

CS314 Software Engineering White Box (Coverage) Testing

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Program testing types

- Black-box testing
 - Specifications drive test inputs and expected outputs
 - No code, design or internal documentation are available
- White-box testing
 - Code structure drives test inputs
 - Specification used to derive tests outputs
 - Code, design, and internal documentation are available
 - Goal is to "cover" the code to gain confidence and detect defects.

White Box Testing

- Statement Coverage
 - Requires all statements to be executed
- Branch Coverage
 - Require decisions evaluate to true and false at least once
 - Implies statement coverage
- Path Coverage
 - Require all possible paths to be executed
 - Implies branch coverage

Coverage Problems

- Statement
 - May not exercise all the conditions in predicates
- Branch
 - May not exercise all combinations of branches
- Path
 - combinatorial explosion
 - infinite paths for loops
 - not all paths are feasible

Coverage

- Statements
- Branch
- Path

```
1. public double fun(double x, int y){  
2.     int p;  
3.     double z;  
4.     if (y > 0)  
5.         p = y;  
6.     else  
7.         p = 0 - y;  
8.     z = 1.0;  
9.     while ( p-- > 0)  
10.        z = z * x;  
11.     if ( y < 0 && z != 0.0)  
12.        z = 1.0/z;  
13.     return z;  
14.}
```

IntelliJ IDEA Coverage

- <https://www.jetbrains.com/help/idea/code-coverage.html>
- <https://www.youtube.com/watch?v=yNYzZvyA2ik>

IntelliJ IDEA Coverage

- ▼ edu.csu2017sp314.DTR14.tripco 72% classes, 34% lines covered
 - ▼ Model 100% classes, 65% lines covered
 - Location 90% methods, 91% lines covered
 - LocationList 85% methods, 83% lines covered
 - Model 40% methods, 23% lines covered
 - Query 90% methods, 53% lines covered
 - ShortestRouteCalculator 68% methods, 69% lines covered
 - Trip 100% methods, 100% lines covered
 - Presenter 50% classes, 22% lines covered
 - View 63% classes, 20% lines covered
 - TripCo 37% methods, 18% lines covered
 - WebSocket 0% methods, 0% lines covered
 - XMLReader 100% methods, 66% lines covered

```

38
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47
private boolean checkValid(String check:
    if (checks == null) return false;
    (checks.length() > compareTo
    checks.substring(0, compa
    urn true;
    turn false;

```

Hits: 5
 checks == null
 true hits: 0
 false hits: 5

[all classes]

Overall Coverage Summary

| Package | Class, % | Method, % | Line, % |
|-------------|----------------|-----------------|-------------------|
| all classes | 72.7% (16/ 22) | 41.1% (81/ 197) | 34.8% (560/ 1609) |

Coverage Breakdown

| Package ^ | Class, % | Method, % | Line, % |
|---|---------------|----------------|------------------|
| edu.csu2017sp314.DTR14.tripco | 66.7% (2/ 3) | 19.4% (6/ 31) | 11% (27/ 245) |
| edu.csu2017sp314.DTR14.tripco.Model | 100% (6/ 6) | 76.6% (49/ 64) | 65% (368/ 566) |
| edu.csu2017sp314.DTR14.tripco.Presenter | 50% (1/ 2) | 37.5% (3/ 8) | 22.2% (10/ 45) |
| edu.csu2017sp314.DTR14.tripco.View | 63.6% (7/ 11) | 24.5% (23/ 94) | 20.6% (155/ 753) |

Branch Coverage

Path Coverage