

Testing (II)

Admin

- Mid-term
- Project milestone 2
- Project milestone 3.A

Testing coverage

- Statement coverage
- Branch coverage
- Condition coverage
- Path coverage

- Other
 - Data flow coverage
 - Mutation coverage

How to compute coverage (automatically)?

- You can instrument the program, and add counters here and there ...

Coverage measurement tool

- gcov

What is a “good” test set?

- Achieve good coverage
- Little redundancy

How to design good test set manually?

- White-box testing
 - Obtain the list of test properties to cover
 - Cover at least one new property at a time
 - Cover all properties that can be covered
 - Some properties may be infeasible to cover

Cyclomatic complexity & basis path set testing

- Cyclomatic complexity
 - Based on program flow graph
 - Calculated by $E - N + 2$
 - Represents # of (linearly) independent paths in a graph
 - If one path covers at least one edge/node not covered by existing paths, it is independent
 - Upper bound of branch coverage
- Basis path set testing

How to automatically generate test set?

- To be covered later, if we have time
- For C programs, non-structural inputs
- For structural inputs
- For even more structural inputs (how to test a compiler?)

How to conduct black box testing?

How to conduct black box testing?

- Equivalence class
 - Divide the input spaces into several equivalence classes; test at least one input in each class
- Boundary cases
 - If the expected input is a range of value, ...
 - If is a set of value, ...
 - If is a string, ...
- Common bug patterns
- Fuzz testing

Integration testing

- Use special values as function parameters

Can testing prove bug free?

- No!
- What is the implication of 100% path coverage?

Non-functional testing

- Performance testing
- Security testing
- ...

Misc.

- To cover later, if we have time
- ...
- Why we need testing (Ariane 5 story)?
- How to save regression testing effort?
- Can we test only part of the program?
- Research topics on testing