

A Comparative Study of Black Box Testing and White Box Testing

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Abstract— The most important and time consuming part of software development life cycle is Software testing. Its main purpose is to detect software faults and failures so that defects can be recovered and corrected in early phases of testing. Software Testing is a process of confirming that the product software that has been manufactured by programmers is a good quality product and also to assure that the product is working according to the specification that has been intended so that customer satisfaction can also be possible. In this paper, we have described and compared the two most important and commonly used software testing techniques for detecting errors, which are: Black Box Testing and White Box Testing.

Keywords— Software Testing, Black Box Testing, White Box Testing, Software Development Life Cycle (SDLC)

I. INTRODUCTION

As we all make mistakes so Software testing is necessary. Some of those mistakes are not affected the system, but some of them are expensive and can be dangerous. So we need to check each and everything and anything we produce because the things cannot be always correct as we are humans who can do mistakes usually. The main objective of testing is to detect the errors in the software so that it can be corrected and removed. For other software quality factors like reliability, compatibility integrity, security, capability, efficiency etc, software testing is used.

The main focus of this paper is to discuss different methods of white box and black box testing technique. This work shows the comparison between black box and white box testing techniques. Tester can use this information in testing of software. All this information helps to develop a high quality product. These are the important testing techniques discussed in this paper.

1. Black Box Testing
2. White Box Testing

II. BLACK BOX TESTING

Black box testing is a technique of software testing. It is used to determine the functionality of application. The main focus of black box testing is available input for an application and expected outputs for each input values.

This testing method is based on software requirement and specification. It is a software testing technique whereby the internal workings of the item being tested are not known by the tester.

It is also called specification based testing and behaviour testing. This technique is named so because in this testing, tester needs not to know about the internal code implementation of application. This testing handles both valid and invalid inputs according to the customer requirement.

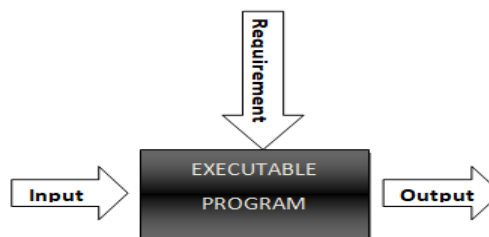


Fig 1: Representation of Black Box Testing

BLACK BOX TESTING TECHNIQUES

1. Equivalence partitioning: It is a technique for designing the test case. In this technique it takes all input values and divides into partitions. It contains both valid and invalid

partitions. Test cases are designed from each partition to uncover the errors.

2. Boundary Value Analysis: This technique is used to design the test cases to uncover the errors. In this technique it takes the boundary values or nearby boundary value of input domain for test data. Test Cases are designed for both valid and invalid boundary values. One Test Case is selected from each boundary values.

3. Cause Effect Graphing: It is a software test design technique that concentrates on external behaviour of system. It specifies logical relationship between input and output conditions with the help of Boolean operators. Input values represent 'Cause' and output values represents 'Effect'. The relation of Cause and Effect helps to create test cases.

4. Decision Table Based Testing: It is a good technique to deal with large number of inputs and there respected outputs. Decision Table has completeness property; it contains all possible values of condition values. It is very useful for complex business flow to convert into test cases.

5. Error Guessing: It is a technique for assumption and guessing. Experienced testers find out the defects. The complete success of this technique is depending on skill of testers, a good tester knows where and what kind of defects are mostly found.

BLACK BOX TESTING ADVANTAGES

1. Testing is performs according to the customer's point of view requirements.
2. Testing is performed by third party to avoid the developer-bias.
3. Tester can be non technical person. Programming and implementation knowledge is not required for this testing technique.
4. Testing is efficient when used on a larger system.

Test cases can be designed as soon as the specifications are complete

BLACK BOX TESTING DISADVANTAGES

1. Redundant tests can be formed if software designer/developer has already run the test cases.
2. It is very difficult to design test cases if requirements are not clear and concise.
3. This testing is not efficient to test complex segments of code.
4. The results of this testing are often overestimated.

Black Box testing is performed at following levels of software testing:

1. Integration Testing
2. System Testing
3. Acceptance Testing

III. WHITE BOX TESTING

White Box Testing is a software testing technique. The main focus of white box testing is structure of an application. It investigates about the internal logic, code structure, and control flow of application. This technique is also known as Clear Box Testing, Open Box Testing, Glass Box Testing, Transparent Box Testing, Code-Based Testing or Structural Testing.

In white box testing, tester must have full knowledge about the programming language (source code). It is concern with internal working of application. It requires detailed information about application.

White Box testing is testing method that applies on the source code of the software. This technique examines all path of source code. For this testing technique tester must have strong programming skills. White Box Testing needs highly skilled resources and implementation knowledge.

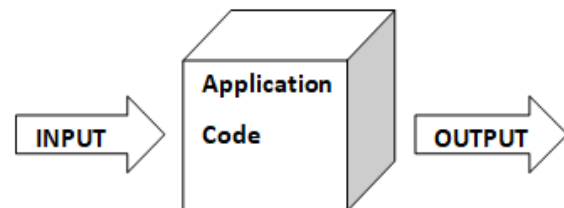


Fig 2: Representation of White Box Testing

WHITE BOX TESTING TECHNIQUES

1. Control Flow testing: It is a structural testing technique. It examines the control flow of program. It contains both simpler and complicated paths. This testing is applied on all software to test control flow. It is a fundamental technique. It is applicable on small programs and subparts of large programs.

2. Path Testing: In Path Testing it tests all the possible paths of program. It is a comprehensive technique. It insures that all paths are traversed at least once. Path coverage technique is better than Branch coverage. It is good for testing complex programs.

3. Data Flow Testing: Dataflow Testing focuses on the points where variables receive values and where values are used. It has some issues like:

1. A declared variable but never used within the program.
2. A variable which is never declared but used in program.
3. A multiple declaration of variable before it is used.

WHITE BOX TESTING ADVANTAGES

1. Testing is more thorough, with the possibility of covering most paths.
2. Testing can be started at an earlier stage. It is not depends on GUI of application.
3. White Box Testing allows you to help in the code optimization

WHITE BOX TESTING DISADVANTAGES

1. Tools are not available for every kind of implementation/platform.
2. If there is frequent change in implementation. It is hard to maintain test scripts.
3. It is not possible for testing each and every path/condition of software program, which might miss the defects in code.

White Box testing technique is applicable to the following levels of software testing:

1. Unit Testing
2. System Testing
3. Integration Testing

Black Box Testing	White Box Testing
It is also called Specification Based Technique.	It is also called Structural Testing Technique.
Internal structure and coding knowledge is not required.	Internal structure and coding knowledge is required.
Main concentrate on functionality of system.	Main concentrate on code structure ,branches , loops, conditions etc.
Implementation knowledge is not required.	Implementation knowledge is required.

Fig 3: Comparison of Black Box and White Box Testing

IV. CONCLUSION

Testing plays a vital role in finding errors in software systems. Testing is most important phase in a Software Development Life Cycle as it helps the software engineers to test and enhanced the quality of software product. It starts at the earlier phases of Software Development Life Cycle so that we can correct the errors and bugs at the time parallel. It will help in terms of software cost, quality and also minimizes the effort. The knowledge of the testing technique that gives its contribution to quality of software as it is important to the advancement of software testing research.

This paper describes and compares the two most important software testing techniques, to carry out the testing in a proper and efficient manner. For the improvement of software quality, testing is the most important and challenging activity. The main focus of testing techniques is quality assurance, reliability of software, validation and verification.

Software Quality is main concern of software engineering. Testing is widely used approach to ensuring software quality. Black Box Testing is concern about the functionality of the software where White Box is concern about the internal structure of software. Both have own importance in testing of software

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