Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

A Review on Selenium Web Driver with Python

S. Nyamathulla[1] , Dr. P. Ratnababu[2] , Nazma Sultana Shaik[3], Bhagya Lakshmi. N[4]

[1,3] Assistant Professor, Department of IT, Vignan's Foundation for Science,Technology and Research, Vadlamudi, Guntur
[2] Professor, Department of CSE, Chalapathi Institute of Engineering and Technology, Lam, Guntur
[4]Research Scholar, Department of CSE, VIT AP University, India
nyamath.j@gmai.com, ratnajoyal@gmail.com, Nazma.cs@gmail.com, bhagyait@gmail.com.

ABSTRACT

Software testing is considered as a significant and essential activity in the development of software. Testing is done in order to ensure that software complies with user requirements as defined in the specification of the software requirement specification (SRS). Testing can be automated or manual. Many web based applications are already working for a few days using internet browsers. Using the Selenium web driver will reduce the time expended on testing. Selenium is a web based online testing tool. Testers do not have to learn the selenium web driver tool thoroughly in order to test the sample. Selenium testing is a useful technique for developers and testers to test their code. Selenium supports many popular programming languages such as C#, Java, Python, etc. The aim of this paper is to illustrate the use of the Python Selenium tool for automated testing of web applications.

Keywords: Selenium, Software Testing, Selenium IDE, Test Automation

I INTRODUCTION

Manual testing is performed manually by the testers, while automated testing is done with the aid of the tools. In this case, bugs are corrected to make the software work correctly. Testing can be either manual or automated. There are many features of automated testing in the development of software. Automated testing minimizes the costs and costs of testing to a significant degree. Selenium is convenient for developers and testers; they may test their code based on the frame's screenshot characteristics. It provides an adapted test report for the tester. It is very easy to manage and rebuild the test suite for a new version of the application using this tool. Software testing is a critical task and plays a crucial role in the development of software. Testing can be defined as checking the output against a given set of inputs. The software must determine the right output for a given set of inputs as specified in the software specifications specification. If the software generates correctness, it means that the functionality is correct and the software does not err. On the other side, if the performance is not as according to the specification, this means that the functionality is inaccurate and there are errors.

The time of testing depends on the algorithm, programming language, code line, feature points, external and internal interfaces used [1]. Selenium is a popular, freely available testing tool that is used to test online and real-time applications. Since Selenium was suggested to automate the interface of the web browser, programming scripts may therefore spontaneously perform the same interactions that others have performed manually. For testers who are excellent at coding and who know how and when to incorporate various frameworks, Selenium is ideally suited. Selenium does not test desktop-based applications.

A detailed explanation of the function of the selenium tool[5,14] has been given by Yadav et al. Gojare et al. presented the selenium framework's utility chapter, screenshots generation measures, different kinds of the test suite, customization of test reports, and finally the outcomes of report customization[6].

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

II HISTORY OF SELENIUM

Selenium developed in 2004. The guy behind her looks was Jason Huggins. He is a maker and engineer of selenium. He began his employment when he physically tried to apply himself in thinking works and recognized that he might maximize the use of his time, rather than physically passing through these movements. He began working with Javascript and built a Java scripting library, which can interface with the website and organically test several programs. Selenium Core has become a Javascript library that incorporates all of Selenium Remote Control's (RC) [2] and Selenium IDE characteristics. Selenium was a huge computer, but it also had certain advantages. The protection of Selenium was not so accurate that it was hard to execute a portion of the material in Selenium [3]. Web applications have been shown to grow more efficient and complicated step by step, making the employment of Selenium unbelievably tough for them to maintain. Google developer Simon Stewart began chipping the firm and named it a web driver. Google used Selenium inappropriately; yet, analysts fired at the object's limitations. Simon Stewart was looking for a software test system which would use the local software strategy and a functioning framework to directly communicate with the internet browser. In 2008, the web driver became a key element of the solution to the Selenium restriction [2].

III DIFFERENCES BETWEEN MANUAL AND AUTOMATED TESTING

Whenever a tester begins checking the program manually as an end-user, it is referred to as manual testing. In this test, all test cases are written manually by the tester and one by one must be tested [4]. Manual testing of web applications [3] is a very challenging job. So, automated testing is preferable. The use of the test automation tool is referred to as automated testing. Test cases must be prepared manually, but their execution is automated. Selenium, TestingWhiz, QTP, Test Complete, Ranorex, Sahi, Watir, Tosca Testsuit, Telerik TestStudio, and Katalon Studio are just a few of the most recent automated software testing tools. Whenever there is a large number of test cases, the software can be tested using either of these automated test tools. The distinctions between manual and automated testing are shown in Table 1.

Table1: Difference between manual testing and automated testing

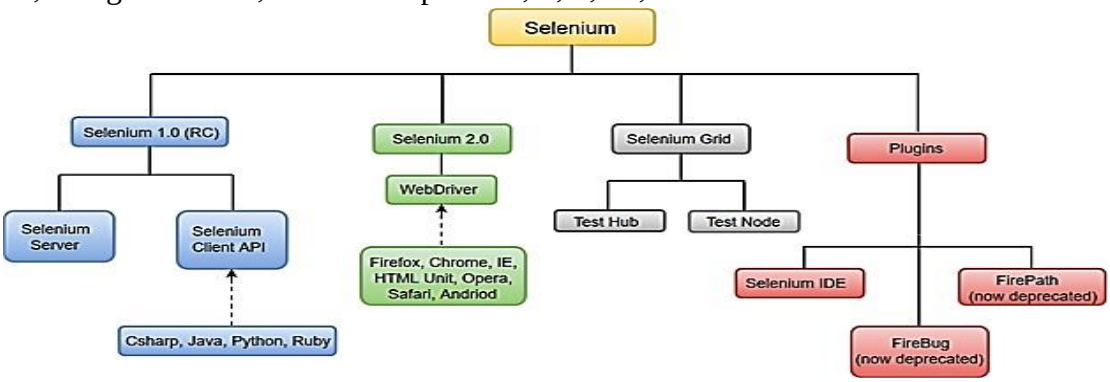
Factors	Manual Testing	Automated Testing
Time	The test case must be written manually and must be checked manually. So it's time-consuming.	Cases may have been written manually, but the execution is automated. So it's time to save.
Speed	Manual testing is very low in speed	Automated speed of testing is high
Cost	Investment in people will be very heavy.	During the initial stage, the cost appears to be more expensive, but later, testing becomes cheaper.
Training	There is no training required.	Training of the testers is important to make them comfortable with the test tools.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

IV INTRODUCTION TO SELENIUM

Selenium is an open-source automated test suit that helps in the automated testing of web applications. It is very similar to Fast Test Pro with the exception that Selenium focuses on the automated testing of web-based software. If testing is conducted using a Selenium instrument, it is referred to as Selenium Testing. The Selenium tool was created by Jason Huggins in 2004[7]. Figure1 shows various components of the Selenium tool. Selenium is a free-ware application that supports different platforms, such as Linux, Windows, Mac, etc. Selenium can be used for browsers such as Google-Chrome, Firefox, and Internet-Explorer. Java, C#, Python, Ruby can be used to write test cases. Selenium is a compatibility-focused open-source tool that also supports different browsers, formats, languages, and frameworks. Irrespective of product and test configuration, Selenium provides the necessary support. The browsers supported by Selenium are as follows:

Firefox: new ESR, previous ESR, current update, one previous release, Safari, Opera Android, Google Chrome, Internet-Explorer 7, 8, 9, 10, and 11 for suitable combinations



of Vista, Windows 7, Windows 8. The Selenium code is written in one of the following

Figure1: Selenium Components

languages such as C#, Java, Perl, PHP, Python, and Ruby, and Java is a favourite language

for Selenium testers. But several testers have begun to prefer these languages because of the ease-to-use features of Python and Ruby.

V ARCHITECTURE OF THE SELENIUM

The architecture of the Selenium Web Tool is defined in Figure 2. It comprises two fundamental components: Client and Selenium Server. A WebDriver API for web page interactions and other application features is included in the client. It also provides the remote class Web Driver which communicates with the remote Selenium server. The Selenium server consists of a server part used to receive requests from the Selenium client's Remote Web Driver class. It also includes the Application Driver API, which may be used for web browser testing on a server machine. The fourth part is the Selenium Grid, which Selenium Server uses via command line parameters for grid features, having a central hub and various nodes and favorite browser abilities. Grid is a method that allows parallel experiments to be carried out on several machines and various browsers, which influences the reduced runtime. Components of Selenium are defined as follows:

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

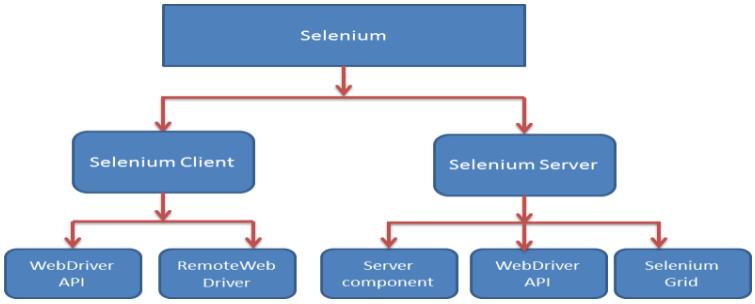
A. Selenium IDE

A Selenium IDE Firefox plug-in that allows the tester to record their actions during the workflow while conducting the test. The test cases can be developed using Selenium's integrated development environment.

B. Selenium Remote Server

The browser carries Selenium requests from the Client-Server Architecture built-in editor.

C. Selenium WebDriver



The precursor to the Selenium Web Driver is the Selenium Remote Server. By sending the commands and retrieving the data, contact with the browser is achieved.

Figure 2: Selenium Architecture

D. Selenium Grid

This is a tool that is used at similar intervals of time to run the test cases parallel across different machines. Selenium Grid will reduce the execution time of test cases.

Table2: Differences between Selenium Remote Server and Web Driver

Selenium Remote Server	**Selenium Web Driver**
The interaction of selenium server between the instructions and the browser.	With the use of web driver, the instructions would be directly sent to the browser.
Less Object Oriented	Purely Object Oriented
Mobile applications cannot be tested	Mobile Applications can be tested.
Slow in performing the test cases	Faster than selenium remote server

VI INTEGRATED DEVELOPMENT ENVIRONMENT (IDE) IN SELENIUM

The IDE is a Firefox plugin that allows testing professionals to record their behavior when monitoring the workflow, they wish to analyze. The primary components of the Selenium IDE are as follows. The Selenium IDE is equipped with a menu bar, a Basic URL text field, a Toolbar, a Test Case pane, a Command View and the Run or failure status test section.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

Figure 3 displays the File menu with the Test Case and Test Suite choices as the redrawn type [9]. Figure 3 illustrates an action menu that enables users to log, play the complete test suite, play the current test case, play or break, play quickly or slowly, set break point and execute the current test phase. The help menu allows testers to evaluate documentation, UI-element documentation, and travel around Selenium sites as shown in Figure 4. Figure 5 In the Edit Menu, copying, pasting, removing, redoing and all processing control operations in the test case will be shown

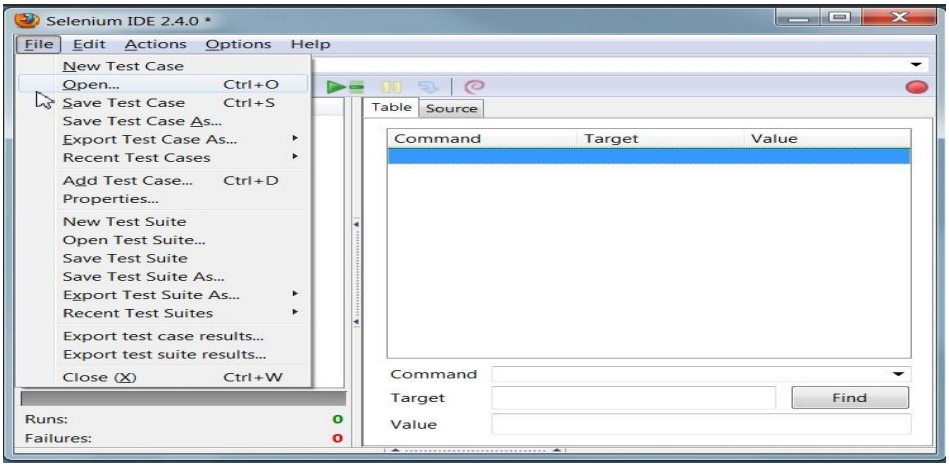


Figure 3 File Menu of Selenium

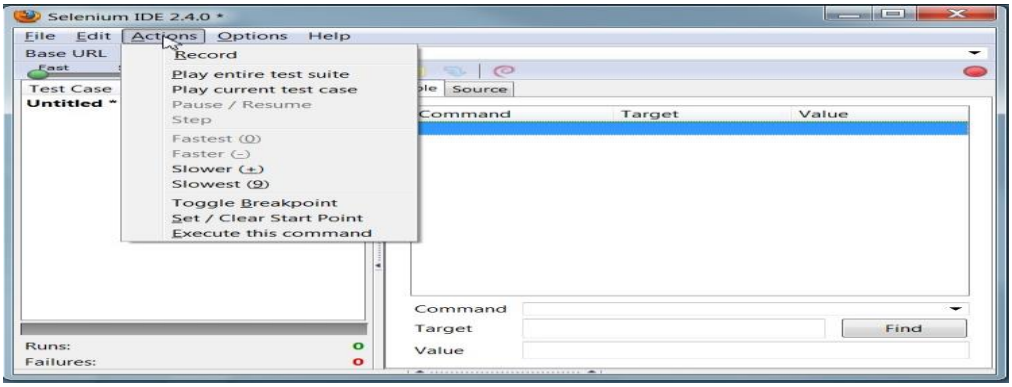


Figure. 4: Action Menu of Selenium

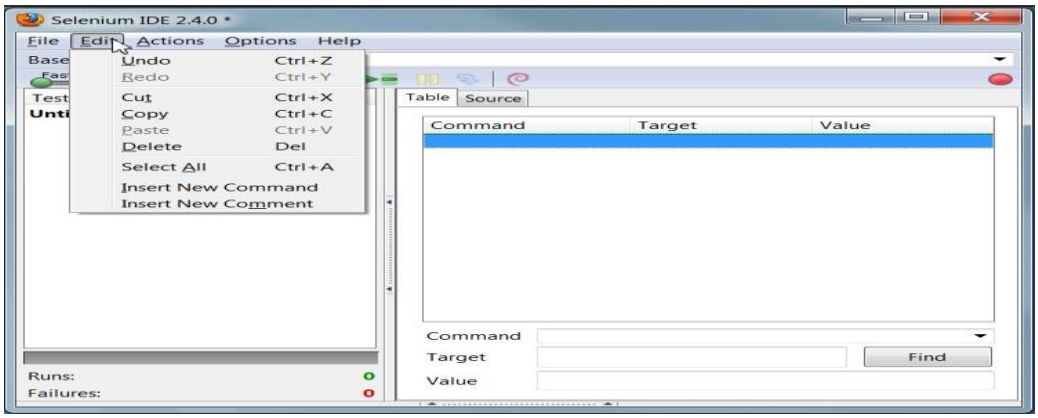


Figure. 5: Edit Menu of Selenium

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

VII TESTING USING SELENIUM

Step 1: Search for selenium IDE first using the Mozilla Firefox search page; Firefox Add-on IDE download. To restart the browser, observe the Selenium IDE of the browser as shown in Fig. 6.
Step 2: The IDE will appear after clicking the Selenium IDE, as seen in Fig 7. The red color circle indicator is used to document the test case. It's in the default recording mode; we may pause and stop it.
Step 3: Generation of Selenium IDE Script
Request to be tested: Open a new tab and input your tested application address, open a text converter, and put any text in the text field. Change the tab in top, lower case, alternative case, phrase case, etc. Recording: This entire procedure is reported in Selenium IDE, as seen in Fig 8. 8. Selenium IDE allows browser interactions in the tester and is thus assigned for a fully specified time schedule as the Selenium IDE script. The Save and Run process for future runs may be stored after a script is developed, as shown in Fig. 9. There is no loss in the current test run. As demonstrated in Figure 9, we may delay the procedure using the control button rapidly and rapidly.

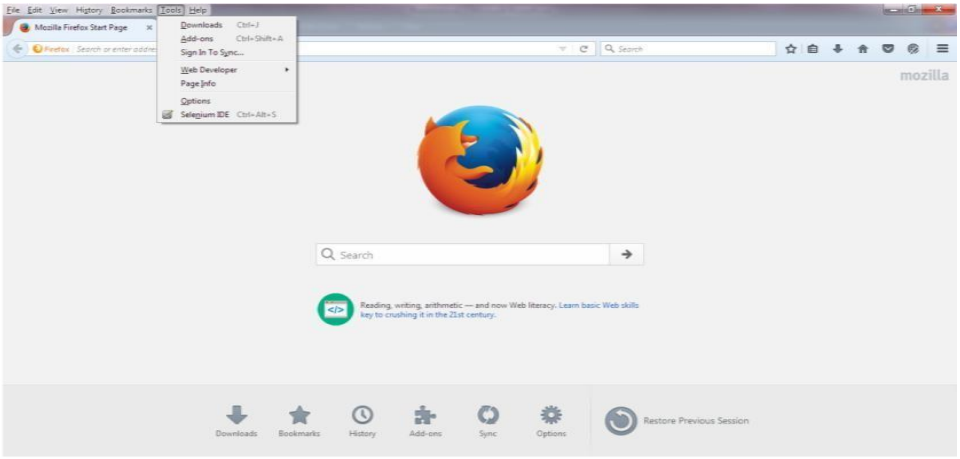


Figure 6: Selenium IDE in Firefox

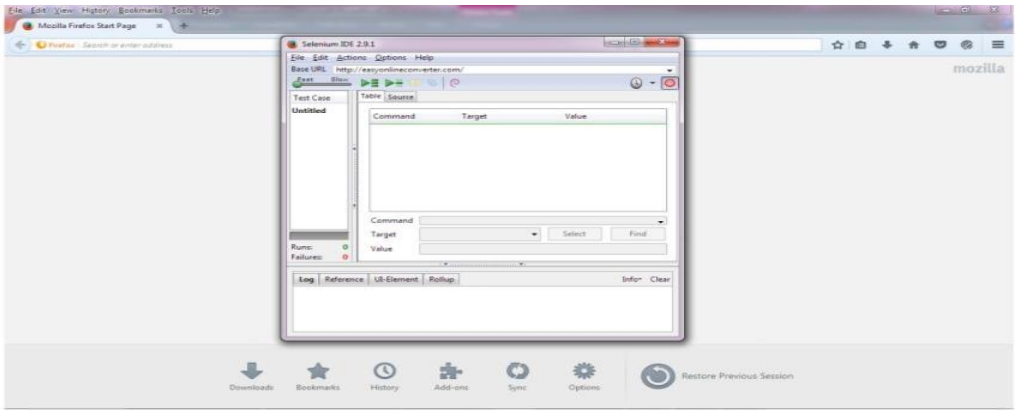


Figure 7: Selenium IDE pops up in Firefox.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

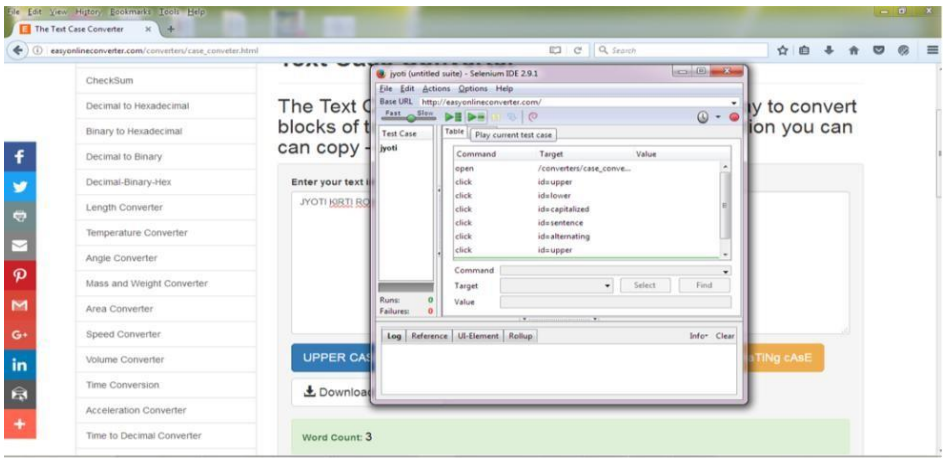


Figure. 8: Recording of the Selenium IDE Script.

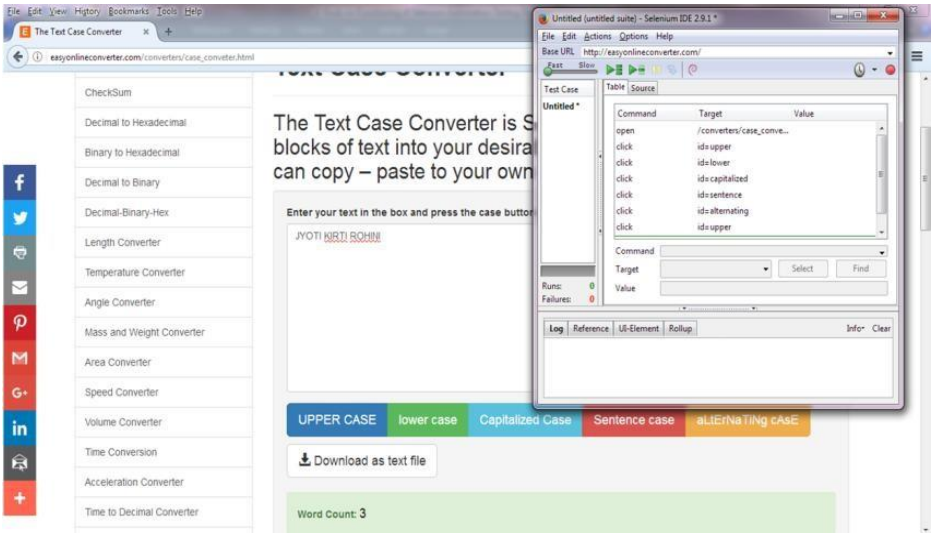


Figure 9: Run the Selenium IDE Script.

VIII JAVA VS PYTHON IN SELENIUM

Java and Python are very popular programming languages. In the beginning, with Selenium, Java was mainly used. But for a few days now, Python has also become the popular Selenium language. Python has a lot of benefits over other programming languages in general. As contrasted with Java, Python is easy to use and more lightweight. Compared to other programming languages, Python is also quite simple. As it uses basic English keywords that are very easy to understand, it is also very user-friendly. Also, its syntax problems are much less complex than other programming languages.

When used with Selenium, Python is even more useful than Java. In contrast to Java programs, Python programs run faster. Java uses conventional braces to begin and end blocks, while Python uses indentations. Java utilizes static typing, while Python uses dynamic typing. In general terms, we can say that Python, compared to Java, is simpler and more compact.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 4, 2021, Pages. 16760 - 16768
Received 20 May 2021; Accepted 3 June 2021.

IX CHALLENGES

Selenium is a freeware testing tool open-source. There are several difficulties with Selenium. One of the biggest drawbacks of the user interface testing tools is that they are slow for many reasons. One method to reduce trial run time is to conduct 1000 tests in 1000 machines in 1000 minutes on a server grid, whereby engineers are more likely to do automated browser user tests in 1000 machines instead of 1000 tests in 1000 minutes. Unfortunately, however, most projects allocate just one, sometimes two, computer for browser testing. Selenium is only supported by web-based apps. Non-web apps are not supported (like Win 32, Java Applet, Java Swing, .Net Client Server, etc.). The sustainability of test cases is a number of concerns when you associate selenium with QTP, Silk Test, Test Partner, and RFT. As Selenium is a freeware tool, there is no direct help if you have difficulties supporting apps. There are various challenges when you have to deal with Win 32 windows and while working with web-based software. Selenium does not allow comparison with Bitmap. You need to rely on resources from other parties for reporting capabilities.

X CONCLUSION

Selenium is a popular open-source library used for web application testing of functional and regression components. It is an open-source tool that facilitates the automation of test cases across different programming languages and browsers. All popular platforms and programming languages are supported by Selenium. Java was the first choice of the testers to use with Selenium before Python. Due to the many benefits of Python, Selenium has also become a very popular language. Easy, usable, more useful, and faster than Java, Python.

REFERENCES

[1] R. S. Pressmen, “Software Engineering, A practitioner’s Approach,” McGraw-Hill Higher Education, 2001.

[2] McMahon, C, “History of a Large Test Automation Project Using Selenium”, 2009.8.

[3] Antawan Holmes and Marc Kellogg, Automating Functional tests using Selenium, Proceedings of AGILE 2006 Conference, 2006.

[4] P VidyaSagar, Paruchuri Ramya, Vemuri Sindhura “Testing using Selenium Web Driver”, IEEE,2017

[5] P. Yadav and A. Kumar, “AN AUTOMATION TESTING USINGSELENIUM TOOL,” International Journal of Emerging Trends & Technology in Computer Science (IJETTCS), vol. 4, Issue 5(2), pp. 68-71,2015.

[6] S. Gojarea, R. Joshi and D. Gaigaware, “Analysis and Design of Selenium WebDriver Automation Testing Framework,” Procedia Computer Science, vol. 50, pp.341 – 346, 2015.

[7] Arjun Satheesh, Monisha Singh “Comparative Study of Open-Source Automated Web Testing Tools: Selenium and Sahi”, Indian Journal of Science and Technology, Vol 10(13) April-2017, ISSN (Online): 0974-5645

[8] Dr. Lokaiah Pullagura, Madhusudhan Rao Dontha, Srinivasarao Kakumanu, "Recognition of Fetal heart diseases through machine learning techniques", Annals of the Romanian Society for Cell Biology., ISSN:1583-6258, Vol. 25, Issue 6, 2021,

Pages. 2601-2615.

[9] Lokaiah Pullagura, Jeeva Katiravan, "Train Delay Prediction Using Machine Learning", International Journal of Engineering and Advanced Technology, vol 9 Issue-2, December 2019.

[10] P. Lokaiah, S. Nyamathulla, M. Kiran kumar, KBV Rama Narasimham, "Performance Evaluation of Different Machine Learning Techniques for Prediction of Diabetes", Journal of Critical Reviews, vol 7, Issue 18, 2020.

[11] Dr. P. Ratna Babu, P. Lokaiah, "An effective noise reduction technique for class imbalance classification", International Journal of Psychosocial Rehabilitation, vol 24, Issue 04, 2020.

[12] Lokaiah Pullagura, Dr. Anil kumar, "Analysis of Train Delay Prediction System based on Hybrid Model", Journal of Advanced Research in Dynamical & Control Systems, Vol. 12, 07-Special Issue, 2020.

[13] Lokaiah Pullagura, Dr. Anil Kumar, "An Effective LSTM Network Model For Accurate Prediction of Delays in Indian Railway Networks", International Journal of Advanced Trends in Computer Science and Engineering, Vol 9, No.4, July-August 2020.

[14] Bhowmik, C., Ghantasala, G. P., & AnuRadha, R. (2021). A Comparison of Various Data Mining Algorithms to Distinguish Mammogram Calcification Using Computer-Aided Testing Tools. In Proceedings of the Second International Conference on Information Management and Machine Intelligence (pp. 537-546). Springer, Singapore.