

Automated Test Case Generation using Data Mining

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Abstract - The Automated Test Case Generation using Data Mining is a data mining concept processed to generate test case of an application automatically. Test case generation is the process of writing SQL test cases and its purpose is to check the output against expected results. Based on the results, either the test case is modified or kept unchanged. A software testing process is to identify appropriate test cases typically requiring high effort for test case generation and make over effort for adapting test cases just in case of requirements changes. Here in this system, a software is developed and sent to test. The software undergoes all the levels of testing such as unit testing, integration testing, system testing, acceptance testing, alpha testing, beta testing. In a manual testing process, the design, selection, creation and execution of test cases is a time-consuming and error-prone task, since appropriate and effective test cases should be obtained from the requirements. And the test cases are generated automatically by the application. The generated test cases are viewed in reports which are specified in excel sheet and graph format. The report can be downloaded by both the developer and tester. And the tester application also does some process of identifying number of bugs in the software, analysing the most risk factor, time calculation for completion of test case report, verifying the execution result and other. The test case report generation is performed by data mining algorithms. One such popular algorithm is Genetic Algorithm (GA) generates test cases by making the fitness value function to process among the entire system during testing. Another algorithm called CART (Classification and Regression Trees) algorithm is used to generate test case reports. Thus a verified software will be created for the usage.

Keywords - Software testing, Test Case report, Data Mining, CART Algorithm, Target variable.

1. INTRODUCTION

Test case generation is one of the foremost necessary and costly steps in software testing, the techniques for automatic generation of test cases attempt to efficiently find a small set of cases that permit an adequacy criterion to be fulfilled, thus, reducing the cost of software testing and leading to additional economical testing of software system merchandise. Software testing helps in building the confidence of a developer that a program does its work correctly. A software testing

system consists of a collection of test cases, each of which is made up of the input of the program, called test data and the output that must be obtained. The need for increasing flexibility of industrial automation system products leads to the trend to shift functional behaviour from hardware solutions to software components. This trend causes an increasing complexity of software products and the need for comprehensive and automated testing approaches to ensure a requested quality level. Thus a test case quality is bought out by using data mining algorithms. Genetic Algorithm method is used to improve the quality and reliability of the software by generating optimized test cases. And also one such popular data mining algorithm used in the project is CART (Classification and Regression Trees) algorithm. It is used in data mining with the objective of creating a model that predicts the value of a target based on the values of several input. CART uses a splitting criterion to test each data and produces a decision tree consisting of root node and child nodes. This is implemented to test the software and generates the test case report. This system processes the developer to create a new software and provide it to the tester for generating test case. The tester tests the software by undergoing all the levels of testing such as unit testing, integration testing, system testing, acceptance testing, alpha testing, beta testing. And the test cases are generated automatically for each test performed by the application. The generated test cases are viewed in reports which are specified in excel sheet and graph format. The report can be downloaded by both the developer and tester. And the tester application also does some process to identify number of bugs in the software, analyse most risk factor, and calculate time for completion of test case report, and verifies the execution result. Thus the application generates a verified and assured test case report.

2. PROPOSED SYSTEM

Software testing is taken into account that it is the most effort consuming activity within the software system development. Although a number of testing techniques and adequacy criteria have been suggested in the literature but it has been observed that no technique are sufficient enough to ensure the delivery of fault free software system important to the necessity of automatic test case generation to reduce the cost and other requirements of testing. Testing can detect any bug, but

in practice test suites are often incomplete. Because writing tests manually takes effort so researchers have developed automatic test generation system using algorithms. The data during system testing are usually generated from the requirements of the developer or the code, whereas the design is rarely concerned with generating test data. The key problem in software testing is to generate test case automatically. Since it improves the efficiency and effectiveness and lowers the high cost of software testing. To solve this problem, the proposed system works with data mining algorithm. A commonly used Genetic algorithm is used to generate test cases with help of best strategy solution. This algorithm works on the fitness value function to get the test data. These data are mined and interrupts when error occurs during testing. Another data mining algorithm called CART algorithm is used to build test case reports. The Classification and Regression tree (CART) produces a splitting criterion from which each module is tested and the number of bugs with most risk factor and highest priority is analysed and shown in the report.

3. TEST CASE GENERATION

Automated test case generation in software testing is performed for the most significant reasons that are as follows:

Upgrades software quality

The manual testing of a software become a common cause in the software testing field. Thus as a result, these automatic test case generations have turned out to be a key to guarantee the quality of software products.

Reduces the software cost

In software testing, the cost plays a major part since the developers and tester works based on the cost implementation. Due to the generation of unfortunate test cases the cost exceeds beyond the expected price. So the cost can be reduced to get the software.

Lowers the manual errors

Usual test cases are manually written in an excel sheet by the tester. This meanwhile causes errors that affects the software product. To avoid such errors done by humans so called system, automated test case generation is being developed which automatically generates test cases when testing is processed

Valid test cases

Data mining algorithm such as genetic algorithm brings out valid test cases for the application. The algorithm works on a criterion choosing a function to be executed orderly to justify the test cases.

Valid reports

Reports are generated for outputted test cases. Reports holds to kinds, text and graph form reports

these are developed using CART algorithm (i.e., Classification and Regression Trees). This algorithm helps in clearing out the most affected bug by showing its highest priority level in the reports.

4. TEST CASE EVALUATION

The Testing is performed and outputs are evaluated from the reports generated. The test case evaluation is processed by the CART algorithm to clear out the bugs in the software. This evaluation is based on the requirements, cost, security, privacy of the application. In this paper testing is evaluated with the help of test cases results. As a result, the reports are generated automatically which provide a clear view of the software errors.

The result of test case generation provides:

Test Cases

The output of every testing process provides test cases by which developer able to understand the errors in the software. Usually the test cases are written manually in an excel sheet by the tester. Later, technology brought out system to generate test cases to reduce manual work.

Text Report

The automated test case generation system generates a test case in form of text report that is sent to the developer. The tester runs the application and all testing is performed for each module. During the testing process, test cases are automatically generated and data are saved into the database. Thus the data are mined from the database and the report is generated. The report contains test case id, test case description, test priority, action, inputs, expected result, actual output, test result, test comments and other.

Graph Report

Another test case is outputted in the form of graphical report. When the testing is performed, the data are mined to develop the test case report with the help of CART algorithm. This algorithm works based on the fixed value, the highest priority bugs to be cleared out first are shown in a graph form using x and y coordinates.

5. SAMPLE TEST CASES

The tester runs the application and software testing is performed. All kinds of testing are performed for each module and the test cases are generated and stored to the database. The test cases are generated using data mining algorithm called Genetic Algorithm (GA). The algorithm holds a file that is inbuilt into the system and interrupts when error occurred. GA provides a fitness value function from which the test data are stored to the database. Later, the data are mined to generate test case reports.

Here are some sample test cases generated during the process of automated test case generation system:

Test Scenario ID	Login-1			Test Case ID	Login-1A		
Test Case Description	Login – Positive test case			Test Priority	High		
Pre-Requisite	A valid user account			Post-Requisite	NA		
Test Execution Steps:							
S.No	Action	Inputs	Expected Output	Actual Output	Test Browser	Test Result	Test Comments
1	Launch application	https://www.facebook.com/	Facebook home	Facebook home	IE-11	Pass	[Priya 10/17/2017 11:44 AM]: Launch successful
2	Enter correct Email & Password and hit login button	Email id : test@xyz.com Password: *****	Login success	Login success	IE-11	Pass	[Priya 10/17/2017 11:45 AM]: Login successful

Fig -1: Sample Test Case1

Test Scenario ID	Login-1			Test Case ID	Login-1B		
Test Case Description	Login – Negative test case			Test Priority	High		
Pre-Requisite	NA			Post-Requisite	NA		
Test Execution Steps:							
S.No	Action	Inputs	Expected Output	Actual Output	Test Browser	Test Result	Test Comments
1	Launch application	https://www.facebook.com/	Facebook home	Facebook home	IE-11	Pass	[Priya 10/17/2017 11:44 AM]: Launch successful
2	Enter invalid Email & any Password and hit login button	Email id : invalid@xyz.com Password: *****	The email address or phone number that you've entered doesn't match any account. Sign up for an account.	The email address or phone number that you've entered doesn't match any account. Sign up for an account.	IE-11	Pass	[Priya 10/17/2017 11:45 AM]: Invalid login attempt stopped
3	Enter valid Email & incorrect Password and hit login button	Email id : valid@xyz.com Password: *****	The password that you've entered is incorrect. Forgotten password?	The password that you've entered is incorrect. Forgotten password ?	IE-11	Pass	[Priya 10/17/2017 11:46 AM]: Invalid login attempt stopped

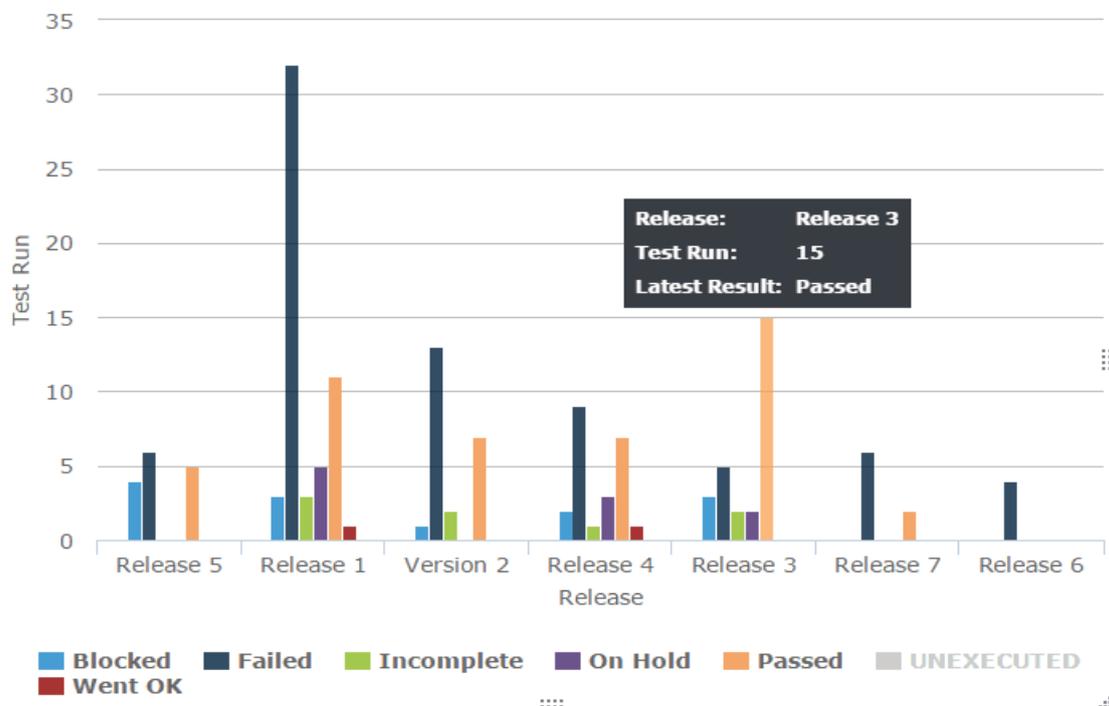
Fig -2: Sample Test Case2

6. SAMPLE REPORTS

Text Report

Test case ID	Test case	Test case Description	Test Step	Test step Description	Expected Result	Actual Result	Status	Comment
TC001	Validate Login Credentials	Test the login functionality of the e-commerce site to make sure that registered user is allowed to login into site using valid credentials.	Pre-Condition	1) Make sure that site under test is available and testable. 2) Make sure that required data for login is available.				
			Step 1	Launch the ecommerce application with the given URL: <Test Site URL>	The e-commerce site launched properly.	Site launched successfully.	Pass	
			Step 2	Navigate to Login page.	Login page is displayed to user with Username and Password fields are displayed on the page.	Login page loaded successfully.	Pass	
			Step 3	Enter valid Username in username field.	Username field should be editable and accept the username.	Username input accepted.	Pass	
			Step 4	Enter valid Password in Password field.	Password field should be editable and accept the password and display as star or dot.	Password input displayed in dot and accepted.	Pass	
			Step 5	Click on login button.	User should login into site and navigated to Home page.	User navigated Checkout page.	Fail	

Graph Report



7. CONCLUSION

In this paper the automated test case generation system generates the test cases automatically and it evaluates the test cases and produces the test reports. This system lowers the human work and cost of the testing process so as to produce a better results. Both the manual and automation testing, are preferable in order to reduce bugs in software test automation is performed to create test scripts. This system undergoes all the levels of testing such as unit testing, integration testing, system testing, acceptance testing, alpha testing, beta testing. This automated system can be applied to perform all types testing but some non-functional testing cannot be performed. So in future systems can be developed to concentrate on those non-functional testing types (like load testing, stress testing, scalability testing) which have not been implemented in present. There are multiple directions for future work such as to find more generic methods to gain more enhancements in the overall testing effort to get better results to overcome all the errors.

REFERENCES

- [1] Hitesh Tahbaldar and Bichitra Kalita, "Automated Software Test Data Generation: Direction of Research", International Journal of Computer Science & Engineering Survey (IJCSSES), vol. 2, no. 1, Feb. 2011.
- [2] Vishawjyoti and Sachin Sharma, "Study And Analysis Of Automation Testing Techniques", Journal of Global Research in Computer Science, vol. 3, no. 12, Dec. 2012.
- [3] Milad Hanna , Amal Elsayed Aboutabl and Mostafa-Sami M. Mostafa, "Automated Software Testing Framework for Web Applications", International Journal of Applied Engineering Research ISSN 0973-4562, vol. 13, no. 11 (2018), pp. 9758-9767.
- [4] Ahmed Mateen, Marriam Nazir and Salman Afsar Awan, "Optimization of Test Case Generation using Genetic Algorithm (GA)", International Journal of Computer Applications (0975 - 8887), vol. 151, no. 7, Oct. 2016.
- [5] Chayanika Sharma, Sangeeta Sabharwal and Ritu Sibal, "A Survey on Software Testing Techniques using Genetic Algorithm", IJCSI International Journal of Computer Science Issues, vol. 10, issue 1, no. 1, Jan. 2013.
- [6] Jatinder Kaur and Jasmeet Singh Gurm, "Description of Genetic and CART Algorithm using Data Mining Tool", International Journal of Advanced Research in Computer Science and Software Engineering, vol. 5, issue 6, Jun. 2015.