

Unit Testing

March 16, 2009

Slides by Mark Hancock
(adapted from notes by Craig Schock)

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What is debugging?

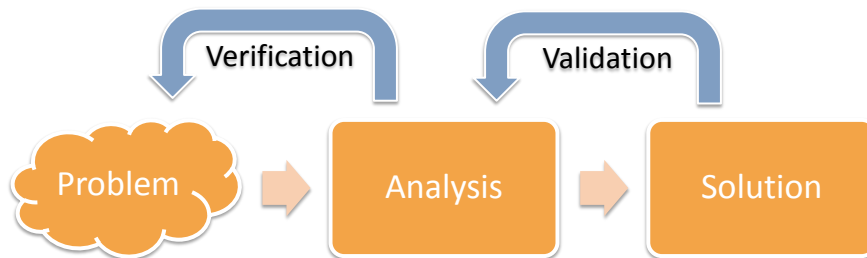
How do you currently debug your code?

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Analysis & Design



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Why is it important to validate the solution against the analysis?

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In other courses or life experiences, how do you go about testing the validity of something?

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Hypothesis Testing

- (Normal) scientific approach:
 - Problem
 - Hypothesis
 - Hypothesis Test

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What are some properties that distinguish computer programs from events in the physical world (e.g., the weather, people's actions)?

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Determinism

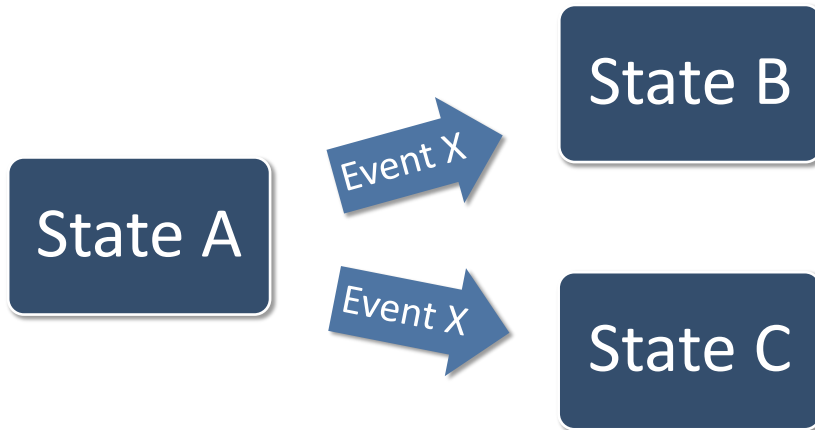


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Non-Determinism



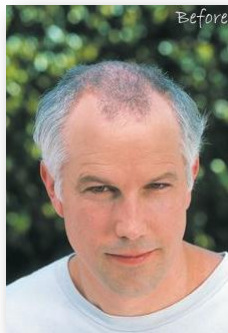
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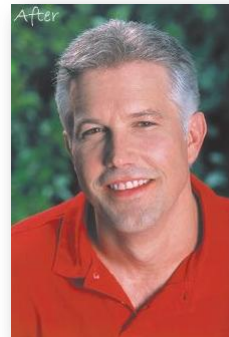
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Example: Hair Restoration

Before



After



Source: <http://www.hairclub.com>

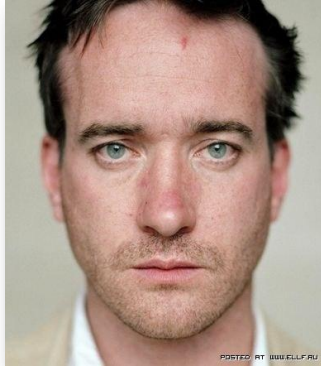
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Example: Photoshop

Before



After



Source: <http://www.hemmy.net>

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How could you formulate a test using a before state and an after state?

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Unit Testing

- Base unit of implementation: **objects**
- Process:
 - setup known state of object(s)
 - send messages to object(s)
 - test resulting object(s)'s state

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What kind of messages can we send to objects?

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Types of Messages

- Reveal State
- Change State
 - create objects
 - delete objects
 - create associations
 - delete associations
 - change internal state

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Exercise

- Create a unit test for the “passHighestCard” method in the HonestPlayer class
 - describe the initial known state
 - describe the method you would call
 - describe the expected resulting state

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“Do Assignment” Algorithm

```
while (!assignment.isDone())
{
    // write some code
    while (!assignment.compiles())
    {
        // fix syntax errors
    }

    while (!assignment.behavesCorrectly())
    {
        // fix semantic errors
    }

    if (caffeineSupply.isDepleted())
    {
        sleep(28800000);
    }
}
```

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What’s are the disadvantages of this algorithm?

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Disadvantages

- tedious
- perform one test at a time
- test things we know will likely work

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Automated Testing

- Write code that **automatically** tests the state
- Write **many tests** that can be run at once
- As you write new code, if any of them fail, you know you've introduced a bug.

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It tends to be hard to convince programmers to use unit tests. Why do you think that might be?

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Unit Testing Summary

- A process of **validation**
- Makes use of **determinism**
- Send messages to objects in **known state** and test the result
- Can create **many** tests on all of the **units** in your code

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Next Class

- JUnit (Unit Testing in Java)
- Midterm Review (in Java)

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