Locating Defects is Uncertain

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Why Programs Fail
A Guide to Systematic Debugging

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- A 400-page book on systematic debugging
- Appears September 2005 (Morgan Kaufmann)

www.whyprogramsfail.com
What is a bug?

- A bug is a defect.
- A defect is an error in the code.
- An error is a deviation of what’s correct, right, or true.
  - A defect is a deviation from the correct code.
What is a defect?

- How do we know the correct code?
- We don’t know (until we fixed the code)
  - A defect is the code which was fixed
  - Defect detection is about suggesting fixes
Do we have a defect?

- Or: Is this bug real?
- Or: Do we have to change something?

Evaluation: Did people change something?
Where is the defect?

- Or: Where do we have to change something?

Evaluation: Where did people change something to fix the defect?
Locating Defects

• The defect is in some entity E iff E fails
• Easy to tell for programs (test fails)
• Harder to tell for functions (postcond fails)
• Almost impossible to tell for statements
  ▶ Becomes harder with finer granularity
Predicting Changes

• Ultimate evaluation: Can we predict the fix?
  ▶ We can only provide educated guesses

• How close are we to the actual fix?
  ▶ We must learn from actual fixes
Program Analysis

- Code
- Specs
- Runs
- Tests
- Classes
- Field
- History
- Bugs
- more…