CSC207.01 2013F, Class 05: Unit Testing

Overview

- Preliminaries
  - Admin.
  - Homework questions.
- A few remaining notes on Git.
- A few notes on unit testing.
- An example: Testing exponentiation.
- A few notes on test-driven development.
- Lab!

Admin

- What should earnestw do about his gmail account?
  - Write a custom spam filter
- I made some changes to the CSS stylesheet for the class. Let me know if you notice and whether the changes are an improvement or (whatever the opposite of improvement is).
- A friendly reminder that "Learning from Alumni" is a great opportunity to get real-world recommendations on how to prepare for a job or internship (and to network). And you get 1 credit. Thursdays, 2:15-4:05.
- Reading for Monday: Debugging
- I’m working on getting more of the assessment forms up. Sorry for the delay. (My primary goal is making sure that the readings and labs are up to snuff.)
- EC opportunities:
  - CS Table, today! Alan Turing on AI.
  - Humanities Center Speaker Sarah Hendron, Next Wednesday, 7:30 p.m., JRC101 Waking the Machines: Art, Design, and Adaptive Technology
  - Learning from Alumni 2:15-4:05 next Thursday: Ian Lunderskov ’08
  - Tentative Thursday Extra next week: Matt Atherton ’95
- Mentoring is Wednesday nights at 8-9pm

Questions on HW2

- Does anyone need a partner for HW2?
- Are there questions on HW2? I see only two of you have filled out the prologue, which suggests few people have looked at the homework.
- Question: Can I really write “isOdd” without using %, /, *
  - Yes, if you are willing to interpret the assignment in a certain way.
  - Yes, if you are willing to write ugly and inefficient code?
A few remaining notes on Git

- There are GUI’s for command-line git
  - GitHub for Mac is really good (So says Sunny Shine)
- `git commit -m "*Message*"` provides a faster way to commit.

A few notes on unit testing

- One strategy for seeing if your code works: Call the procedure, print out the result
- Why that strategy is bad
  - You have to spend time comparing results - Computers are faster
  - You have to remember what result you expected (you probably have to document)
  - You won’t want to do many tests
- What’s the solution? A test framework
  - You write the tests as code that specifies input and expected output
  - The computer does all the work
  - Rerunning the tests is easy
  - And you can write loops to generate lots of tests
- We’ll call this strategy "unit testing" -
- Designing good tests requires practice and thought
- And a testing framework
  - We’ll use JUnit

An example: Testing exponentiation

```java
/**
 * Compute x^n
 * @pre
 *   x^n < Integer.MAX_VALUE
 *   x^n > Integer.MIN_VALUE
 */
int expt(int x, int n)

- One test: 9 == expt(3,2)
  ```
  assertEquals("D’s Test", 9, expt(3,2));
  ```
- Another test: 1 == expt(posint,0)
  ```
  for (int i = 0; i < 10000; i++) {
      assertEquals(i + "^0", 1, expt(i,0));
  }
  ```
- Negative tests
assertEquals("Negative", 1, expt(-2,0));
assertEquals("Negative", -2, expt(-2,1));
assertEquals("Negative", 4, expt(-2,2));
assertEquals("Negative", -8, expt(-2,3));

- A for loop to do a lot of tests

```java
for (int base = 2; base < 500; base++) {
    assertEquals(base + " squared", base*base, expt(base, 2));
    assertEquals(base + " cubed", base*base*base, expt(base, 3));
} // for
```

- A for loop for a power of 1

- Detour: Java specifies that integers are 32 bits, excess $2^m-1$ notation 32 bits: If only positive, largest $2^{32}-1$; if you allow negative, it’s even smaller (maybe $2^{31}-1$, if I remember the notation)

- Nest for loops: Different bases, different powers

```java
for (int power = 1; power < 6; power++) {
    assertEquals(3 + "^" + power, ..., expt(3, power));
} // for
```

- Something complicated that lets us get back to the original number

**A few notes on test-driven development**

*Skipped*

**Lab!**

*Insufficient time. Finish up on your own.*

Copyright (c) 2013 Samuel A. Rebelsky.

This work is licensed under a [Creative Commons Attribution 3.0 Unported License](http://creativecommons.org/licenses/by/3.0/) To view a copy of this license, visit [http://creativecommons.org/licenses/by/3.0/] or send a letter to Creative Commons, 543 Howard Street, 5th Floor, San Francisco, California, 94105, USA.