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ITP2200
Introduction to Software Testing

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Lecture 2
Coverage and Coverage criteria

So, how did the homework go?

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Quick assignment until next week

Homework:

- Have a quick look at your projects from last semester.

- Try to map all the (very many, I know) definitions to those projects

- Write a quick description and let’s discuss them

- Prepare questions about how they can be improved in terms of quality

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What do we remember from last time?

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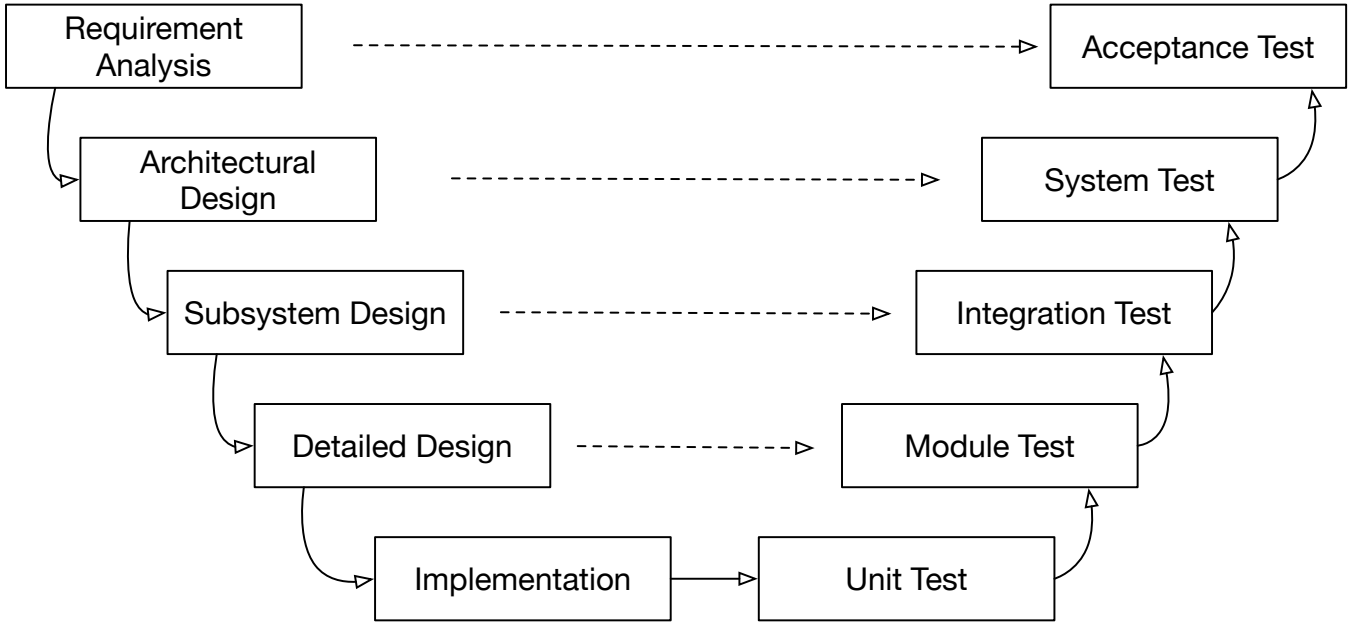
What do we remember from last time?



- Or the one-sentence guide to the entire field of software engineering

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Some simple code

What values we should use?

- Are there any values that would reveal a bug?

A:

```
if ( a >= 0 ) return “a is positive”;

else return “ A BUUUUG! “;
```

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Some simple code

What values we should use?

- Are there any values that would reveal a bug?

B:

```
for(int i=0; i < array.length; i++)
{
    System.out.print(array[i] + “ ”);
    if ( array[i] < 0) negatives++;
    else positives++;
}
```

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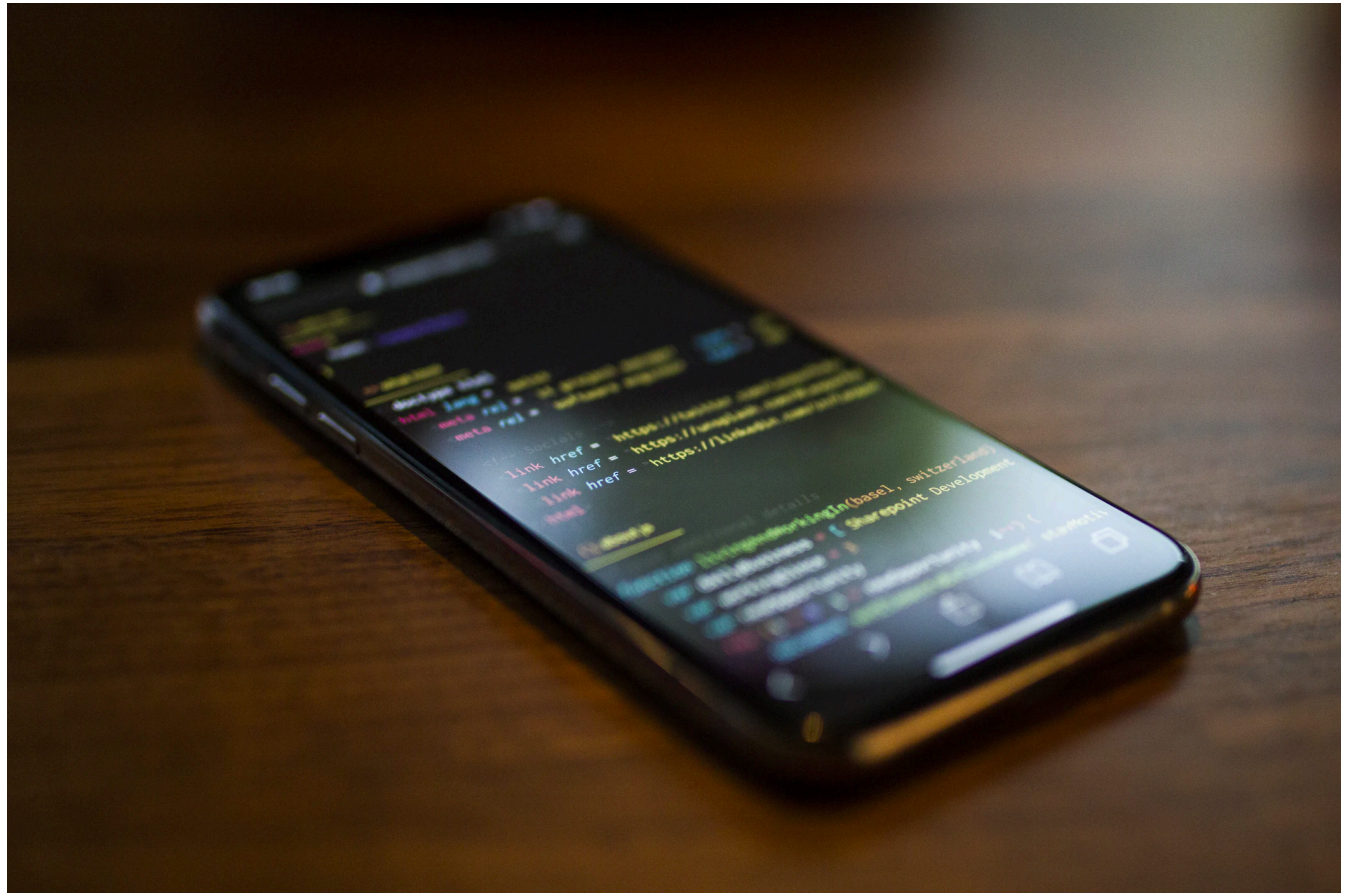
Quality as a Goal



Audience participation question:

Examples of good software vs bad software?

How did you evaluate them?

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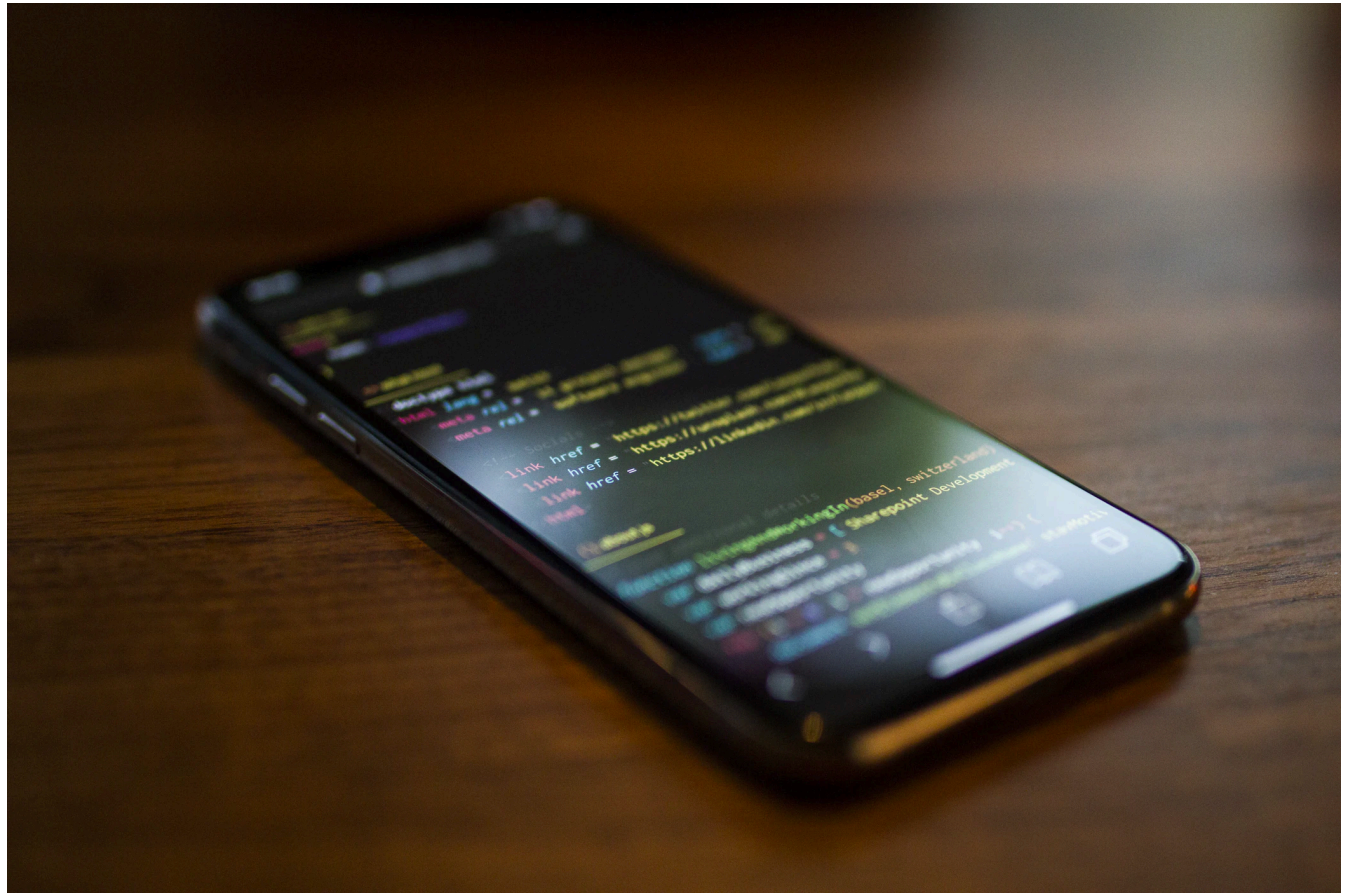
Quality as a Goal



Verification: Does the product fulfil the requirements?
- Build the product right.

Validation: Does the product fit with intended usage?
- Build the right product.

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Wait, “bugs”?

Well, technically:

Software Fault: A static defect in the software.

Software Error: An incorrect internal state that is the manifestation of some fault.

Software Failure: External, incorrect behaviour with respect to the requirements or other description of the expected behaviour.

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“bugs” for short

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So, how do we know something is wrong?

Testing: Evaluating software by **running** it.

Test Failure: Execution that yields the "wrong" result.

Debugging: The process of finding a **fault** that caused a failure.

Test Case Values: The input values necessary to complete some execution of the software under test.

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How do we know a “wrong” result?

Expected Results: program’s **intended** behaviour.

Software Observability: How easy it is to observe the behaviour of a program.

Software Controllability: How easy it is to provide a program with the needed inputs.

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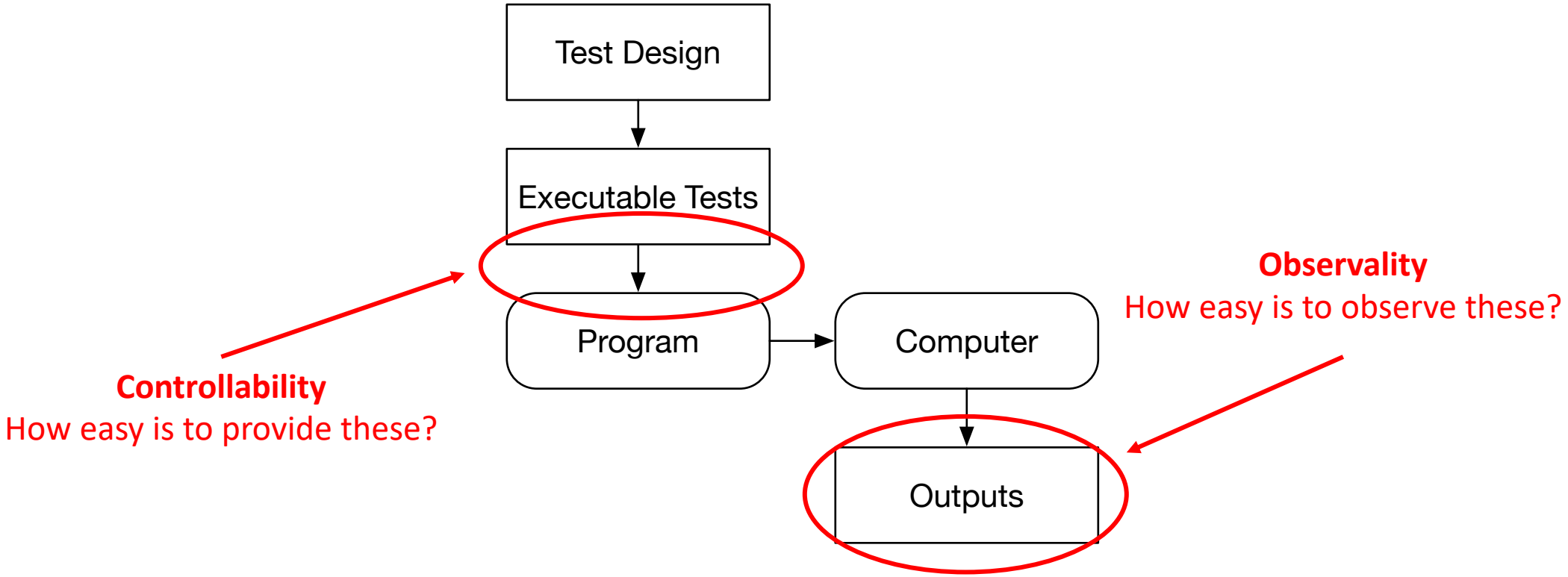
Observability vs Controllability



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Coverage as a means of evaluation

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Coverage as a means of evaluation

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Enough theory, let's get to code!

```java
public class SortingHelper {

    public static int[] sortArray(int[] array){
        int n = array.length;
        int[] result = array.clone();
        int temp = 0;
        for(int i=0; i < n; i++) // Looping through the array length
        {
            for(int j=1; j < (n-i); j++)
            {
                if(result[j-1] > result[j])
                {
                    //swap elements
                    temp = result[j-1];
                    result[j-1] = result[j];
                    result[j] = temp;
                }

            }
        }

        return result;
    }
```

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Questions so far?

Exercise for the Seminar

In groups (self-organized, so pick a room you like, chat to the people there, figure it out):

- Discuss previous projects, especially **JavaScript** and the current **OOP exercises**

- What did you test in the past? Do you remember what tests you ran?

- What parts of the code were/weren't covered?

- What inputs did you use?

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Exercise for the Seminar

Select a module you find interesting from one of the projects:

- Discuss, for existing tests (or tests that you remember), how execution proceeds through the code
- Write test cases that cover different execution paths. (Try to cover as many as possible)
- Do you think the module is ready for delivery now, and why?

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Exercise for the Seminar

Take a look at the source and the test code in package ex02:

- Try to understand what the source code does.
- Run the test case, then run it again with the “Coverage” option in IntelliJ.
- Can you come up with a way to split the test into two, so that the same code is still covered?

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More definitions

Definition 1.17 Test Case: A test case is composed of the test case values, expected results, prefix values, and postfix values necessary for a complete execution and evaluation of the software under test.

Definition 1.18 Test Set: A test set is simply a set of test cases.

Definition 1.19 Executable Test Script: A test case that is prepared in a form to be executed automatically on the test software and produce a report.

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