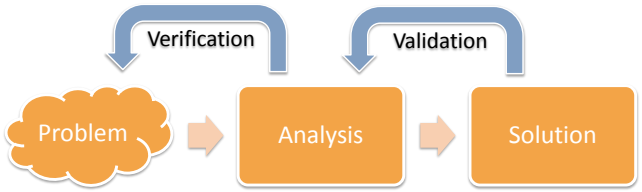
Unit Testing

What is debugging?

How do you currently debug your code?

Analysis & Design



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

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

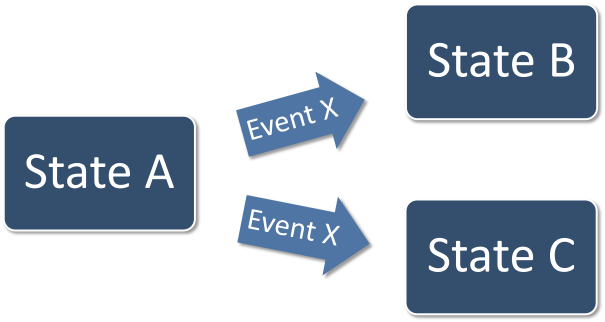
Hypothesis Testing

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

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

Determinism

Non-Determinism



Example: Hair Restoration

Before **After**

Source: http://www.hairclub.com

Example: Photoshop

Before **After**

Source: http://www.hemmy.net

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

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

What kind of messages can we send to objects?

Types of Messages

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

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

"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);
    }
}
```


What's are the disadvantages of this algorithm?

Disadvantages

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

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.

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

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

Next Class

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