1. **What is OAT (Orthogonal Array Testing)**

Orthogonal Array Testing strategy is one of the Test Case Optimization techniques.

Orthogonal Testing is a black box testing - test cases optimization technique used when the system to be tested has huge data inputs.

For example, when a train ticket has to be verified, the factors such as - the number of passengers, ticket number, seat numbers and the train numbers has to be tested, which becomes difficult when a tester verifies input one by one. Hence, it will be more efficient when he combines more inputs together and does testing. Here, we can use the Orthogonal Array testing method.

This type of pairing or combining of inputs and testing the system to save time is called Pairwise testing. OATS technique is used for pairwise testing.

1. **Why OAT (Orthogonal Array Testing)**
2. Systematic and Statistical way to test pairwise interactions
3. Interactions and Integration points are a major source of defects.
4. Execute a well-defined, concise of test cases that are likely to uncover most (not all) bugs.
5. Orthogonal approach guarantees the pairwise coverage of all variables.
6. **How OAT's is represented**

OA's are commonly represented as:

[](http://cdn.guru99.com/images/cassandra/Orthogonal-Array-Testing.png)

* **Runs (N)** – Number of rows in the array, which translates into a number of test cases that will be generated.
* **Factors (K)** – Number of columns in the array, which translates into a maximum number of variables that can be handled.
* **Levels (V) –** Maximum number of values that can be taken on any single factor.

A single factor has 2 to 3 inputs to be tested. That maximum number of inputs decide the Levels.

**How to use this technique:**

1. Identify the independent variable for the scenario.

2. Find the smallest array with the number of runs.

3. Map the factors to the array.

4. Choose the values for any "left over" levels.

5. Transcribe the Runs into test cases, adding any particularly suspicious combinations that aren't generated.

**Example 1**

A Web page has three distinct sections (Top, Middle, Bottom) that can be individually shown or hidden from user

* No of Factors = 3 (Top, Middle, Bottom)
* No of Levels (Visibility) = 2 (Hidden or Shown)
* Array Type = L4(23)

(4 is the number of runs arrived after creating the OAT array)

If we go for Conventional testing technique, we need test cases like: 2 X 3 = 6 Test Cases

|  |  |  |
| --- | --- | --- |
| **Test Cases** | **Scenarios** | **Values to be tested** |
| Test #1 | HIDDEN | Top |
| Test #2 | SHOWN | Top |
| Test #3 | HIDDEN | Bottom |
| Test #4 | SHOWN | Bottom |
| Test #5 | HIDDEN | Middle |
| Test #6 | SHOWN | Middle |

If we go for OAT Testing we need: 4 Test cases as shown below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Test Cases** | **TOP** | **Middle** | **Bottom** |
| Test #1 | Hidden | Hidden | Hidden |
| Test #2 | Hidden | Visible | Visible |
| Test #3 | Visible | Hidden | Visible |
| Test #4 | Visible | Visible | Hidden |

**Example 2:**

A microprocessor's functionality has to be tested:

1. Temperature: 100C, 150C and 200C.
2. Pressure : 2 psi,5psi and 8psi
3. Doping Amount :4%,6% and 8%
4. Deposition Rate : 0.1mg/s , 0.2 mg/s and 0.3mg/s

By using the Conventional method we need = 81 test cases to cover all the inputs. Let's work with the OATS method:

No. of factors = 4 (temperature, pressure, doping amount and Deposition rate)

Levels = 3 levels per factor (temperature has 3 levels-100C, 150C, and 200C and likewise other factors too have levels)

Create an array as below:

**1. Columns with the No. of factors**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test case #** | **Temperature** | **Pressure** | **Doping amount** | **Deposition rate** |

**2. Enter the number of rows as equal to levels per factor. i.e temperature has 3 levels. Hence, insert 3 rows for each level for temperature,**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test case #** | **Temperature** | **Pressure** | **Doping amount** | **Deposition rate** |
| 1 | 100C |  |  |  |
| 2 | 100C |  |  |  |
| 3 | 100C |  |  |  |
| 4 | 150C |  |  |  |
| 5 | 150C |  |  |  |
| 6 | 150C |  |  |  |
| 7 | 200C |  |  |  |
| 8 | 200C |  |  |  |
| 9 | 200C |  |  |  |

**3. Now split up the pressure, doping amount and the deposition rates in the columns.**

For eg: Enter 2 psi across temperatures 100C,150C and 200C likewise enter doping amount 4% for 100C,150C and 200C and so on.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test case #** | **Temperature** | **Pressure** | **Doping amount** | **Deposition rate** |
| 1 | 100C | 2 psi | 4% | 0.1 mg/s |
| 2 | 100C | 5 psi | 6% | 0.2 mg/s |
| 3 | 100C | 8 psi | 8% | 0.3 mg/s |
| 4 | 150C | 2 psi | 4% | 0.1 mg/s |
| 5 | 150C | 5 psi | 6% | 0.2 mg/s |
| 6 | 150C | 8 psi | 8% | 0.3 mg/s |
| 7 | 200C | 2 psi | 4% | 0.1 mg/s |
| 8 | 200C | 5 psi | 6% | 0.2 mg/s |
| 9 | 200C | 8 psi | 8% | 0.3 mg/s |

Hence, in OAs, we need 9 Test cases to cover.