HNDIT 4012 Software Engineering

Testing

Topics covered

- Introduction
- Verification & validation.
- Black-box Testing
- White-box Testing
- Manual & Automated Testing

Introduction

- The aim of the testing process is to identify all defects existing in a software product.
- Thus testing provides a practical way of reducing defects in a system and increasing the users' confidence in a developed system.

Aim of Testing

- **Errors** - These are actual coding mistakes made by developers. In addition, there is a difference in output of software and desired output, is considered as an error.
- **Fault** - When error exists fault occurs. A fault, also known as a bug, is a result of an error which can cause system to fail.
- **Failure** - failure is said to be the inability of the system to perform the desired task. Failure occurs when fault exists in the system.

Software Validation

- Validation is process of examining whether or not the software satisfies the user requirements.
- It is carried out at the end of the SDLC. If the software matches requirements for which it was made, it is validated.

Software Verification

- Verification is the process of confirming if the software is meeting the business requirements, and is developed adhering to the proper specifications and methodologies.

Testing Approaches

- Tests can be conducted based on two approaches .
  - Functionality testing
  - Structural testing

Functional Testing

- In the black-box testing approach, test cases are designed using only the functional specification of the software, i.e. without any knowledge of the internal structure of the software.
- For this reason, black-box testing is known as functional testing.

Structural Testing

- On the other hand, in the white-box testing approach, designing test cases requires thorough knowledge about the internal structure of software, and therefore the white-box testing is called structural testing.

BLACK-BOX TESTING

- It is carried out to test functionality of the program. It is also called ‘Behavioral’ testing. The tester in this case, has a set of input values and respective desired results.

Black-box Testing Techniques

- Equivalence class portioning
- Boundary value analysis

Equivalence Class Partitioning

- In this approach, the domain of input values to a program is partitioned into a set of equivalence classes.
- Equivalence classes for a software can be designed by examining the input data and output data.

Example 01

- For a software that computes the square root of an input integer which can assume values in the range of 0 to 5000, there are three equivalence classes: The set of negative integers, the set of integers in the range of 0 and 5000, and the integers larger than 5000. Therefore, the test cases must include representatives for each of the three equivalence classes and a possible test set can be: {-5,500,6000}.

Boundary Value Analysis

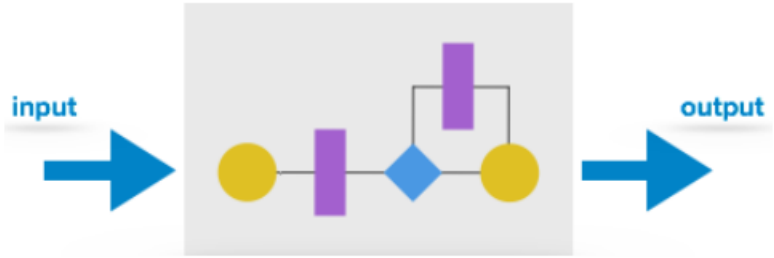
- A type of programming error frequently occurs at the boundaries of different equivalence classes of inputs.
- For example, programmers may improperly use < instead of <=.
- Boundary value analysis leads to selection of test cases at the boundaries of the different equivalence classes.

Example 02

- For a function that computes the square root of integer values in the range of 0 and 5000, the test cases must include the following values: {0, -1,5000,5001}.

White-box Testing

- It is conducted to test program and its implementation, in order to improve code efficiency or structure. It is also known as ‘Structural’ testing.



White-box Testing Techniques

- Statement Coverage
- Decision Coverage
- Branch Coverage
- Condition Coverage
- Path Coverage
- Control flow testing
- Data flow testing

Manual Testing

- This testing is performed without taking help of automated testing tools.
- The software tester prepares test cases for different sections and levels of the code, executes the tests and reports the result to the manager.
- Manual testing is time and resource consuming.

Automated Testing

- This testing is a testing procedure done with aid of automated testing tools.

Discussion

- Software Testing Tools