

Experiment Results

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I. INTRODUCTION

In this report we implemented and tested two given programs. Decision table testing, equivalence testing and boundary testing done for each and compared a) different testing techniques for same application b) same testing technique for different programs.

II. EXPERIMENT 1

In this program there are 3 input variables as ‘number_of_items’, ‘total_cost’ and ‘delivery_time’. First two variables are numeric while the third parameter is an enum type.

A. Decision Table Testing

Decision tree testing for program 1 generated 12 different test cases, it is expected since for inputs ‘number_of_items’ and ‘total_cost’ generate two possible paths of execution,

$$\text{Branching due to } (\#items) = \begin{cases} \text{True,} & \text{if } number_of_items \leq 3, \\ \text{False,} & \text{if } number_of_items > 3. \end{cases}$$

$$\text{Branching due to } (total_cost) = \begin{cases} \text{True,} & \text{if } number_of_items \leq 100, \\ \text{False,} & \text{if } number_of_items > 100. \end{cases}$$

while ‘delivery_time’ can generate 3 values as ‘NEXT_DAY’, ‘SECOND_DAY’ and ‘THIS_WEEK’. Hence, $2 \times 2 \times 3 = 12$.

number_of_items	total_cost	delivery_time	Expected Outcome
≤ 3	≤ 100	NEXT_DAY	25
≤ 3	≤ 100	SECOND_DAY	10
≤ 3	≤ 100	THIS_WEEK	number_of_items * 1.50
≤ 3	> 100	NEXT_DAY	35.00
≤ 3	> 100	SECOND_DAY	15.00
≤ 3	> 100	THIS_WEEK	10.00
> 3	≤ 100	NEXT_DAY	number_of_items * 6.00
> 3	≤ 100	SECOND_DAY	number_of_items * 2.50
> 3	≤ 100	THIS_WEEK	0.00
> 3	> 100	NEXT_DAY	number_of_items * 7.50
> 3	> 100	SECOND_DAY	number_of_items * 3.50
> 3	> 100	THIS_WEEK	number_of_items * 2.50

TABLE I: Test cases generated for decision table testing.

The total test case generation and implementation took 55 minutes. While running 12 test cases took 0.008 seconds¹, running the full ‘mvn test’ command took 4.59 seconds^{2 3}

¹Test execution times are reported by mvn

²‘time mvn test’ command used for timekeeping

³Tested setup has 32G ram Ryzen 7 5800X running Debian 12 and openjdk 17.0.13

B. Equivalence Testing

For equivalence testing valid and invalid partitions of input variable domains are selected.

1) *Equivalence Partitions*: Following are the valid and invalid partitions of program 1.

Input	Partition Type	Partition Condition	Selected Value
number_of_items	Valid	≤ 3	3
	Valid	> 3	4
	Invalid	≤ 0	-1
	Invalid	< 0	-2
total_cost	Valid	≤ 100	100
	Valid	> 100	101
	Invalid	≤ 0	-2
	Invalid	< 0	-2
delivery_time	Valid	NEXT_DAY, SECOND_DAY, THIS_WEEK	SECOND_DAY
	Invalid	Null or unsupported value	null

TABLE II: Partitioning for input values with conditions and selected values.

Total Cost	Number of Items	Shipping Time	Expected Outcome
100.0	3	NEXT_DAY	25.0
150.0	3	SECOND_DAY	15.0
100.0	4	THIS_WEEK	0.0
150.0	4	NEXT_DAY	30.0
100.0	-1	NEXT_DAY	Exception
-50.0	3	SECOND_DAY	Exception
100.0	3	null	Exception

TABLE III: Test cases generated for equivalence testing

The total test case generation and implementation took 40 minutes. While running 7 test cases took 0.028 seconds, running the full ‘mvn test’ command took 6.49 seconds.

III. BOUNDARY VALUE TESTING

For boundary value testing ‘delivery_time’ does not eligible since enum’s do not have boundaries. For other two variables, values just before, exactly and just above valid input range and logical branching boundaries are selected. Those values are -1,0,1 for both ‘number_of_items’ and ‘total_cost’ while branching boundary values are 3,4 and 100,101 respectively as can seen in Table IV

Input	Boundaries
number_of_items	-1
	0
	1
	3
	4
total_cost	-1
	0
	1
	100
delivery_time	101
	n/a

TABLE IV: Boundary values for input parameters.

number_of_items	total_cost	delivery_time	Partition Type	Expected Outcome
3	100	NEXT_DAY	All Valid	25.00
3	101	SECOND_DAY	All Valid	15.00
4	100	THIS_WEEK	All Valid	0.00
4	101	NEXT_DAY	All Valid	30.00
-1	100	NEXT_DAY	Invalid Items	Exception
3	-50	SECOND_DAY	Invalid Cost	Exception
3	100	null	Invalid Delivery	Exception

TABLE V: Test cases generated for boundary value testing

1) *Test Cases*: Using above boundaries following test scenarios generated.

The total test case generation and implementation took 24 minutes. While running 9 test cases took 0.026 seconds , running the full ‘mvn test’ command took 7.01 seconds.

IV. CONCLUSION