Comparative Study on Software Testing Strategies Common Errors andBug Report

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Abstract—Software testing is a process of finding errors while executing a program in the software. It is a important part and critical phase of any software development life cycle and aimed to evaluating the capability, quality or usability of a program. The software testing is to make a quality of service in efficient way. Software must be fully tested before it could be handled to the customer. Software testing is the main activity of validating and executing the software with the major purpose of find out the errors. The black box testing, white box testing and grey box testing is the very important testing techniques in software testing strategies. This paper executing the comparative study on the black box, white box and grey box testing techniques. The software bug is arising at the time of software testing. The bug report is giving knowledge about the software testing. In this paper the testing strategies, common errors and bug report have been described. Some typical latest researches have been summarized.

Keywords—Comparative of software testing strategies, Black box testing, White box testing, Grey box testing, common errors, Bug report and Sample bug report.

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1 INTRODUCTION

Software testing is the process of quality checking about the software system conducted the software testing engineer and stakeholders with testing about the quality of the software product. The quality of software is assured by testing the software development [7].application and its progression. Software testing uses the key features such as verification and validation. The more than one software testing techniques are used to testing the software applications [9]. The widely using software testing techniques are unit testing, component testing, regression testing, smoke testing validation testing, verification testing, black box testing, white box testing, grey box testing, module testing, functional testing, alpha and beta testing, component testing, nonfunctional testing and test the complicity of the program modules[14].Software bug is an error, failure or faults in a given software product or a system, that causes is to produce an incorrect or unexpected result at the software executing time[16]. The software bug is detected manually or using some of the automated tools in software development life cycle.[17]. Some of the software errors are functionality errors, communication errors, syntactic errors, calculation errors, control flow errors. A bug report contains device logs and information about the software bugs[17].stack traces and information about the developer, other bug information to help find and fix bugs in apps. The bug report gives an idea for clearing the bugs in the software product and it is providing the bug information of our applications Software Based on the application the strategies are used. This paper seeks to determine how block box, grey box and white box testing is differ one to other testing techniques [11]. The all software testing strategies are used to checking quality of the given applications. but it should be differ one to another based on the functionality of the testing strategies. The black box, white box is a very popularly using software strategy to test our application systems. In this paper detailed describe about the comparative study on the black box, white box and grey box testing and describing the common errors are arriving at running stage of the software application. More than one type of errors are identified at the testing phase in software development life cycle.

2 LITERATURE REVIEW

Research done on software testing has changed over the years. Many early papers written on the subject lamented the inability of researches to address the comparison between the software testing strategies.As anjubansal pointed out, "the importance and functionality of the software testing strategies" but fails to address how the testing strategies are differ one to another. (anjubansal_2015).

At that same time, DeeptikapilaGrover wrote a paper for identifying some advantages and limitations for using the software testing. Grover was successful identifying the problem involved in white box testing and block box testing, but did discus many other issues in much depth such as the problems given as a testing time. This was problem with many early papers (Deeptikapila grover-2016). Robert F.Roggio compared object oriented paradigm and traditional software testing. By means of the test cases,

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testing levels and object oriented features. The paper concluded with more and better ways of testing using object oriented programs (Robert F.Roggio-2016)

Shalinigautamdescribed about the software testing using the testing tools. This paper proposed the types of testing, test cases and automation testing with comparison among tools used. This paper detailed describes about functional and nonfunctional testing with the manual and automation tools. The paper concluded with more and better ways of testing using test cases (Shalini gautam-2016)

3. SOFTWARE TESTING STRATEGIES

3.1 Black box testing

Black box testing is the one of the common strategy In software testing. It is a method of examines the functionality of a software application without considering the internal structure or workings. This strategy is applies every level of software testing, like unit, integration, system and acceptance testing.
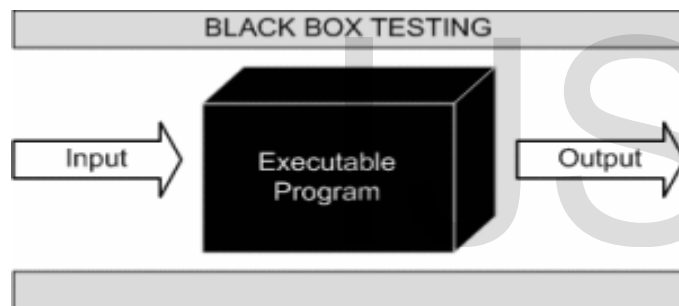

Figure 1: Black box testing approach

3.1.1 Steps including in black box testing

The following stepsare carrying out any type of Black Box Testing.

- The Initial requirements and specifications of the system are examined.
- Tester chooses valid inputs for supporting an given application (positive test scenario) to check the SUT processes correctly. Also some of the invalid inputs (negative test scenario) are chosen to verify that the SUT. Because the system is able to detect them.
- Tester determines the expected outputs for all those valid or invalid inputs.
- Software tester constructs or developing test cases for the selected inputs.
- The test cases are executed in the system.

- Software tester compares the actual outputs and expected outputs for given application.
- If any defects are tested it should be return to the developer for rebuilding the codes.

3.1.2 Types of Black Box Testing

Some important types in black box testing as follows,

- **Functional testing:**In functionality testing the tester checks the functionality of the application. It is including functional requirements.
- **Non-functional testing:**In non functional testing test the un-functioned requirements.
- **Regressiontesting**: Regression Testing is determines after code fixing the given application from developer side. The tester check in various systems the new code is affecting in any other existing system or a application.

3.1.3 Black Box Testing Strategy

Some important test strategy in black box testing is,

- **Equivalence Class Testing:** It is a method of minimizing the number of test cases is used in given application. This method works based on dividing the program input values in to equivalence classes.
- **Boundary Value Testing:**It is a method used to test the boundary values of the given application. There is a possibility that the system chance to fail on boundary value analysis. Because it chance to error that the developer done at the boundaries of the equivalence classes. This technique determines to check the certainrange of values is acceptable by the system or not.
- **Decision Table Testing**: A decision table testing is a matrix form that contains the information about the application. Its represents the combinations in unique column.

3.2 White Box Testing

The white box testing is also called as glass box, structural, transparent, clear box and open box testing.In white box testing technique, to test the internal workings of the given application. Like loops, variable, dataflow etc. in white box testing the tester must be having the full internal knowledge about the given application. The each and every line should be tested in this technique. The output also verified by the tester.
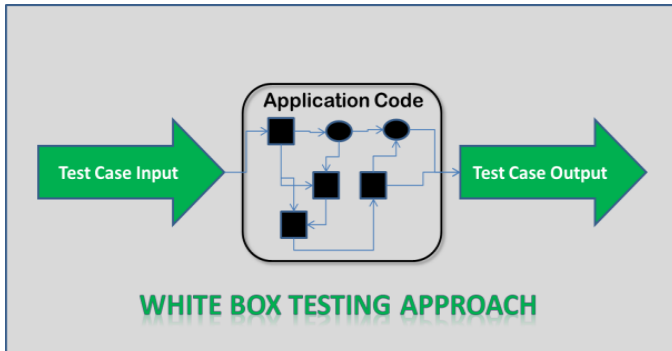
Figure 2: White box testing approach

3.2.1 White Box Testing Steps

- Identify the feature, component, program to be tested
- Plot all possible paths in a flowgraph
- Identify all possible paths from the flowgraph
- Write test cases to cover every single path on the flowgraph
- Execute, rinse, and repeat

3.2.2 Types of white box testing

Unit Testing

The unit testing tests the each module and component of the software. It is test the every module in the program. The unit consider as smallest module in the program. This testing is generallyconsidered as a white box test class. Unit testing is essentially done by the programmer or a developer.

Testing for Memory Leak

The memory leak is a very important think to test it during development phase of anapplication. Because a memory leaks result of programming bug. The continuous runs and the frequently open of a program is chance to memory leak. Even it is very small memory leak cause the program to terminate.

3.2.3 White Box Testing Strategies

Most widely known white box testing strategies are the following

Basis path testing

The basis path testing is used to defining a basis set of execution paths. The test cases are derived to execute the every statement in then program at least one time during the testing.

Flow graph notation

The flow graph notation is the graph or a pictorial representation of the program. It is contains the node, edges, compound condition and regions. A node represent the simple expression is referred to as a predicate node. The edges represent the relationship between the nodes the result may true or false. The edges are must be started and end with the nodes. In flow graph notation areas are bounded the set of edges and nodes called regions.

Independent program paths

The independent program path is defined as in program the start node end node that introduce at least one new set of processing condition or a statement (that is a new node). Using the cyclomatic complexity the program path is determines

CyclomaticComplexity

Itis used to provide a logical complexity quantitative measure of a program. The cyclomatic complexity is defined based on the number of independent paths in the basis set. The complexity is computed based on the above formula, $V(G) = E-N+2$.method is to detect a bugs and effect of the software.

Control flow testing

The full structure of a program, design and codes are studied in this type of testing.

Dataflow testing

It is used to test the flow of the data. The data points at which variables receive values and which these Formal inspection. The formal inspection is done by a third party or other persons. The main goal of these values is used.

Loop testing

This technique used to test the loops in the given program. It is one part of the control structure. That completely focused to validity on the construct or a program.

3.3 Grey Box Testing

The gray box testing is a one type of software testing strategy for software debugging in which the **tester** has the limited knowledge of the internal details in the program. The grey box testing is the combination of black box and white box techniques.
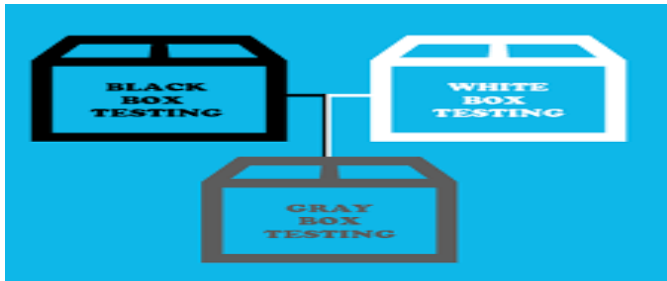

Figure 3: Grey box testing approach

3.3.1 Grey box testing steps

- Identify the input values
- Identify the output values
- Identify the major paths in given application
- Identify the sub functions of the application
- Develop the inputvaluesforthe sub functions
- Develop the output values for the sub functions
  Figure 3: grey box testing approach
- Executing the test case for the given sub functions

3.3.2 Grey Box Testing Strategies

The grey box testing including following strategy,

Matrix Testing

The matrix testing is based on a table. It is one type of document that used to maps and traces the user requirements with the test case scenario.

Regression testing

The regression testing is the separate form of the unit testing, integration testing and system testing. It is a process of running a old test suite after every change to the system.

Pattern Testing

The pattern testing is based on the ATPG it is stands for Automatic Test Pattern Generator. To generate the automatic test pattern to the every applications.

Orthogonal Array Testing

This method is very useful to finding errors with the logic faults of the given application. The errors are detected in three modes single mode, double mode and multi-mode.

4. SOFTWARE BUG

A software bug is an error, in a given application it ischanceto produce incorrect or unexpected results in software running time. The process of fixing and rectifying the bugs is called "debugging" some technologies and automated tools are used to fixing the bugs. The software bug is identified and report by the software testers.

5 COMMON ERRORS

5.1 functionality errors

The functionality errors defined as the total functionality of the application is collapsed. It is very easy to find but very hard to rectify. This type of errors producing the unexpected, impossible or confusing results in program running time.

5.2 Communication Errors

The communication error occurs in communication the software to the end-user. The errors should be occurred for user communicating with the other system or the end user systems.

5.3 Syntactic Error

The syntactic error is representing as the syntax error. It is misspelled words, incorrect syntax and thegrammar mistakes.

5.4 Calculation Errors

These errors occur to the following reasons

- Using bad logics
- Incorrect formulas
- Data type mistakes or mismatches
- Developing Code errors
- Function call and return issues, etc.

5.5 Control flow errors

- The control flow error is representing the incorrect usage of the control structures. For using conditions, expressions and the statements are correctly otherwise it is chance to a control flow errors. also the incorrect looping values producing the errors

6. BUG REPORT

The bug report is also called defects report. It is a report that represents the list of bugs found by the software testers while testing and executing the software product. The bug report contains the all information about the software testing. It is including the developer name, tester name, total amount of bugs, bug names and bug id etc.

6.1 Sample Bug Report

The sample bug report as follows,

1. Bug name: name of the bug name to be traced by the tester
2. Bug id: it is a used to identify the bugs easily(identification of bugs)
3. Area path: user menu and new user or existing user
4. Build number: version of thenumber 5.0.1

5. Severity: high (high/medium/low)or 1(to check the severity)
6. Priority: high (high/medium/low)or 1(to check the priority)
7. Assigned to: name of the developer
8. Reported by: name of the reporter
9. Reported on: reported date
10. Reason: note the defects

7 CONCLUSION

The knowledge of the testing techniques is used tocheckquality of the software is important to the advancement of the software testing research. We have reviewed various functionality of the software testing. The bug report is very useful in future for detecting more and more software bugs easily. The software testing has having the most important in future.The application quality is judge based on the quality.

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