

Chapter 3. Structural Testing & Code Coverage

Structural testing - using source code to guide testing coverage criteria

1. Code coverage

branching instructions - if, for, while, do-while, lambda
3 clause if = $3 \times 2 = 6$ cases

2. Structural testing

→ specification-based testing

→ examine source code

→ run with code coverage tool

→ implement automated test case for missing lines

3. Code coverage criteria

line coverage - touch every line once (e.g. if statement should be true)

branch coverage - cover every branch created by branching instruction

condition + branch coverage - consider every condition of branch

path coverage - all possible path of execution

4. MC/DC coverage criterion

modified condition/decision coverage

test important combinations instead of all possible ones

→ $N+1$ tests instead of 2^N or $2N$

independence pair - pair of outcomes, changing 1 value, changes outcome
↳ unique-cause MC/DC criteria

5. Handling loops

loop boundary adequacy criterion → loop should be executed 0, 1, >1 times

6. Criteria subsumption

7. Mutation testing

fault detection capability

introduce bugs in code \rightarrow check if test suite catches the bug

Mutators:

\rightarrow conditional boundary: $<\leftrightarrow>$, $\leq\leftrightarrow\geq$

\rightarrow increment: $i++\leftrightarrow i--$

\rightarrow invert negatives: $i\leftrightarrow -i$

\rightarrow math operators: $+\leftrightarrow -$, $/\leftrightarrow *$

\rightarrow true returns: replace boolean expressions with true

\rightarrow remove conditionals

