软件工程

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2.2

Software Testing

2.2 Software Testing

- Quality
- 2 types of testing
  - Nonexecution-Based testing
  - Execution-Based Testing
- What should be tested?
- Testing vs. correctness proofs
- Who should perform execution-based testing?
- When does testing stop?

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Software Quality

- Not “excellence”
- Extent to which software satisfies its specifications
- Software Quality Assurance (SQA)

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Two Types of Testing

- **Nonexecution-based testing**
- **Execution-based testing**

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Nonexecution-Based Testing

- Underlying principles
  - We should not review our own work
  - Group synergy
- 2 types of nonexecution-based testing
  - Walkthroughs
  - Inspections

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Execution-Based Testing

- **Definitions**
  - **Failure (Incorrect behavior)**
  - **Fault (“Bug”)**
  - **Error (mistake made by programmer)**

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Execution-Based Testing

- **What do you think the below statement?**
  - **“Testing is demonstration that faults are not present”**

❖ ***It is a nonsensical statement.***

❖ **A successful testing finds a fault.**

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Execution-Based Testing

What is execution-based testing?

- **The process of inferring certain behavioral properties of product based, in part, on results of executing product in known environment with selected inputs.**
  - **Inference**
  - **Known environment**
  - **Selected inputs**

---- What should be tested?

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Execution-Based Testing

What should be tested?

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1. Correctness

The product is correct, if:

- **input that satisfies the input specifications is provided**
- **the product is given all the resources it needs**
- **the output satisfies the output specifications**

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2. Utility

- **Does it meet user's needs?**
  - **Ease of use**
  - **Useful functions**
  - **Cost-effectiveness**

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3. Reliability

- **Frequency and criticality of failure**
  - **Mean time between failures**
  - **Mean time to repair**
  - **Mean time, cost to *repair* results of failure**

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4. Robustness

- Range of operating conditions
- Possibility of unacceptable results with valid input
- Effect of invalid input

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5. Performance

- **Extent to which space and time constraints are met**
- **Real-time software**

Who Performs Execution-Based testing?

- Testing is destructive
- Solution
  - The programmer does informal testing
  - SQA does systematic testing
  - The programmer debugs the module
- All test cases must be
  - Planned beforehand, including expected output
  - Retained afterward

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When Can Testing Stop?

- Only when the product has been irrevocably retired.

Thinking

Should SQA group and development group be management independent or not?

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