Software Engineering

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2.3 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?

Software Quality

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

Two Types of Testing

- **Two types of testing**
  - **Nonexecution-based testing**
  - **Execution-based testing**

Nonexecution-Based Testing

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

Execution-Based Testing

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

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.

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?

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**

2. Utility

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

3. Reliability

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

4. Robustness

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

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

When Can Testing Stop?

- **Only when the product has been irrevocably retired.**

When Can Testing Stop?

- **Thinking:**

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

Terminology

- ***Client***, **is the individual or organization that wants a product to be developed.**
- ***Developers***, **are the members of the organization responsible for building that product.**
- ***User***, **the person or persons on whose behalf the client has commissioned the product and who will utilize the software.**

Thank You !