CSCE 747 Software Testing and Quality Assurance

Lecture 02 – Boundary Value Testing

9/3/2013

- Last Time
- Today

The NextDate Function

- **2.3.1 Problem Statement**
- **NextDate is a function of three variables: month, day, and year. It returns the date of the day after the**
- **input date. The month, day, and year variables have integer values subject to these conditions:**
- **c1. 1 ≤ month ≤ 12**
- **c2. 1 ≤ day ≤ 31**
- **c3. 1812 ≤ year ≤ 2012**

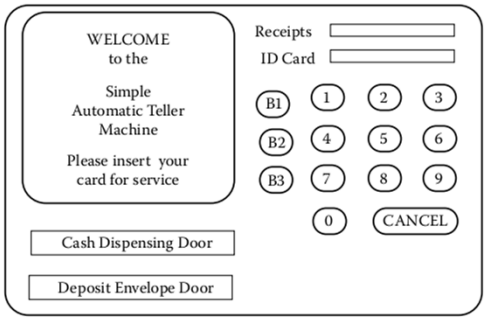
- Jorgensen, Paul C. (2011-07-16). Software Testing (Page 22). Auerbach Publications. Kindle Edition.

The Commission Problem

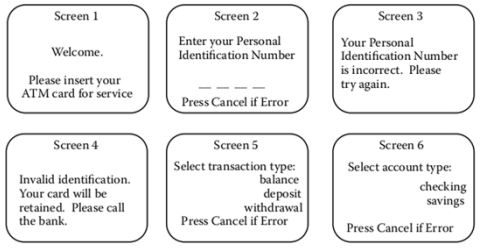
- **2.4.1 Problem Statement**
- **A rifle salesperson in the former Arizona Territory sold rifle locks, stocks, and barrels made by a gunsmith in Missouri. Locks cost $45, stocks cost $30, and barrels cost $25. The salesperson had to sell at least one complete rifle per month, and production limits were such that the most the salesperson could sell in a month was 70 locks, 80 stocks, and 90 barrels.**
- **After each town visit, the salesperson sent a telegram to the Missouri gunsmith with the number of locks, stocks, and barrels sold in that town. At the end of a month, the salesperson sent a very short telegram showing –1 lock sold. The gunsmith then knew the sales for the month were complete and computed the salesperson's commission as follows:**
  - **10% on sales up to (and including) $1000,**
  - **15% on the next $800, and**
  - **20% on any sales in excess of $1800.**
- **The commission program produced a monthly sales report that gave the total number of locks, stocks, and barrels sold, the salesperson's total dollar sales, and, finally, the commission.**

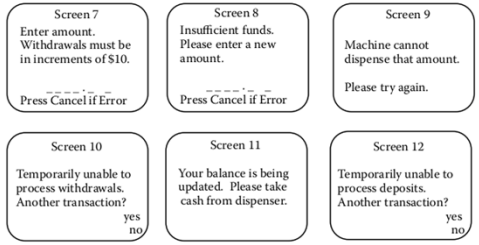
Simple ATM (SATM)

- GUI/Interface

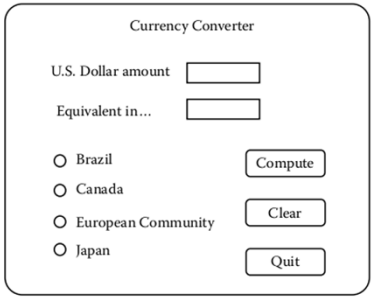


- **2.5.1 Problem Statement**
- **The SATM system communicates with bank customers via the 15 screens shown in Figure 2.4.**
- **Using a terminal with features as shown in Figure 2.3, SATM customers can select any of three transaction types:**
  - **deposits,**
  - **withdrawals, and**
  - **balance inquiries.**
- **These transactions can be done on two types of accounts: checking and savings.**





Currency Converter



Saturn Windshield Wiper Controller

- The windshield wiper on some Saturn automobiles is controlled by a lever with a dial. The lever has four positions — OFF, INT (for intermittent), LOW, and HIGH — and the dial has three positions, numbered simply 1, 2, and 3.
- The dial positions indicate three intermittent speeds, and the dial position is relevant only when the lever is at the INT position. The decision table below shows the windshield wiper speeds (in wipes per minute) for the lever and dial positions.

c1.	Lever	OFF	INT	INT	INT	LOW	HIGH
c2.	Dial	n/a	1	2	3	n/a	n/a
a1.	Wiper	0	4	6	12	30	60

Functional Testing

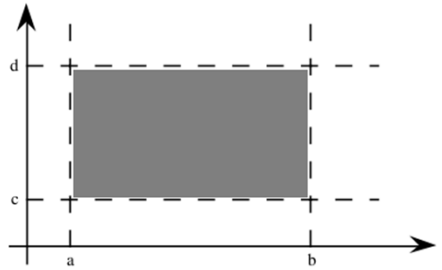
- Black Box testing

Boundary Value Testing

- Consider testing f(x,y) subject to constraints
- $a \leq x \leq b$
- $c \leq y \leq d$
- "Strongly typed languages (such as Ada®and Pascal) permit explicit definition of such variable ranges."

Input domain

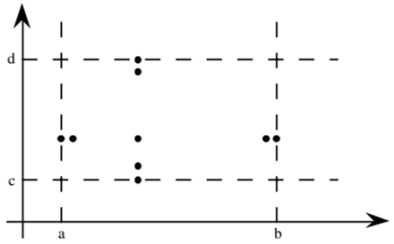
- **Input domain of a function of two variables.**



- **Automatically generate test cases**

T – Test case generator

- **The tool T – generates test cases automatically**
  - **Min**
  - **Min+**
  - **Nom (nominal)**
  - **Max-**
  - **Max**
- **MAXINT**
  - **-- /usr/include/limits.h**

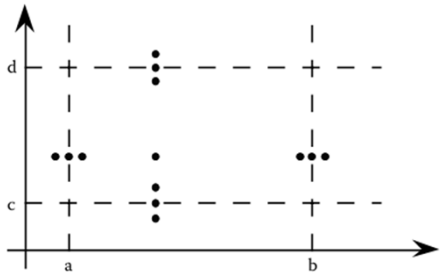


logical (versus physical) variables,

- Physical variables – tied to a real thing, temperature, age, etc.
- Logical variable – Pin numbers

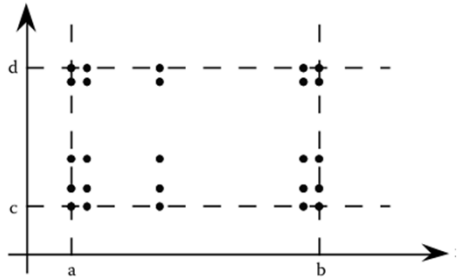
Robustness Testing

- Robustness Testing adds
- Max+
- Min-



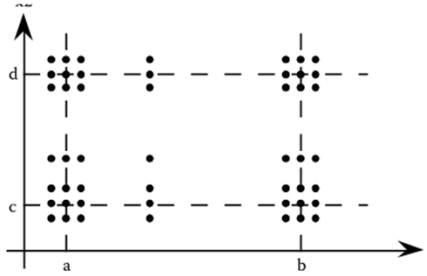
Worst-Case Testing

- **Worst-Case Testing**



Robust worst-case test cases

- **Robust worst-case test cases**
- **Combines robust and worst case**



Special value testing

- Special value testing is probably the most widely practiced form of functional testing.
- most intuitive and least uniform.
- Ad hoc

Table 5.1 Triangle Problem Boundary Value Analysis Test Cases

Case	a	b	c	Expected Output
1	100	100	1	Isosceles
2	100	100	2	Isosceles
3	100	100	100	Equilateral
4	100	100	199	Isosceles
5	100	100	200	Not a Triangle
6	100	1	100	Isosceles
7	100	2	100	Isosceles
8	100	100	100	Equilateral
9	100	199	100	Isosceles
10	100	200	100	Not a Triangle
11	1	100	100	Isosceles

Table 5.2 Triangle Problem Worst-Case Test Cases

Case	a	b	c	Expected Output
1	1	1	1	Equilateral
2	1	1	2	Not a Triangle
3	1	1	100	Not a Triangle
4	1	1	199	Not a Triangle
5	1	1	200	Not a Triangle
6	1	2	1	Not a Triangle
7	1	2	2	Isosceles
8	1	2	100	Not a Triangle
9	1	2	199	Not a Triangle
10	1	2	200	Not a Triangle
11	1	100	1	Not a Triangle

Table 5.3 NextDate Worst-Case Test Cases

Case	Month	Day	Year	Expected Output
1	1	1	1812	January 2, 1812
2	1	1	1813	January 2, 1813
3	1	1	1912	January 2, 1912
4	1	1	2011	January 2, 2011
5	1	1	2012	January 2, 2012
6	1	2	1812	January 3, 1812
7	1	2	1813	January 3, 1813
8	1	2	1912	January 3, 1912
9	1	2	2011	January 3, 2011
10	1	2	2012	January 3, 2012
11	1	15	1812	January 16, 1812

Input Space of Commission Problem

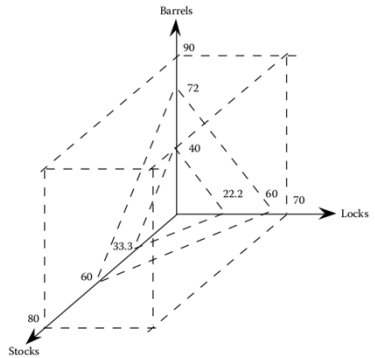


Table 5.5 Output Special Value Test Cases

Case	*Locks*	*Stocks*	*Barrels*	*Sales*	*Commission*	*Comment*
1	10	11	9	1005	100.75	Border point +
2	18	17	19	1795	219.25	Border point –
3	18	19	17	1805	221	Border point +

Eclipse and Java Assignment