



Testing Terminology ⁰²

Lecture Objectives:

- 1) Explain the difference between white box and black box testing.
- 2) Explain the difference between static testing and dynamic testing.
- 3) Define test requirement.
- 4) Define coverage criterion.
- 5) Define coverage and coverage level.
- 6) Define infeasibility.
- 7) ^{Compare} Compare and contrast white and black box testing.
- 8) Compare and contrast top down and bottom up testing.
- 9) Compare and contrast static testing with dynamic testing.

What is wrong with the

following terms?

- Complete testing
- Exhaustive Testing
- Full coverage

All
mean
the same
thing.

Not possible

Meaningless

Black Box versus White Box

Testing

Black Box \Rightarrow No idea
↓



How the implementation
is done.

Black Box versus White Box

Testing

We know the details.



Black Box Testing and White Box Testing

- Black box testing (also called functional testing) is testing that ignores the internal mechanism of a system or component and focuses solely on the outputs generated in response to selected inputs and execution conditions.
- *White-box testing is testing that takes into account the internal mechanism of a system or component (IEEE, 1990).*

Static and dynamic testing

- Static Testing : Testing without executing the program

- This include software inspections and some forms of analyses
- Very effective at finding certain kinds of problems – especially “potential” faults, that is, problems that could lead to faults when the program is modified

Program never runs



- Dynamic Testing : Testing by executing the program with real inputs

Effectiveness depends on the test cases.



Top-Down and Bottom-Up

Testing



- Top-Down Testing : Test the main procedure, then go down through procedures it calls, and so on

May take a while to find mistakes.

- Bottom-Up Testing : Test the leaves in the tree (procedures that make no calls), and move up to the root.

- Each procedure is not tested until all of its children have been tested



Test Design

100+ brands to discover



+

Coca-Cola
freestyle®

Definitions

- Test Requirement –
 - A test requirement is a specific element of a software artifact that a test case must satisfy or cover. – *Something we must test.*
- Coverage Criterion –
 - A rule or collection of rules that impose test requirements on a test set – *Rules governing how to test.*
- Coverage –
 - Given a set of test requirements TR for a coverage criterion C, a test set satisfies C if and only if for every test requirement tr in TR, at least one test t in T exists such that it satisfies tr
- Coverage Level –
 - Given a set of test requirements TR and a test set T, the coverage level is the ratio of the number of test requirements satisfied by T to the size of TR.
- Infeasible test requirements –
 - test requirements that cannot be satisfied
 - No test case values exist that meet the test requirements
 - Dead code
 - Detection of infeasible test requirements is formally undecidable for most test criteria

Code which cannot execute.

cannot be proven a priori



Base

~~Flavors~~

Flavors

"Subtypes"

Test requirements

- TR1 = {base=Coke, base=Sprite, base=Fanta, base = Minute Maid Lemonade, base = Poweraid, base=Barq's Root Beer, base = Seagram's Ginger Ale}

base = H₂O

- TR2 = {subtype=Regular, subtype=Zero, subtype=Caffeine Free}

- TR3 = {flavor=Regular, flavor = Orange, flavor = Lime, flavor=Raspberry, flavor=Cherry, flavor=Cherry Vanilla}

"Sub Flavors"

126



Coke R R

Coke Z R

Coke CF R

Test Cases for Freestyle

- https://docs.google.com/document/d/1uFQRZYtwyyvW2wL6J2eVUcumg_OChHrDLE3vczadGyg/edit?usp=sharing

Life Savers

$C_h \Rightarrow \text{Red}$

$R_g \Rightarrow \text{purple}$



- TR1={Flavor=Cherry, flavor=Raspberry, flavor=Watermelon, flavor=orange, flavor=pineapple}
- TR2={Color=red, color=purple, color=green, color=orange, color=yellow}

Criteria Subsumption

- Definition
 - A coverage criteria $C1$ subsumes $C2$ if and only if for every test set that satisfies criterion $C1$ is also satisfies $C2$.