

Boundary Value Testing

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BOUNDARY VALUE TESTING2

Boundary Value Testing

Any program needs inputs and gives outputs from its range. This input and output can be considered as a function. The Boundary value analysis is the best technique to use for functional testing. The goal of functional testing is to use knowledge of the basic function of a program to identify test cases. The Boundary Value Testing focuses on the boundary of the input space to identify test cases. The reasoning behind boundary value testing is that errors tend to occur near the extreme values of an input variable.(Basili & Selby, 1987)

The basic idea in boundary value is to select input variable value at their:

- Minimum
- Just above the minimum
- A nominal value
- Just below the maximum
- Maximum

Example of Boundary Value Testing

In a system designed for package delivery system's payment: weight up to 100 lb are called as "medium Package". The rates for delivering the medium package up to 10 lb are \$14. The next 30 lb is delivered for \$24. Each next 20 lb up to 100 lb is delivered for an extra \$5.

Equivalence classes	Boundary Values	Expected Outcomes
0-10 lb : \$14	{-1,0,1}, {9,10,11}	BV = -1 / Invalid BV = 0 / Invalid BV = 1 / Valid

BOUNDARY VALUE TESTING3

		BV = 9 / Valid BV = 10 / Valid BV = 11 / Invalid
11-40 lb : \$ 24	{10, 11, 12}, {39, 40, 41}	BV = 10/ Invalid BV = 11/ Valid BV = 12/ Valid BV = 39/ Valid BV = 40/ Valid BV = 41/ Invalid
41-60 lb: \$ 5	{40, 41,42}, {59, 60, 61}	BV = 40/Invalid BV = 41/Valid BV = 42/Valid BV = 59/ Valid BV = 60/ Valid BV = 61/ Invalid
61-80 lb: \$ 5	{60,61,62}, {79, 80,81}	BV = 60/Invalid BV = 61/Valid BV = 62/Valid BV = 79/ Valid BV = 80/ Valid BV = 81/ Invalid
81- 100 lb: \$ 5	{80, 81,82}, {99, 100,101}	BV = 80/Invalid

BOUNDARY VALUE TESTING4

		BV = 81/Valid BV = 82/Valid BV = 99/ Valid BV = 100/ Valid BV = 101/ Invalid
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When boundary value testing should be used

The Boundary value testing is used to reduce large number of test cases to manageable range.

That means boundary value testing is used when practically it is difficult to test large number of test cases individually. Also boundary value testing appropriates for calculation-intensive applications with variables that represent physical quantities.

Types of software testing problems that boundary value testing addresses

In a most of software testing problems, Equivalence Partitioning and Boundary value analysis are linked and can be used together. We can apply boundary value testing technique for software that has a valid boundary value and an invalid boundary value. This is one of the black box test design technique. We can select multiple test cases from valid and invalid input domains based on software needs. But we have to select at least one test case from each input domain.

Key assumptions of boundary value testing

Boundary value testing is based on a critical assumption called “Single fault assumption theory”. According to this assumption, we can get the test cases on the basis of the reason and

BOUNDARY VALUE TESTING⁵

failures are not due to simultaneous occurrence of two (or more) faults. So, we obtain test cases by holding the values of all but one variable at their nominal values and allowing that variable assume its extreme values.(Gupta, n.d.) Also Program is a function from Input to Output and those input and/or output variables have well-defined intervals.

Limitations of boundary value testing

1. Boundary value testing assumes the variables to be truly independent which is not always possible.
2. Boundary value testing test cases have been found to be basic because they are obtained with very little insight and imagination(Gupta, n.d.).
3. Does not work well for Boolean variables
4. Does not work well for logical variables
5. Difficult to determine expected values for invalid variable values(Copeland, 2004)

References

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