Design Tests

An Approach to Programmatically Check your Code Against Design Rules

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To Check code against design rules is an important activity to guarantee quality on source code

- Design Review
  - Manual Process
  - Error-prone
  - Does not scale
The Problem

To Check code against design rules is an important activity to guarantee quality on source code

- Design Review
  - Manual Process
  - Error-prone
  - Does not scale
The Problem

- Gap between state-of-the-art and the state-of-the-practice
  - Approaches from the state-of-the-art are difficult to use
The Problem

Lack of structural conformance checking
Design decisions are violated
The Proposed Solution

**Design Test**

A test that checks whether an implementation complies with a given design rule expressed as an algorithm.
What's the big deal?

- It is written in the target programming language
- Automated test
Example of Design Rule

Only *controller* package shall access the *dao* package of the *peer* component.
Example of Design Test

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---

**Design Test Pseudocode**

```plaintext
1  daoPackage = org.ourgrid.peer.dao
2  controllerPackage = org.ourgrid.peer.controller
3  callers = daoPackage.getCallers()
4  FOR each caller IN callers DO
5    assert ( caller == daoPackage ) || ( caller == controllerPackage )
6  ENDFOR
```
Example of Design Test

Only *controller* package shall access the *dao* package of the *peer* component.

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- Facts about the code (an API)
Example of Design Test

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Design Test Pseudocode

```java
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6 END FOR
```

- Facts about the code (an API)
- Assertion routines
Checking Code against Design Rules with Design Tests

The Problem
The Proposed Solution
Early Evaluation
Benefits

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Checking Code against Design Rules with Design Tests

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Checking Code against Design Rules with Design Tests

Specification
Execution

Design Rules

JUnit

DesignWizard

Application

Green Bar
Red Bar
Design Test Execution

```java
package org.ourgrid.test.design;

import java.io.IOException;
import java.util.Set;

import junit.framework.TestCase;
import org.designwizard.design.PackageNode;
import org.designwizard.exception.InexistentEntityException;
import org.designwizard.main.DesignWizard;

public class OurGridDesignTest extends TestCase {

    public void testCommunication() throws IOException, InexistentEntityException {

        DesignWizard dw = new DesignWizard("ourgrid.jar");

        PackageNode dao = dw.getPackage("org.ourgrid.peer.dao");
        PackageNode controller = dw.getPackage("org.ourgrid.peer.controller");

        Set<PackageNode> callers = dao.getCallersPackages();

        for (PackageNode caller : callers) {
            assertTrue(caller.equals(dao) || caller.equals(controller));
        }
    }
```
Design Test Execution

```java
package org.ourgrid.test.design;

import java.io.IOException;
import java.util.Set;

import junit.framework.TestCase;

import org.designwizard.design.PackageNode;
import org.designwizard.exception.InexistentEntityException;
import org.designwizard.main.DesignWizard;

public class OurGridDesignTest extends TestCase {

    public void testCommunication() throws IOException, InexistentEntityException {

        DesignWizard dw = new DesignWizard("ourgrid.jar");

        PackageNode dao = dw.getPackage("org.ourgrid.peer.dao");
        PackageNode controller = dw.getPackage("org.ourgrid.peer.controller");

        Set<PackageNode> callers = dao.getCallersPackages();

        for (PackageNode caller : callers) {
            assertTrue(caller.equals(dao) || caller.equals(controller));
        }
    }
}
```
DesignWizard

The Problem
The Proposed Solution
Eraly Evaluation
Benefits

Static Analysis

DesignWizard’s API

Code metadata

ASM Bytecode Manipulator

Jar File

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Early Evaluation

- OurGrid
  - 100KLOC
  - Execution time: 6.7 seconds
  - 10 violations
Early Evaluation

- All developers understood what the test was supposed to do.
- They appreciated the way to check whether they are following the rules.
- The test was added in the test suite of OurGrid in order to be performed daily.
Examples of design rules to check

- Rules related to framework usage
- Law of Demeter
- Bug patterns
Benefits

- Design tests can express several design rules (Expressivity)
- Design tests are easy to compose/maintain
- Design tests are easy to be added into process development
- Design tests with DesignWizard scales

... but we still have to prove it!
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Thank you

www.designwizard.org