

Test Case Prioritization using Robotic Process Automation (Ui Path Studio tool)

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Abstract—RPA(Robotic Automation Process) is a simple but powerful automation technology to compete in today's digital and complex business environment. RPA has enabled organizations to re-imagine how people and applications can work together, delivering a quick ROI. With robotics technology, automate and build a platform for any application. RPA has become so widespread because it is broadly applicable. Virtually any high-volume, business-rules-driven, repeatable process is a great candidate for automation—and increasingly so are cognitive processes that require higher-order AI skills. Enterprises in industries all along from financial services to healthcare and far beyond have implemented RPA in areas as finance, compliance, legal, customer service, operations, and IT.

Index Terms— Test case prioritization, Requirement based test case prioritization and based on historical data, RPA(UiPath Studio tool),Artificial Intelligence,Model Based Test.

I. INTRODUCTION

Software Testing is the major activity done while developing and releasing a bug free and efficient application which should be done very effectively at early stage so that errors can be identified early and developers can fix it as early as possible [17].

There is a need for scheduling the test cases effectively within the regression suite in order to maximize rate of fault detection and Test case coverage. Test cases can be automated which can reduce the execution time of the regression suite thereby minimizing repetitive human manual efforts. Test Case Prioritization is a way of arranging the Test cases based on some criteria either. Executing those prioritized Test cases rate of fault detection can be done earlier stage and can be fixed as early as possible. TCP does not discard Test cases, instead it runs most significant Test cases and different techniques are used for Prioritizing the Test cases for saving maintenance cost and time.

II. MOTIVATION

In order to reduce the manual effort which is done by humans for executing the Regression suite in each release, Bots are used in RPA for doing the repetitive tasks. Test Scenarios are prioritized and automated based on 3 factors: Client input on requirements 2. Weight of the Functionality coverage 3. Based on frequently occurring faults in the Test scenarios in any regression suite Automating the Test or Regression Suite is faster in execution, it is cheaper, versatile and powerful, automated suites can be recorder and reused. Prioritized TCs can be automated using any RPA tool which reduces the manual tasks. TCs can be executed by attended or unattended robots called bot.

III. AIMS AND OBJECTIVES

The main objective of our paper is to automate the Prioritized Test cases in order to reduce execution time and manual repetitive tasks.

1. Uncover as many as errors (or bugs) as possible in a given product by prioritizing the TCs based on requirement and Historical data.
2. Demonstrate a given software product matching its requirement specifications.
3. Validate the quality of software testing using the minimum cost and efforts by automating the TCs through RPA tool.
4. Generate Prioritized test cases, executed the Automated TCs and generating reports showing execution time [1]. For any vast application, it is not possible for testing each and every data or different functional or non-functional flows, so here comes the use of TCP and Automation.

In our paper, we wanted to bridge the gap by automating the Test cases and reducing the execution time.

A. RPA(Robotic Automation Process)

RPA is a simple but powerful automation technology to compete in today's digital and complex business environment. RPA has enabled organizations to re-imagine how people and applications can work together and deliver error free application quickly[1]. With robotics technology, automate and build a platform for any application.

Enterprises in industries all along from financial services to healthcare and far beyond have implemented RPA in areas as finance, compliance, legal, customer service, operations, and IT. Some RPA tools used now a days are UI Path Studio, Automation Anywhere, Blue Prism, Pega, Contextor, Keysight's Eggplant,Kryon and Kofax.

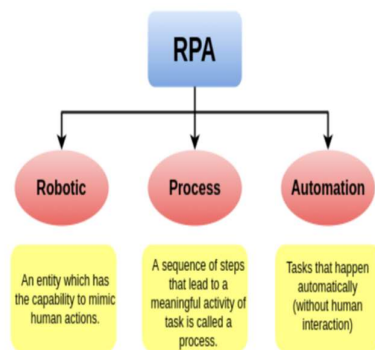


Figure 1.1: What is RPA[18]

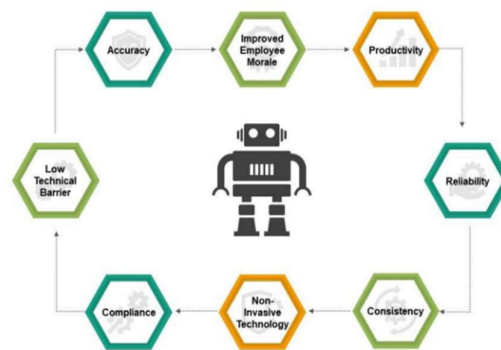


Figure 1.2: Benefits of RPA[18]

Nowadays, RPA has been widely used in health care Systems which reduces the costs of repetitive manual tasks in Administration claiming, Manages Health care workflows, Improves health care cycle, Records audit procedures, Takes care of discharge and other procedures, faster account settlements and Simplifies appointment scheduling and many more[6].

B. Ui Studio Path - RPA tool

Some RPA tools used now a days are UI Path Studio, Automation Anywhere, Blue Prism, Pega, Contextor, Keysight's Eggplant,Kryon and Kofax.

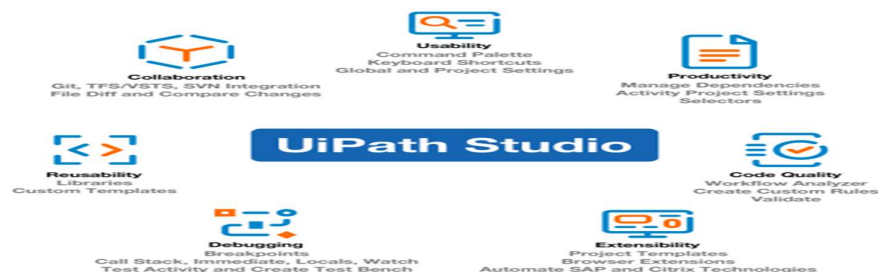


Figure 1.3: Benefits of Ui Path tool[19]

Here in this paper, a Healthcare application is automated which includes the appointments, patient's data entry, billing , etc. By automating Test cases through Ui Studio Path RPA tool and prioritizing the automated Test cases will make the Regression Testing more efficient by saving time and reducing manual effort [2]. UiPath Studio tool to Automate any Health Care System[5]. UiPath is a robotic process automation platform for end-to-end high-scale automation[5].

IV. LITERATURE REVIEW

The different test case prioritization techniques with and without RPA are reviewed and analysed:

TABLE I. COMPARISONS OF TCP APPROACHES

#Sl No	Author Name	Year	Approach	Key Factors Considered
1	Marina Cernat, et al.[1]	2020	MBT, RPA	Open Source MBT, Ui Path
2	Lucija Ivančić, et al.[2]	2019	Literature Review of RPA in terms of State, trends and application	SLR based on WoS and Scopus DB.
3	R. Kavitha, et al.[3]	2010	TCP Technique to improve rate of fault severity detection.	End-User Priority, Changes in Requirement and implementation complexity.
4	Sai Priyatham Dongoor, et al.[4]	2019	Systematic Literature review on Requirement based TCP	Prioritization Goals, Empirical studies
5	J. G. Enríquez et al.[27]	2020	Systematic mapping of Current state of RPA	Analysis of RPA tools
6	Rayapureddy Kalyani et al.[21]	2018	TCP based on Grouping, Code Scope Metric	1.Requirements clustering 2. Mapping of necessities to test cases 3. Prioritizing the test cases 4. Clustering the prioritization 5. Test case selection from the clusters
7	Hema Srikanth, et al.[23]	2008	Software Testing, Reliability and Quality, TCP techniques.Prioritization of Requirements for Testing (PORT Version 1.1)prioritization factors (PFs): (1) customer-assigned priority on requirements, (2) requirement complexity, (3) requirements volatility.	Test cases are being ordered according to WP values. WP is weightage Prioritization. Test cases having the higher values are executed first.
8	Zainab Sultan et al.[22]	2007	TCP Techniques, Test Suite Minimization.	Fault Detection by TCP techniques
9	Namita Panda, et al.[24]	2017	TCP using UML chart diagram and End-user Priority	Association Rule mining , TCs are modeled
10	Namita Panda, et al.[26]	2006	TCP using UML State Machine Diagram and Sequence Diagram	Early Rate of Fault Detection
11	Thanmozhe Hariharan, et. al.[20]	2019	Transformation Strategy.	Case duration and Productivity of an operation is considered.
12	Rajendrani Mukherjee, K. Sridhar Patnaik, et al.[25]	2018	TCP Techniques	Analysis of different research finding on TCP
13	Our Proposed Approach	2022	Automation using RPA tool	Automating Prioritized TC to reduce execution time

V. PROBLEM DEFINITION

Test Case Prioritization (TCP)- is the process of scheduling test cases to be executed in a particular order so that test cases with a higher priority are executed earlier in the test sequence. The priority is defined relative to some test criterion. Test Case Prioritization is a way of arranging the Test cases based on some criteria either. In this paper, TCs are prioritized based on the factors:

- Client input on requirements

- Weight of the Functionality coverage
- Based on frequently occurring faults in the Test scenarios in any regression suite.

TABLE II. HOW TEST CASES CAN BE PRIORITIZED

#TCs	Test Scenarios	Weight as per Client	Weight as per Functionality Coverage	Weight as per Fault Occurrence	Prioritized TCs
T1	Check URL and the Home page	5	5	3	High
T2	User is not able to Fine Doctors through Home page	5	4	2	High
T3	Click on Login/Sign Up button and check for Login page.	5	5	3	Medium
T4	Click on Register tab and check for Register page	4	4	2	Medium
T5	New User Sign Up.	3	3	1	Low

In the Table II, Test Scenarios are prioritized based on the 3 factors mentioned above. For example, T1- T5 all the weighted 5(5 is considered to be of highest priority) as per client requirement. Whereas, T1 is weighted as 3 as per fault occurrence, so it is considered as High Priority TC and so on. An automation tool could have been used for testing the application and TCs can be prioritized based on the highly complex TCs and TCs tend to have more number of faults and by reducing the execution time for each TC will save time and cost.

VI. FLOW CONTROL

In the below figure, a flow graph or the Procedure followed in this paper has been designed:

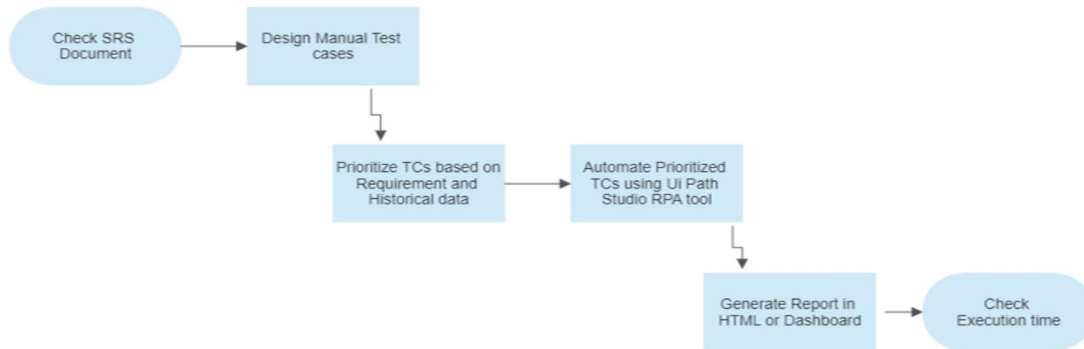


Figure2.1. Flow of Control

VII. CASE STUDY

Here the Test scenarios are identified and automated right during requirement phase to minimize the Faults/bugs, Cost and Time. In the requirement phase the Test Scenarios are being prioritized depending on the functionalities, repetitively failing Test cases in every execution and the TCs which take more time for execution [8]. First all the Test Scenarios are executed manually and total execution time is observed which a repeated task is in every cycle. By Automating the application through RPA minimizes the repetitive tasks which will be done by Bots and reports will be generated automatically[1].

VIII. COMPARISON AND RESULTS

The papers[3][4] reviewed above, has followed different methodologies and techniques for prioritizing, minimizing the cost and execution time of the Test Suite along with the comparable results which are manual task along with some calculations. Paper[2] Robotic Process Automation: Systematic Literature Review referred has presented the results of SLR(Systematic Literature Review) on RPA based on search results from Scopus and WoS(Web of Service) databases through Theoretical and Empirical research method.

Your Company LOGO	Project Name:	IHealthcare_v1.0	Test Designed by:		Sakalya Parveen Balg				
	Module Name:								
	Release Version:	v1.0							
Pre-condition	Pre-condition	Enter url:https://www.practo.c om/							
Dependencies:	Dependencies:	NA							
Test Priority	Test Priority								
Test Case#	Test Scenario	Test Summary	Test Steps	Test Data	Expected Result	Post-condition	Actual Result	Status	Note
1	Click on Login/Signup button and Check for Login page.	Username:	Verify and Click on Login/Signup button.		Login button is should be present and user should be able to click it.				
		Password:	Verify Login tab.		Login Tab should be present.				
			Verify Mobile Number/Email ID textbox, Password textbox, "Forgot Password?" link, "Remember me for 30 days" radio button, "Login with OTP instead of password" and Login button.		Mobile number/Email ID textbox, password textbox, "Forgot Password?" link, "Remember me for 30 days" radio button , "Login with OTP instead of Password" and Login button should be present.				

Figure 5.1: Test Case Sample of RPA of an Health Care System

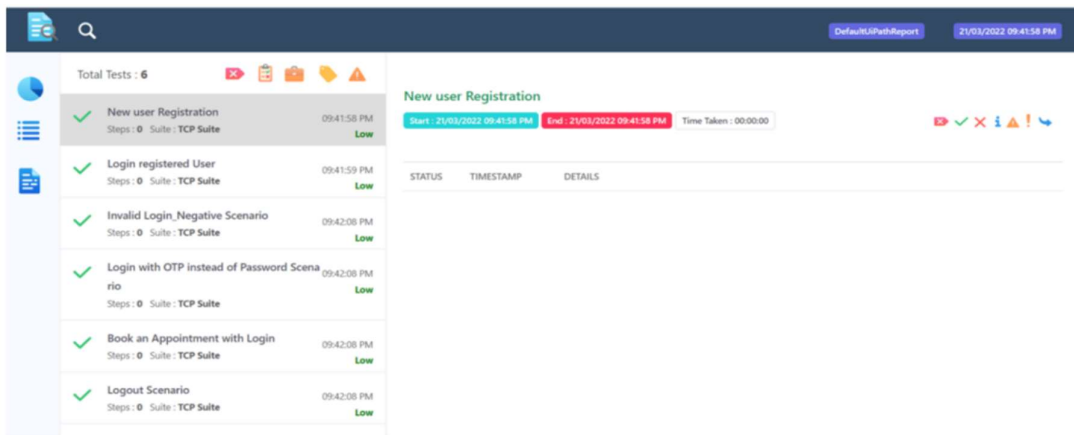


Figure 5.2: Report generated post execution of a Test Suite

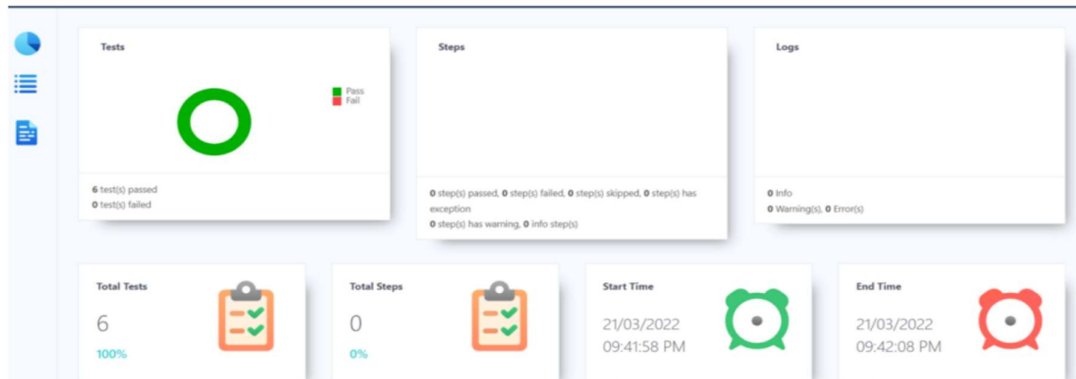


Figure 5.3: Dashboard Report generated post execution of a Test Suite

In our paper, an automation tool is being used to execute the prioritized TCs and run the suite in comparably less time as compared to manual execution of all the TCs in every release. The Test scenarios are executed through Ui Path Studio RPA tool and the execution time is noted while is very less as compared to the annual task done. In the above figures, a Test suite report shows Total Test executed, Pass/Fail, Start time and End time of execution, Priority of the Test cases [5][6]. This will minimize the repeated task done in every release in a very less time[7]. By Automating the application in order to execute the regression suite will minimize the repeated tasks, task and error can be detected and resolved soon. In this paper, we have used Ui Path for automating the application and comparing the execution of Test Suite done manually and through automation [9].

IX. CONCLUSIONS AND FUTURE SCOPE

TCP is a technique which reduces the cost of testing while maintaining the quality of the product. It allows ordering of the test cases in a way that the one with higher priority is executed prior to the other test cases in a test suite. These priorities are decided on the basis of different TCP approaches such as history-based, requirements-based approaches. This research specifically focuses on requirements based regression TCP techniques. The case study observed the use of RPA to TCP based on requirement for a Health care application. TCP is a technique to prioritize and schedule Test cases which reduces the cost of testing while maintaining the quality of the product.

It allows ordering of the test cases in a way that the one with higher priority is executed prior to the other test cases in a test suite. Here the execution of the regression suite is the key thing which can reduce the execution time by automating and executing the prioritized TCs based on requirement. Few of the future extensions are:

- Application (both Web and Mobile) can be automated completely and Executed many times for better optimization and time saving.
- Mobile application automation is missing in this paper, in future this can be implemented.
- AI can be used along with RPA for better performance.
- As unstructured data cannot be handled by bots, so some 3rd party tool or some technology can be integrated with RPA in order to overcome this issue.

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