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STUDY AND ANALYSIS OF AUTOMATION TESTING TECHNIQUES

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Abstract: Testing is a very important activity in Software Development Process. It is to examine & modify source code. Effective Testing produces high quality software. This Paper deals with a significant and vital issue of Software Testing. Testing can be conducted manually as well as Automated. These Techniques have their own advantages & disadvantages. The Objective of this paper is to perform Automation Testing using Software Testing Tool "Selenium". With this web testing tool, test cases are automatically recorded in background while tester is entering the data in a web application screen.

Keywords: Software Testing, Manual Testing, Automation testing, Selenium.

INTRODUCTION

The ultimate goal of software development is to produce high quality software. Superior quality software has characteristics like low cost, reliable and user satisfactory. Testing is the process of executing a program with the intention of finding errors. This is a crucial & essential activity to discover all the errors early software development process. Emphatic & fruitful testing reduces the system cost. Software development houses recruit testing & quality assurance personnel for performing testing activity.

Test means program's response to ever possible input. A program should test for every valid & invalid input. Testing activity can be conducted in to two ways: Manual testing & automation testing. Any type of software testing type can be executed both manually as well using an automation tool.

Manual testing[5] is in which the testing activity is performed by testing persons. Manual testing requires a tester to perform manual test operations on the test software without the help of Test automation. Manual Testing is a process where in a tester often follows a written test plan that leads them through a set of important test cases. A test case in software testing is a set of conditions written for particular applications & tester run all these conditions to ensure the correct functionality of the software applications. Manual testing is a laborious activity that requires the tester to possess a certain set of qualities; to be patient, observant, speculative, creative, innovative, open-minded, resourceful, opinionated, and skilful. In order to fully test that all the requirements of an application are met, there must be at least two test cases for each requirement: one positive test and one negative test. Manual testing helps discover defects related to the usability testing and GUI testing area. Any new application must be manually tested before its testing can be automated. Manual testing requires more effort, but is necessary to check automation feasibility. Manual testing does not require the knowledge of any testing tool.

Automation Testing [6] is running test cases where manual intervention is not required to run each one. It uses special

software to write & execute test cases to compare the actual outcome with the predicted outcome. Once tests have been automated, they can be run quickly and repeatedly. Automated software testing is the best way to increase the effectiveness, efficiency and coverage of software testing. Automation testing requires considerable amount of investment for buying the software & compatible hardware resources. Automation testing does what manual testing does not. Automation testing improves the accuracy & it saves the time of the tester & organization's money. Automation testing is best suited in the environment where the requirements are frequently changing & huge amount of regression testing is required to be performed. Automation testing is best suited in the environment where there are critical test cases that are to be executed repeatedly. It increases the quality of testing structure & reduces the future maintenance cost. Various benefits of Automation testing are fast run of test case. Reusable test cases are made & these test cases reliable. comprehensive & are Programmable.

The main difference between Manual testing & Automated testing is that Automation testing is best suited for the environment where the Repetitive work is more (e.g., running regression tests, re-entering the same test data, and checking against coding standards). Also, manual testing is best suited for the environment where the requirement changes continuously.

INTRODUCTION TO SELENIUM

Selenium[1] is a portable software testing used for Automation testing It is a framework comprises of many tools used for testing web applications. Selenium provides a record/playback tool for authoring tests without learning a test scripting language (**Selenium IDE**). It has a test domain-specific language (**Selenese**) to write test cases in a number of popular programming languages, including C#, Java, Groovy, Perl, PHP, Python and Ruby. All these test cases written can then be run against most modern web browsers. Selenium can run on any operating system platforms like Windows, Linux, and Macintosh etc. It is open source software that can be down loaded from the website of selenium. Selenium was originally developed by Jason Huggins, who was later joined by other programmers and testers at thought works.

Selenium is a suite of tools for web automation testing. Selenium Suite includes following components: Selenium IDE, Selenium Core, Selenium 1 (known as Selenium RC or Remote Control), Selenium 2 (known as Selenium Web driver), Selenium-Grid

SELENIUM IDE

Selenium IDE is an integrated development environment for Selenium scripts. It is implemented as a Firefox extension, and allows you to record, edit, and debug tests. It was previously known as Selenium Recorder. Selenium IDE is not only recording tool: **it is a complete IDE**. Selenium IDE (Integrated Development Environment) works similar to commercial tools like QTP, Silk Test and Test Partner etc.

In this paper our focus is to perform automation testing of a web application using automation testing tool "Selenium IDE".

STEPS FOR IMPLEMENTATION OF TEST CASES USING SELENIUM

Problem analysis:

It is the process of gathering information to discover the basis of positives & negatives of a proposed system. For example let us consider a problem to develop a website for user registration & login. For this we have designed a website with the name DEMO. Here we have to test the web page of a registration form of a website DEMO. The snapshot for Demo is



Demo Application

Greetings, it is now



🕑 Registration Page - Mozilla Firefox
File Edit View History Bookmarks Iools <u>H</u> elp
🔇 💵 C 🗙 🏠 🛃 http://localhost:8080/Demo/jsp/register.jsp
🔊 Most Visited 🗋 Getting Started 🔊 Latest Headlines 🗋 Customize Links 🗋 Free Hotmail 🗋 Windows Marketplace 🗋 Windows

Please fill up the following fields. All fields are mandatory





Writing test cases: Test case is a document that includes a procedure to perform testing. A test case includes a set of test inputs, execution conditions, and expected output developed for a particular objective, e.g. to check a particular program path or to verify that the specific input will meet with the desired output. There is no prescribed format for writing a test case. , but a test case must include input, expected behavior, expected output. We have a sample test case for first name field of registration page of DEMO website.

Figure 1: Main screen of website DEMO



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TEST CASE OF "FIRST NAME" FOR REGISTRATION PAGE:

Table 1: Test cases written for First Name field of Registration page

S.No	Test Case Id	Object	Test Description	Execution Steps	Expected Behavior
01	First Name	Text box	Checking the functionality	1. Entering the	1. Should show the
			of the "Name" text box.	value as "12345" and	popup error message
				clicking on the "Submit"	"Invalid entry. First Name
				Push button	accepts only characters".
				2. Entering the	After clicking the ok
				value as $"/*-+-"$ and	button in the message the
				"Submit" Duck button	cursor should locus on the
				2 Entering the	2 Should show the
				value as " $12354/*$ +-"	2. Should show the
				and clicking on the	"Invalid entry First Name
				"Submit" Push button	accepts only characters".
				4. Entering the	After clicking the ok
				value as Null Characters	button in the message the
				and clicking on the	cursor should focus on the
				"submit" Push button	textbox.
				5. Entering the	3. Should show the
				value as " " blank	popup error message
				space and clicking on	"Invalid entry. First Name
				the "Submit" Push	accepts only characters".
				button	After clicking the ok
				6. Entering the	button in the message the
				value as a to z and	cursor should focus on the
				Push button	A Should show the
				7 Entering the	nopup error message
				value as "abcd12354/*	"FirstName is a required
				+-" and clicking on the	field" After clicking the ok
				"Submit" Push button	button in the message the
				8. Entering	cursor should focus on the
				Infinite entry and	textbox.
				clicking on the "Submit"	5. Should show the
				Push button	popup error message
					"Invalid entry. First Name
					accepts only characters".
					After clicking the ok
					button in the message the
					cursor should focus on the
					textbox.
					value and cursor should
					focus on the "Last Name"
					textbox
					7. Should show the
					popup error message
					"Invalid entry. First Name
					accepts only characters".
					After clicking the ok
					button in the message the
					cursor should focus on the
					textbox.
					8. Should able to

		accept Characte	up ers	to	"35"

Implementation of test cases using SELENIUM tool

ன Selenium IDE	1.9.1			
<u>File Edit Action</u>	ons <u>O</u> ptions Help			
Base URL https	://accounts.google.com/			~
East Slow		>		\bigcirc
Test Case	Table Source		Now Recording, Click to	o Stop Recording
Untitled	Command	Target	Value	
Runs: 0 Failures: 0	Command Target Value			- Find
	P	•	1	
Log Referen	ce UI-Element Rollup			Info• Clear

Figure 3: Screen of Selenium for recording Test Case.

Selenium IDE is add on feature in Firefox. To activate selenium the following steps are to be followed.

Select tools option from firefox menu bar. Select selenium Ide option from tools popup. The screen shown in figure will appear. It has a recording button on right side of the

screen. If mouse pointer is placed on the button then there is a popup message" NOW RECORDING ,CLICK TO STOP RECORDING". This message shows that selenium ide is ready for recording test cases.

😹 Registration Page	+						
♦ ♦ ♥ Ocalhost:8080/Det	emo/jsp/register.jsp					' ∀ C' 🚺 - (Google
🔊 Most Visited 🗌 Getting Started 🗌 X	X-Ray Goggles						
	· • • • • • • • • • • • • • • • • • • •	📓 Selenium II	DE 1.9	9.1 *			
Please III up the follow	ing helds. All helds are mandatory	<u>File Edit A</u> d	tion	s <u>O</u> ptions Help			
User Degistration		East Slov	tp://l × ⊾	ocalhost:8080/	2		
User Registration		Tert Care	∍ и т III	able Source	<u> </u>		
First Name		Untitled *			_		
Last Name garg				Command	Target /Demo/isp/register.isp	Value	
E-Mail				type	name=lastName	garg	
Password			4				
Age	- -						
Mobile							
Submit							
				Command			- Find
		Runs: (Value			
		Failures: (value	1 7		
		Log Refer	ence	UI-Element Rollun			Infor Clear
				1			
x							

Figure 4: Screen for entering the value of field Last Name & corresponding record in selenium.

(ii) There is a red color recording button on the right side of the selenium environment. Once activating recording mode, then what so ever data is entered in the web page will automatically recorded in the selenium. For example when value of Last Name is entered in the web page, the command corresponding to that is recorded on the selenium IDE with command "type" target "name =LastName" and value "garg". Same value entered on web page.

Registration P	age	+						
÷ > %	localhost:8080/Der	mo/jsp/register.jsp					☆ マ C	Soogle ₹
Most Visited	I 🗌 Getting Started 🗌 🗙	(-Ray Goggles						
Please fit User First Name Last Name E-Mail Password Age Mobile	Il up the follow Registration garg ravi2007@ymail.com Submit	ing fields. All fields are mandatory	Runs: C Log Refer	>E 1.	9.1 * is Options Help localhost:8080/ Icalhost:8080/ Icalhost:8080	Target /Demo/jsp/register.jsp name=lastName name= email name= password	Val gar rav abc	ue g i2007@ymail.com .123
~								

Figure 5: Screen for entering the value of field E-Mail & corresponding record in selenium.

(iii) When value of E-mail is entered in the web page, the command corresponding to that is recorded on the selenium IDE with command "type" target "name =email" and value

"ravi20007@ymail.com". Type command corresponds action taken by user, means typing the data.

Registration P	age	+		- 1				
e > %	localhost:8080/De	mo/jsp/register.jsp					☆ マ C 🚼 - G	oogle
Most Visited	Getting Started 🗌 >	-Ray Goggles						
Please fil	ll up the follow	ing fields. All fields are mandatory	Selenium ID <u>File Edit Act</u> Base URL http://www.actionalized.com	E 1.9.1 * ions <u>O</u> p://localt	ptions Help			
User I	Registration		Fast Slow		>= 11 🥆	0		0
First Name			Test Case	Table	Source			
Last Name	garg]	ondied	Co	mmand	Target	Value	
E-Mail	ravi2007@ymail.com]		typ	e	name=lastName	garg	
Password	•••••]		typ	e	name=email name=password	ravi2007@ym abc123	ail.com
Age]						
Mobile]						
	Submit			4				
				Co	mmand			
			Runs: 0	Tar Val	get		•	Find
			Failures: 0			🔻 🔨		
			Log Refere	nce UI	-Element Ro	llup		Info• Clear
x								

Figure 6: Screen for entering the value of field Password & corresponding record in selenium.



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The value of password is entered in the web page, the command corresponding to that is recorded on the selenium IDE with command "type" target "name =password" and value "abc123". Type command corresponds action taken

by user, means typing the data. "Target" on selenium screen corresponds to field whose value is to be executed during execution of the test case.

론 Registration P	age	+						
$\leftarrow \rightarrow - $	localhost:8080/Der	mo/jsp/register.jsp					☆ ≂ ਟ 🚼 -	Google
Most Visited	Getting Started X	(-Ray Goggles						
Please fil User First Name Last Name E-Mail Password Age Mobile	ll up the follow Registration garg ravi2007@ymail.com 23 Submit	ing fields. All fields are mandatory	Runs: C Log Refer	DE 1	9.1 * s Qptions H localhost:8080/ Delta Source Command open type type type type type type type type	telp 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	P garg ravi2007@y abc123 23	mail.com
x			-					
			C					

Figure 7: Screen for entering the value of field Age & corresponding record in selenium.

The value of "age" is entered in the web page, the command corresponding to that is recorded on the selenium IDE with command "type" target "name =age" and value "23". Type command corresponds action taken by user, means

typing the data. "Target" on selenium screen corresponds to field whose value is to be executed during execution of the test case. "value" is the expected output which should match with the actual value during the run of the test case. Vishawjyoti et al, Journal of Global Research in Computer Science, 3 (12), December 2012, 36-43

			*		,	
Registration P	'age	+		Best .	A	
+ → %	localhost:8080/De	mo/jsp/register.jsp			· 1	7 C Soogle
A Most Visited	I 🗌 Getting Started 🛄 X	(-Ray Goggles				
Please fil	ll up the follow	inσ fields. All fields are mandatory	Selenium IDE	1.9.1 *		
I lease In	ii up tiit ionon	ing notas. The notas are mandatory	Base URL http:	ons <u>Options</u> Heip ://localhost:8080/		
User	Registration		Fast Slow		0	0
First Name			Test Case	Table Source		
Last Name	garg]	Untitled	Command	Target	Value
E-Mail	ravi2007@ymail.com]		type	name=lastName	garg
Password	•••••]		type type	name=email name=password	ravi2007@ymail.com abc123
Age	23]		type type	name=age name=mobile	23 8876549987
Mobile	8876549987]				
	Submit			1 1		
				Command		
			Purer 0	Target		- Find
			Failures: 0	Value		
			Log Referen	ce UI-Element Rollun		Infor Clear
x						
		Figure 8:Screen for entering the value of fiel	d Mobile & co	orresponding reco	rd in selenium.	
Registration F	Page	1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4				
€ → ¶	localhost:808	30/Demo/register.htm			<u>ሰ</u> ፣	r C 🖁 🗧 Google
a Most Visited	d 🗌 Getting Started 🗌 🤉	X-Ray Goggles				
			Selenium IDE	1.9.1 *		
Please fi	ll up the follow	ing fields. All fields are mandatory	<u>File Edit Acti</u>	ons <u>O</u> ptions Help		
	User Registi	ration	Base URL http: East Slow	://localhost:8080/	0	
First Name	g	FirstName is a required Field.	Test Case	Table Source	、	
Last Name	garg]	Untitled *	Command	Target	Value
E-Mail	ravi2007@ymail.com			open type	/Demo/jsp/register.jsp name=lastName	garg
Password	•••••			type type	name=email name=password	ravi2007@ymail.com abc123
Age	23			type type	name=age name=mobile	23 8876549987
Mobile	8876549987			clickAndWait	css=input[type="submit"]	
	Submit				ristivancis a requirea riela	
				Command		
			Runs: 0	Target Value		▼ Find
			Failures: 0		•	
			Log Referen	nce UI-Element Rollup		Info• Clear
×						

Figure 9:Screen for entering the command "verify text present" in selenium .

After entering the data , a screen will appear as shown in figure 9. then user has to stop recording by clicking on red button & to enter a command " verify text present" & target value "FirstName is a required field". This command is used to search the message as user has not entered the data for the field "first Name".

Please fill up the following fields. All fields are mandatory

			Selenium	DE 1	.9.1 *					
	User Registi	ration	Eile Edit Actions Options Help							
First Name		FirstName is a required Field.	Base URL http://localhost:8080/							
T (N		, 1	-ast Sid	—		0				
Last Name	garg		Test Case		Table Source					
E-Mail	ravi2007@ymail.com]	Untitled *		Command	Target	Value			
Password	•••••]			open	/Demo/jsp/register.jsp	0370			
Age	23]		4	type	name=email	ravi2007@ymail.com			
Mobile	8876549987]			type type	name=password name=age	abc123 23			
	Submit				type clickAndWait	name=mobile css=input[type="submit"]	8876549987			
					verifyTextPresent	FirstName is a required Field.				
				4						
					Command					
					Target		✓ Find			
			Runs:	1	Value					
				•]_		▼▼				
			Log Refe [info] Exe [info] Exe [info] Exe [info] Exe	cutir cutir cutir cutir cutir	UI-Element Rollu ng: type name=p ng: type name=a ng: type name=a ng: type name=m ng: clickAndWait o	assword abc123 ge 23 nobile 8876549987 css=input[type="submit"]	Infor Clear			
x			[info] Exe	cutir	ng: verifyTextPrese	ent FirstName is a require	d Field. 🔫			

Figure 10: Screen for successful runnikng of test case no. 4 given in Table 1.

Using selenium, when we run the test case using run button, then all the values of the fields are matched with the target values, whose values are entered through TYPE command. But the values of the message will be matched through Verify text present.

CONCLUSION

Automated Software testing is the best way to increase the effectiveness, efficiency and coverage of software testing and Selenium is a framework comprises of many tools used for testing web applications. With the help of the case study, we analyze and find the testing of a web application using automation testing tool "Selenium IDE". Using this approach, test cases are automatically recorded in background while tester is entering the data in a web application screen and these test cases are reusable and best suited in the Regression Testing environment.

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