Testing

Black Box

vs

White Box

CSC110/CIS163
P Baker

Goal: Construct a testing plan to verify that a program works correctly!

Example:

You've written a program that accepts integers and displays the maximum value. (BiggestController)

How do we test BiggestController?

- One strategy: test every possible value
  - not feasible – try it!
- Use a technique called Black Box Testing
- Use a technique called White Box Testing

Black Box Testing

- This testing technique is also called “functional” testing.
- “Black Box” because you don’t know how the program works.
- Only look at input and output.

How do we devise sample data that most efficiently represents all data inputs?

Use Equivalence Partitioning

Group or partition data with **common features**

So for the BiggestController program we said that any integer is a valid input (Java data type INT)

Represent input data in partitions

- We can think of all integers falling into two groups, positive and negative values.
- Our end boundaries are determined by what Java accepts as a valid INT.
- Zero is the boundary between positive and negative values.

Creating a Black Box Testing Plan

- Partition all possible input data values
  - Determine partition boundaries
- Test at the partition boundaries
  - Most programming mistakes occur here
  - Test the boundary
  - Test on either side
- Test data in middle of each partition

Black Box Test Plan for BiggestController

(we are assuming at this point that our program only has to accept “nice” data- but users might not follow that rule)

	Test No.	Input Data	Expected Output	Actual Output
Boundary Tests	1	0	0	
	2	-1	0	
	3	1	1	
	4	-2,147,483,648	1	
	5	-2,147,483,647	1	
	6	-2,147,483,649	1 Stupid User	
	7	2,147,483,647	2,147,483,647	
	8	2,147,483,646	2,147,483,647	
	9	2,147,483,648	2,147,483,647 Stupid User	
	10	Click <Start Again>	0	
Mid pts	11	-800	0	
	12	800	800	
Crazy	13	Hello	800 Stupid User	
	14	Enter	no change	

So did we follow the Black Box guidelines for creating a test plan?

- Sure.

- We tested at each boundary
  - 0
  - -2,147,483,648
  - +2,147,483,647

- We tested on either side of each boundary

- We tested in the middle of each partition
  - -800
  - +800

White Box Testing

- Goal: to verify that a program works correctly by inspecting “how” the program works.
- This is also called “structural” testing

Creating a White Box Testing Plan

- A team (or at least the author, a user and another) evaluates the program code line by line
- Choose data that results in every statement executing some time during the testing

White Box Test Plan for BiggestController

Test No.	Input Data	Expected Output	Actual Output
1	1 <Enter>	1	
2	Click <Start Again>	0	

All lines of code are executed at least once with just 2 tests!

So did we follow the White Box guidelines for creating a test plan?

- Sure

- We reviewed the code line by line
- Pick data to test that each statement in BigController was executed

A final word

Testing is such an important part of software development that there are entire departments and careers devoted to ensuring that software is as error- free as possible!