Software Testing and Reliability

T. Y. Chen
Department of Computer Science and Software Engineering
Swinburne University of Technology

1 

Lecture 1-A

Basic Concepts of Testing

2 

Definitions

- Error
  - A mistake made by the programmer
- Fault
  - An incorrect definition or process in the program
- Failure
  - An observable violation against the specifications

3 

Example

To write a program that will accept two integers and compute their product

The programmer misunderstood to write a program to accept two integers and compute their sum

4 

Example (continued)

Faulty Program:

```
Input A, B
C = A + B     // should be C = A * B
Output C
```

5 

Example (continued)

Consider the following test cases

- A = 0, B = 0
- A = 2, B = 2
- A = 0, B = 7
- A = 2, B = 7
- ……

Which are good test cases?

6 

Example (continued)

Consider the following test cases

- A = 0, B = 0 (0 + 0 = 0; 0 * 0 = 0)
- A = 2, B = 2 (2 + 2 = 4; 2 * 2 = 4)
- A = 0, B = 7 (0 + 7 = 7; 0 * 7 = 0)
- A = 2, B = 7 (2 + 7 = 9; 2 * 7 = 14)
- ……
- ……

7 

Example (continued)

Their inter-relationships

- Error
- Fault
- Failure

8 

Basic Concepts

Input Domain – the set of all valid inputs

Failure-causing inputs are inputs that reveal failures

9 

Example (continued)

Consider the following test cases

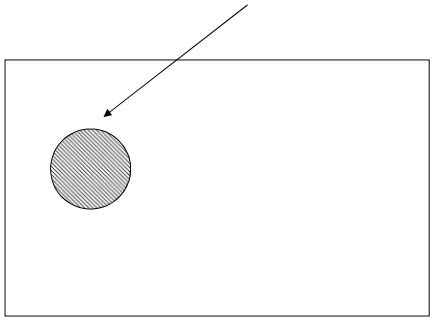
- A = 0, B = 0
- A = 2, B = 2
- A = 0, B = 7 (failure-causing input)
- A = 2, B = 7 (failure-causing input)
- ……
- ……

10 

Consider a program that accepts two integers as inputs

Input domain for a faulty program

failure-causing inputs



11

How to select failure-causing inputs as test cases?

12

How to select failure-causing inputs as test cases?

Development of various test case selection methods

13

Validation and Verification

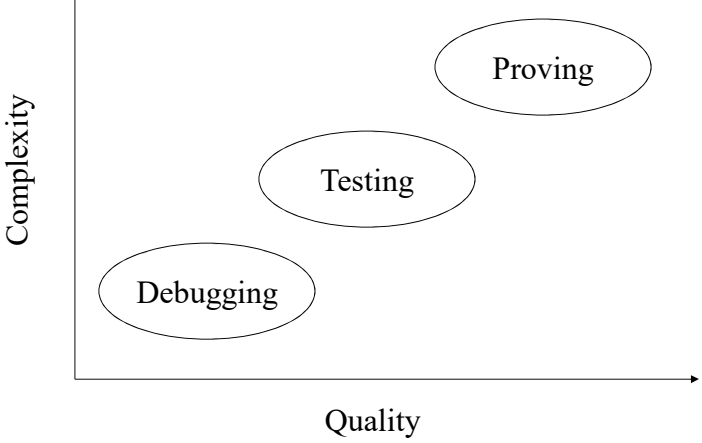
- Boehm:
  - Validation – Are we building the right product?
  - Verification – Are we building the product right?

14

Verification

- Debugging
  - Locating and fixing the error
- Testing
  - An attempt to reveal errors
- Proving
  - Proving the correctness of the program

15



16

Summary

17