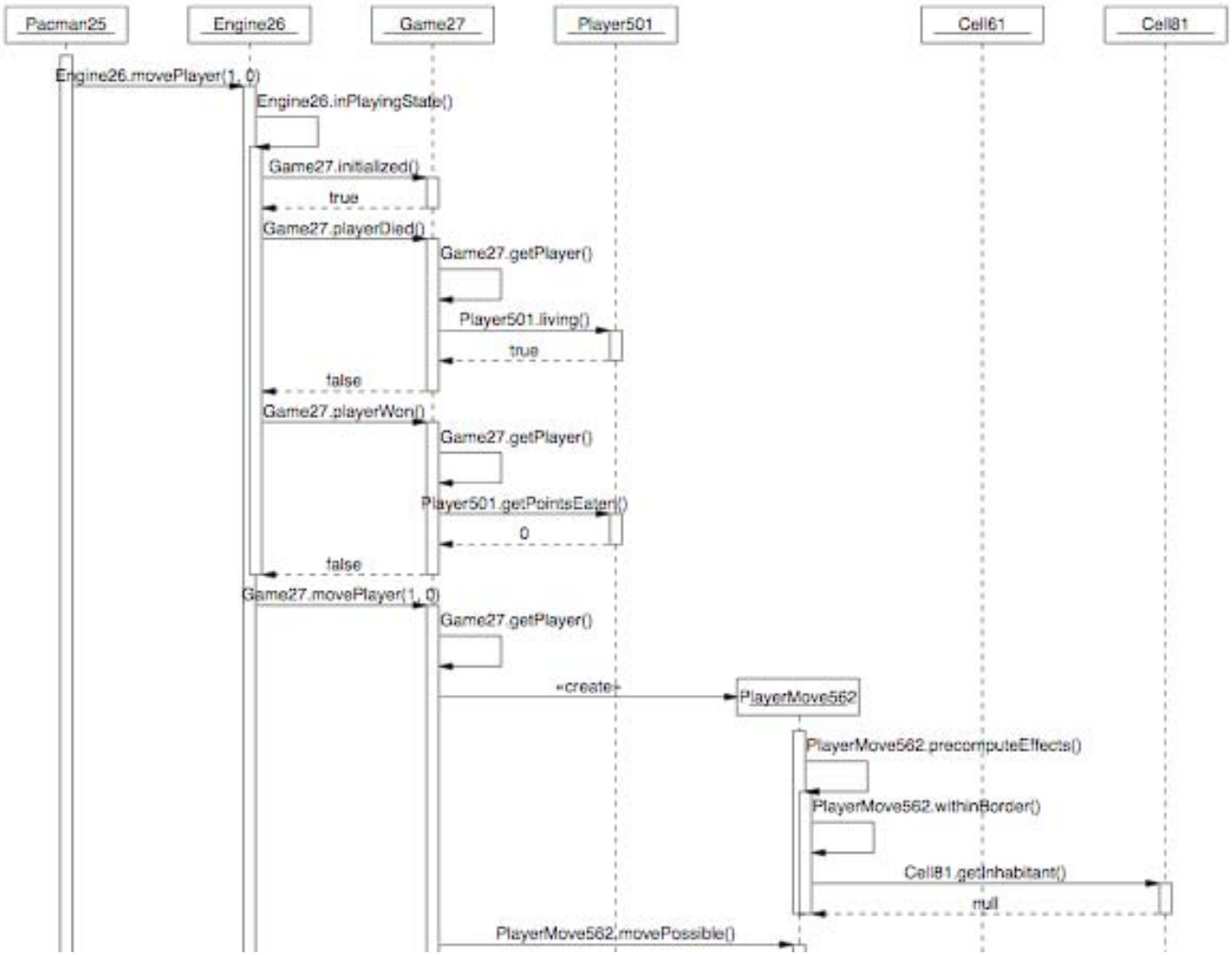
Run test
cases

Visualize as
Scenario diagrams

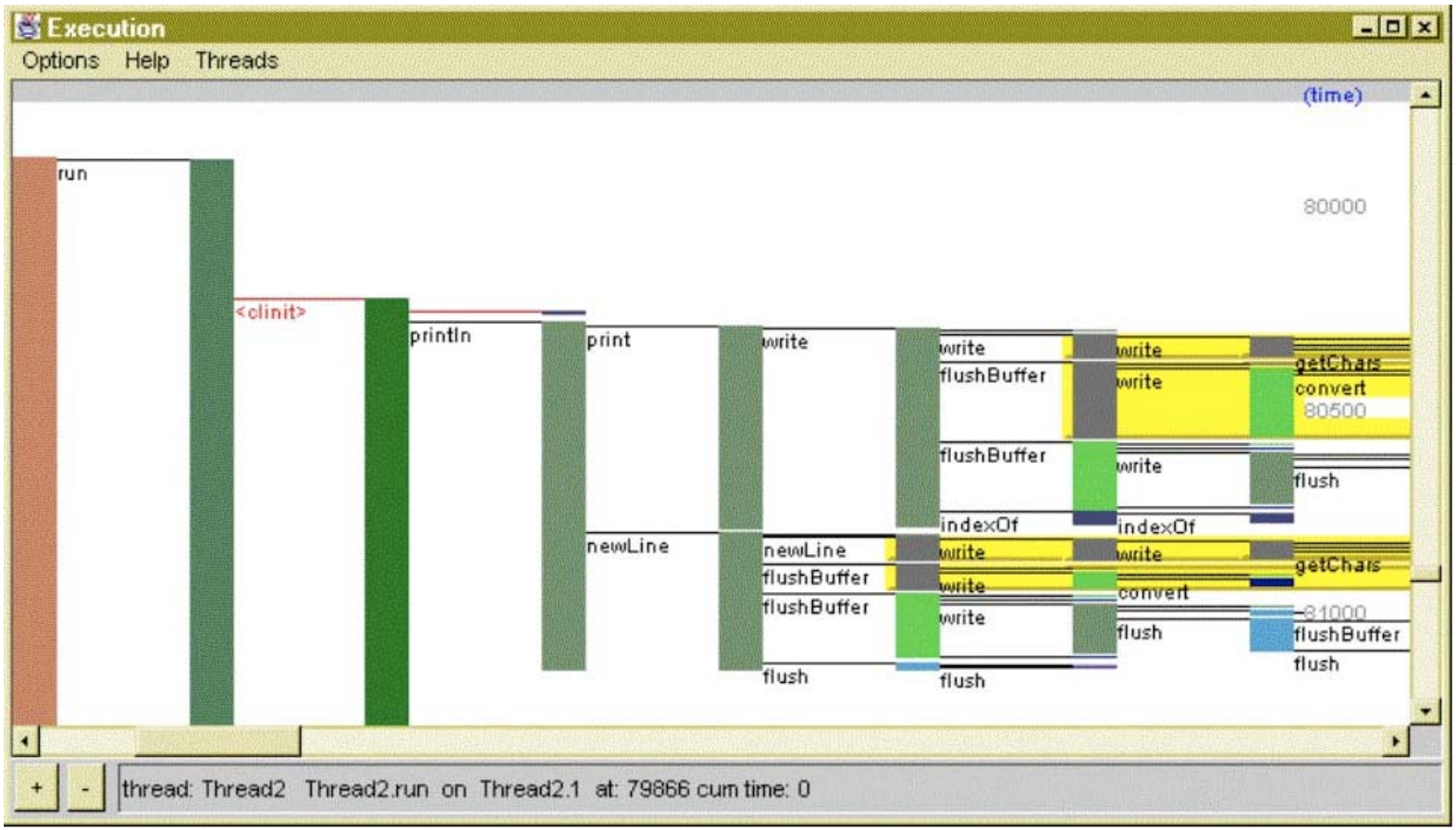
Challenge



Large Scenario diagrams are hard to read

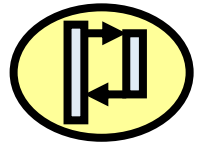


A Really big example!

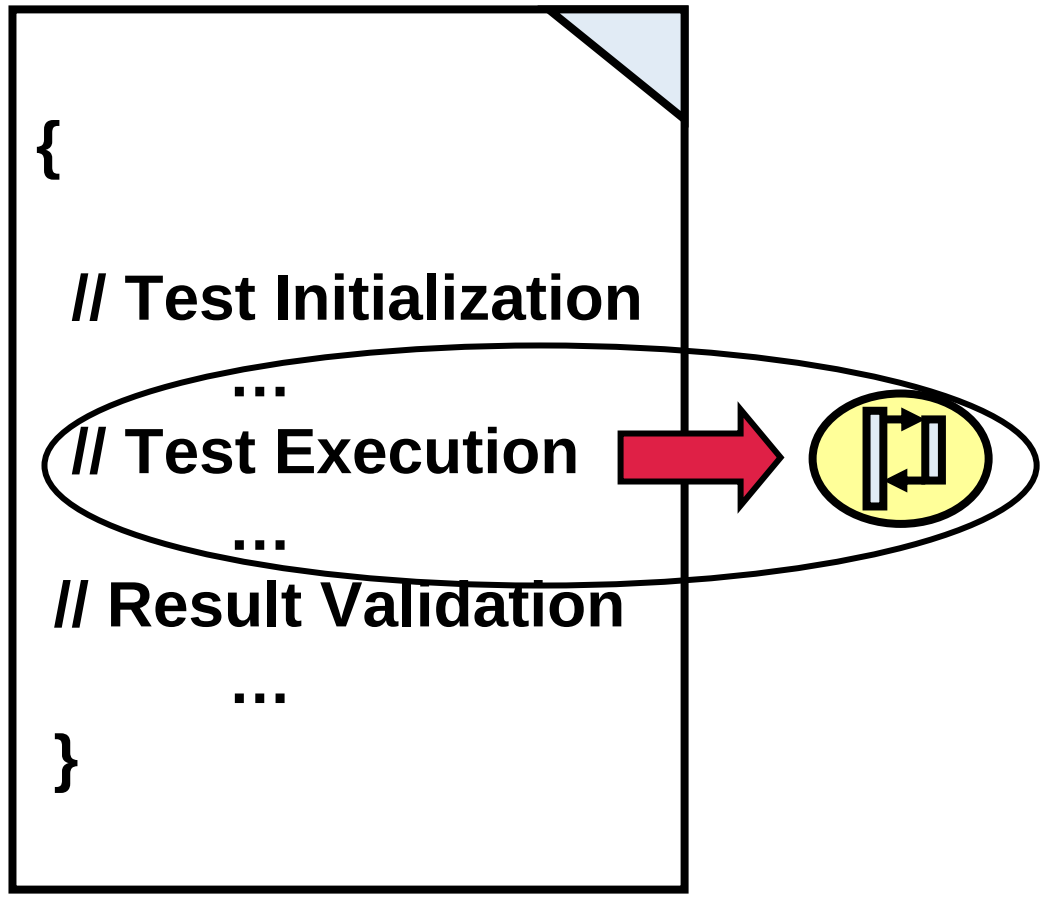


☐[JinSight, De Pauw 1993]

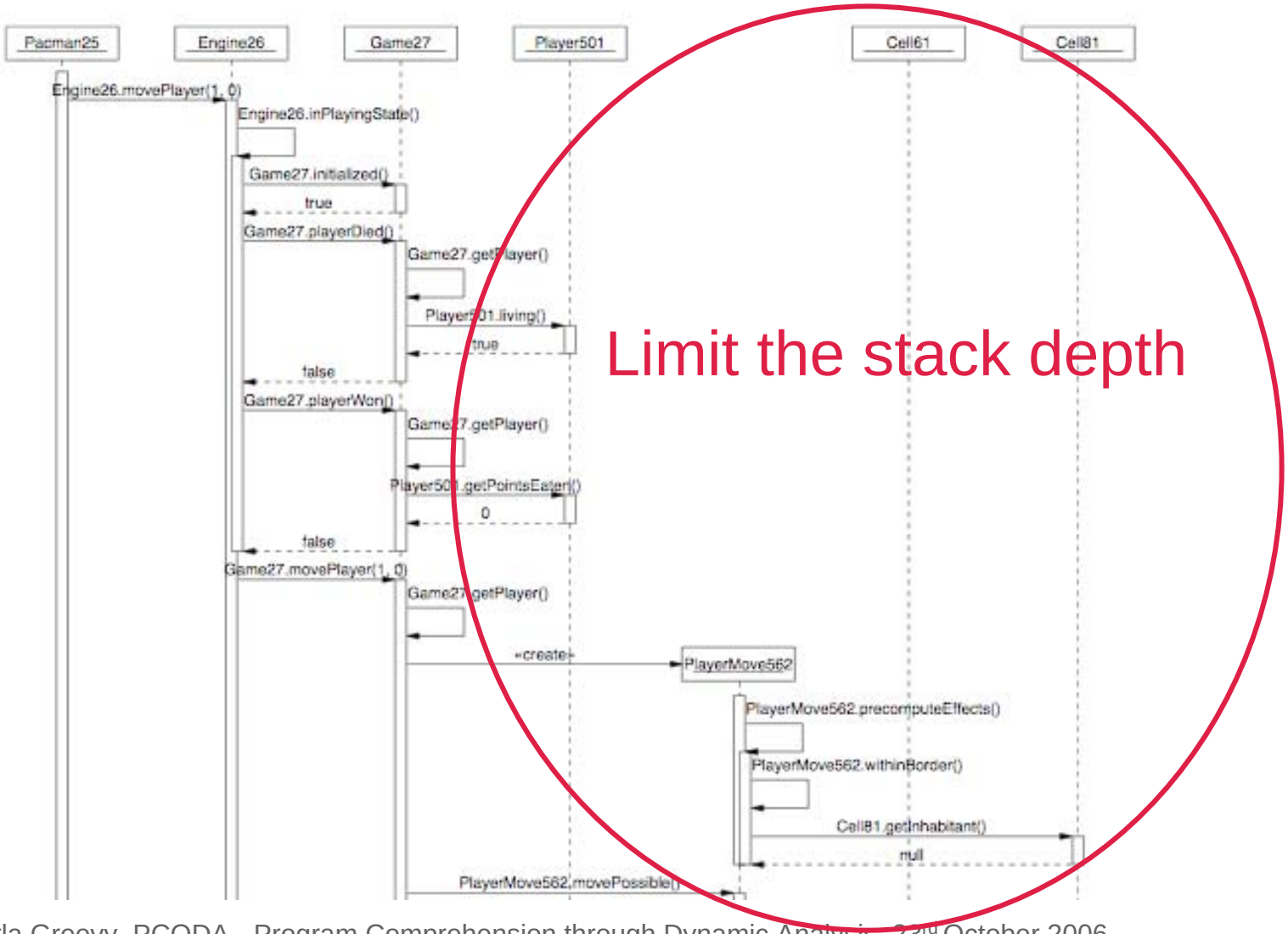
Reduction: Hide Irrelevant details



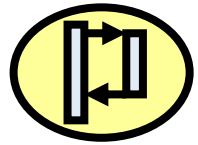
Test Phases



Apply Limit Stack Depth Abstraction



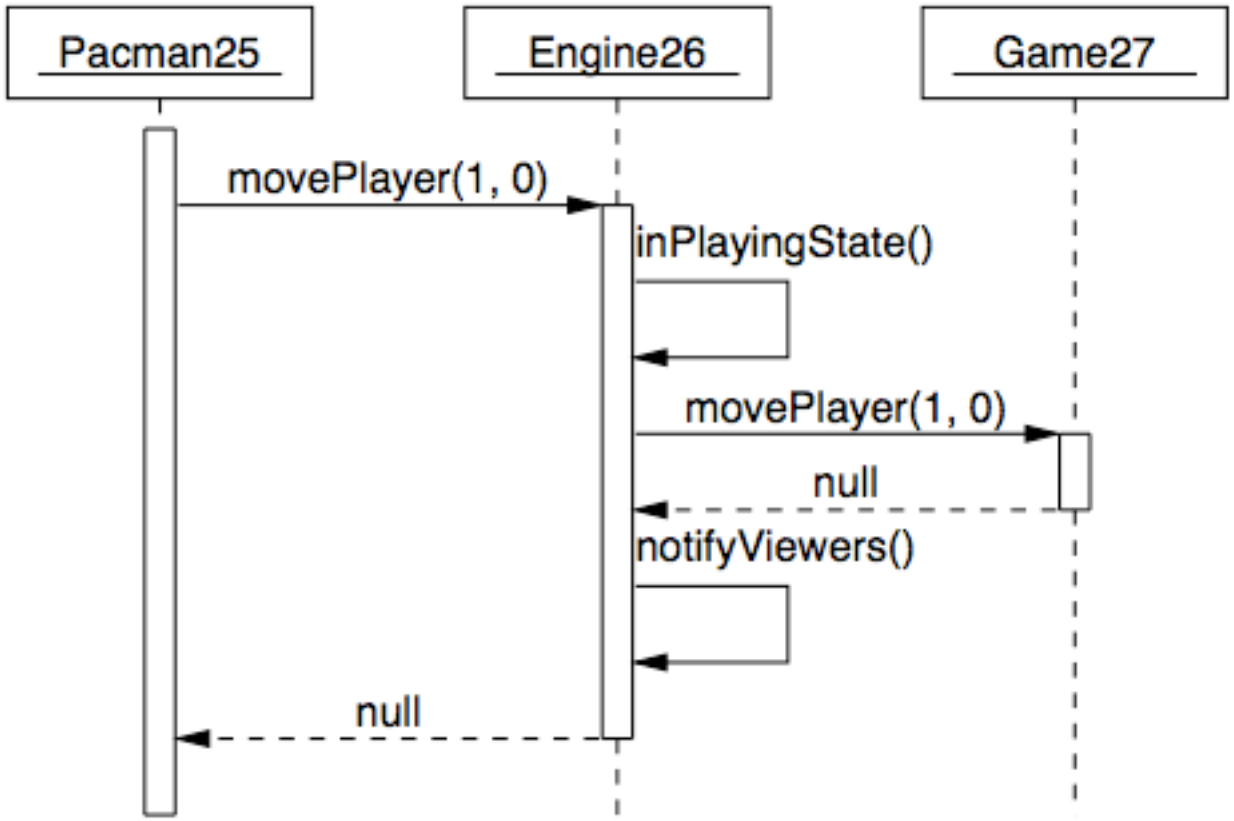
Other Abstractions



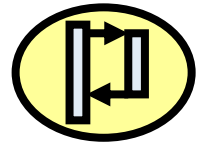
- Hide constructors
- Remove irrelevant constructors

(objects not used in interactions in the execution of a test).

Easy to Read Scenario Diagram with relevant details only



Validation: Case Studies Planned



Jpacman

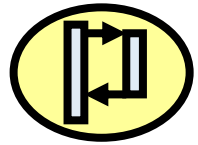
(Java) opensource,

testsuite > 50 test cases

CronMod

an industrial system (Java) with simple and complex unit tests.

Summary and Comments



“Run test cases, filter out setup and result validation, apply semi-automatic abstractions (minimum stack depth) to reduce data and then visualize with scenario diagram”

Questions from Orla:

- *Consider categorizing tests - define metrics?*

- Consider filtering techniques (e.g. repeating sequences due to loops and recursion?)

-What are the next steps?

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

A Lightweight Approach to Determining the Adequacy of Tests as Documentation

Joris van Geet,University of Antwerp, Belgium

Andy Zaidman,Delft University of Technology, The Netherlands

The Research Question

QuickTime™ and a
TIFF (LZW) decompressor
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Tests is to provide “living” documentation for a software system (Agile and XP).

… are the tests adequate?

Adequacy Hypothesis

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"Unit tests are possibly not adequate enough for documentation purposes when they cover a number of units."

one test for every unit (method).

The Approach: Coverage + Isolation Factor

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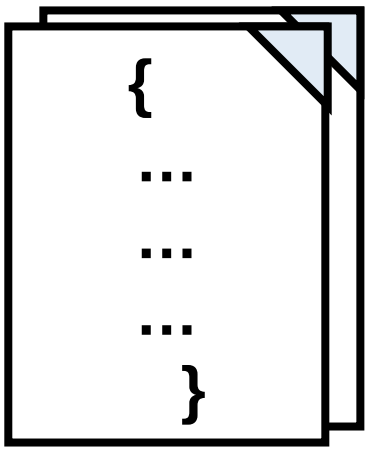
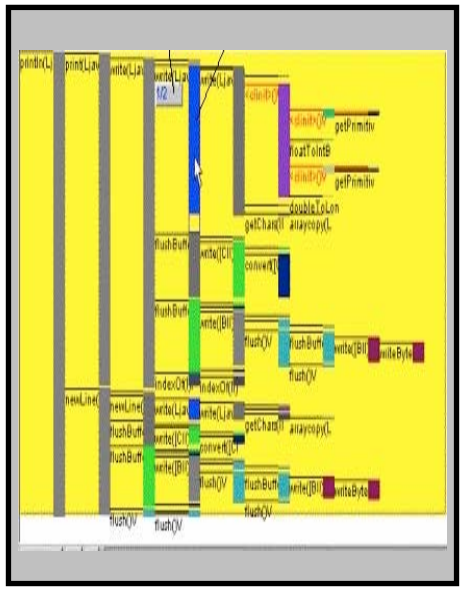


Run test cases

Trace with filter



Execution trace

Emma → Calculate **Coverage**

Tool → Calculate **Isolation Factor**

(is each unit tested isolation?)

Analysis of Coverage Results

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

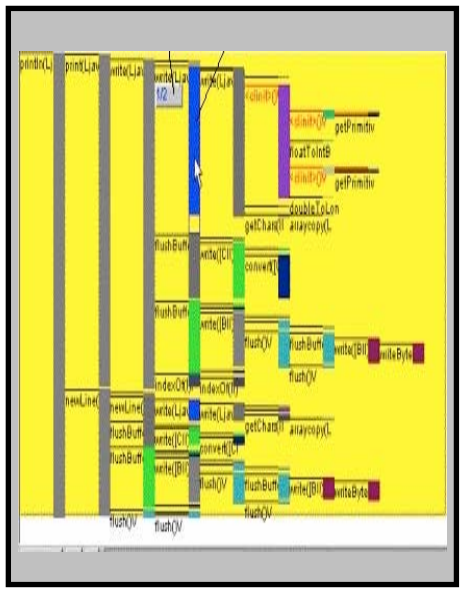
Ant Version	Coverage
1.6.3	61%
1.6.4	63%
1.6.5	65%

(~ 2/3 Methods are covered)

“not all parts of the system require thorough documentation”

Look at the Isolation Factor in more detail…

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.



Execution trace

Isolation Factor

Methods Called by Test

For all tests

Tests Calling a Method

For all methods

Dependency Relationships as sets

Average number of Tests for a Method

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

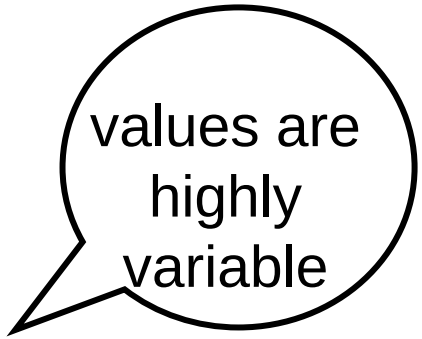
Version	mean	σ
1.6.3	68.02	190.35
1.6.4	64.48	183.49
1.6.5	64.14	182.40

A method is tested by ~ 64 tests

Average number of Methods invoked by a test

QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.

version	mean	σ
1.6.3	230.45	146.10
1.6.4	215.68	135.68
1.6.5	215.41	137.01



A test invokes ~ 215 methods

Box Plot: Number of Methods tested by a Test

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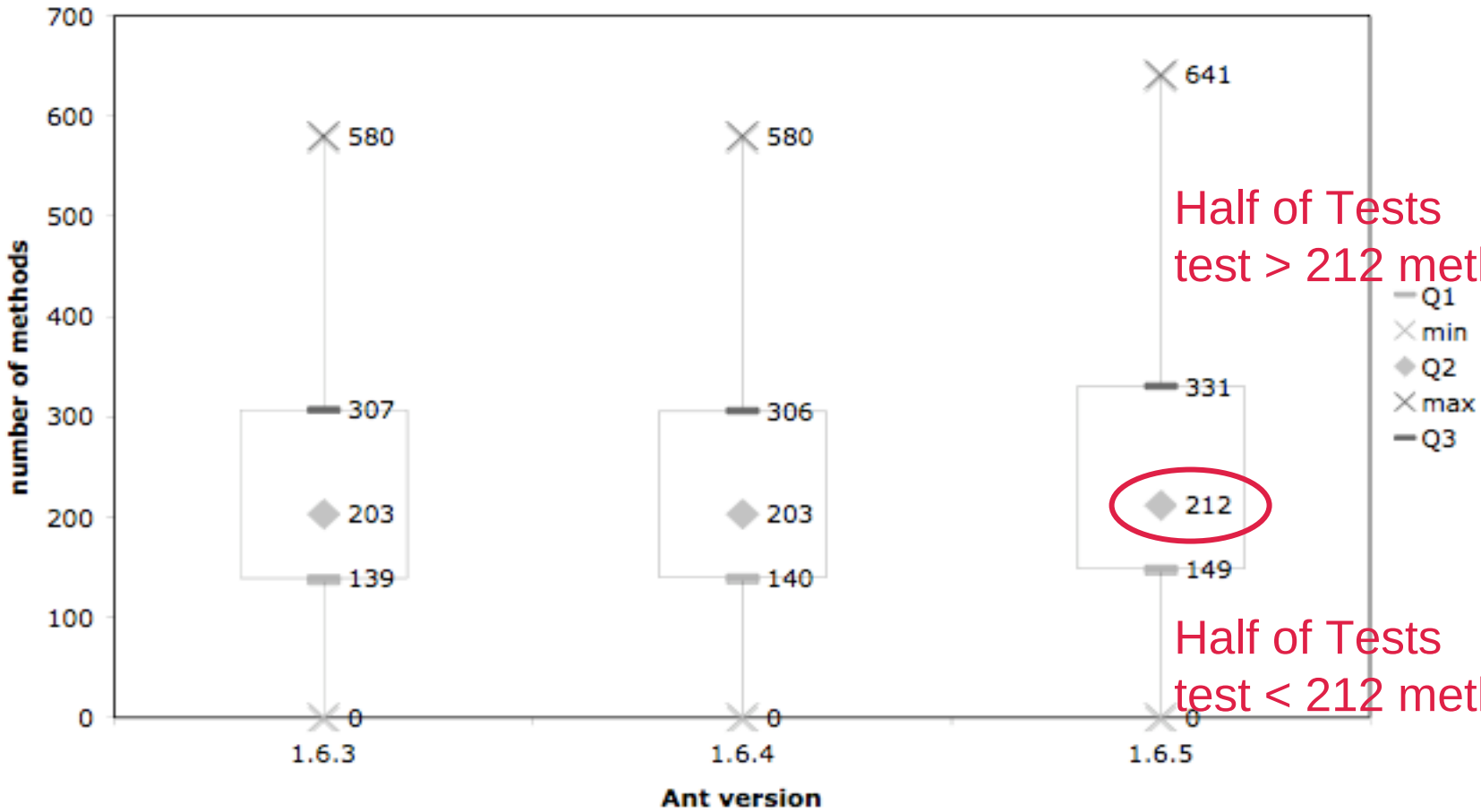
TIFF (LZW) decompressor
are needed to see this picture.



Half of Tests
test > 212 methods

Half of Tests
test < 212 methods

Similar results as obtained by averages

Box plot distribution shows Number of Tests that test a method

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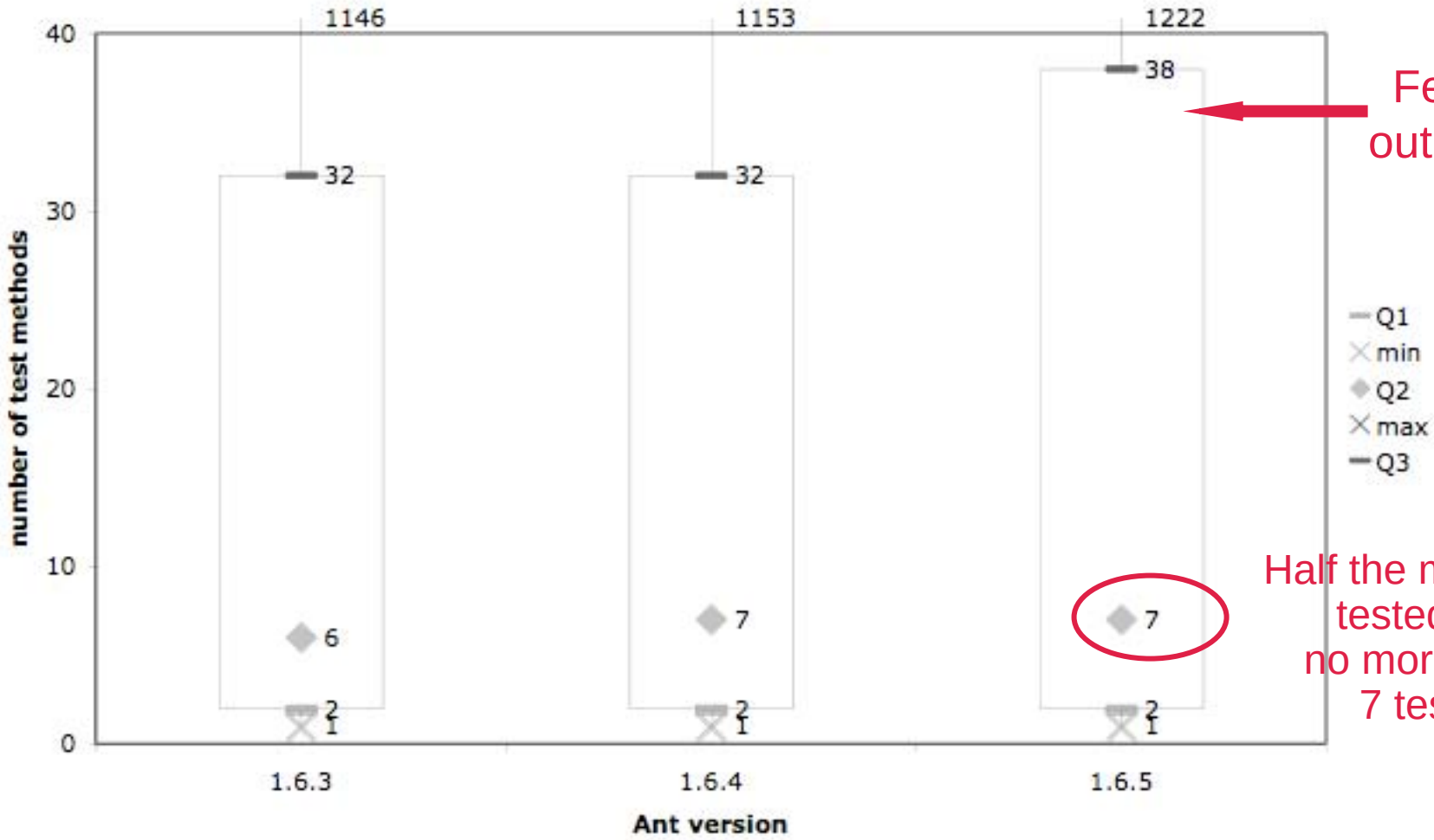

Anecdotal Evidence - Browse code

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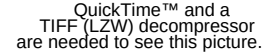
Tests share common setup (filter?)

Identify “often called” methods (characterization?)

Conclusion:

An integration test strategy has been adopted

How do testsuites evolve?



Evolution of tests

The amount of unique methods tested increases over time

A test tests more methods over time

New functionality is being tested

Summary of Paper

QuickTime™ and a
TIFF (LZW) decompressor
are needed to see this picture.

"Run test cases,calculate coverage and isolation factor and determine if tests are adequate

Coverage > 60% AND Isolation Factor High"

Questions from Orla:

- *Consider categorizing tests - define measurements?*
- *Consider evolution of tests - history measurements?*
- *Consider characterizing methods?*
- *Consider more case studies?*
- ***What are the next steps?***

Session 2: Summary

Bas, Arie and Leon:
Visual Comprehension of Tests

- Test Phase identification
- Abstractions

Joris and Andy:
Tests as adequate Documentation?

-Coverage
-Isolation Factor

What are the overlaps and synergies?