



W10

Test Analytics, AI/ ML

Wednesday, May 2nd, 2018

1:45 PM

Machine Learning Heralds the End of Selenium

Presented by:

Jason Arbon

Appdiff, Inc.

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Jason Arbon

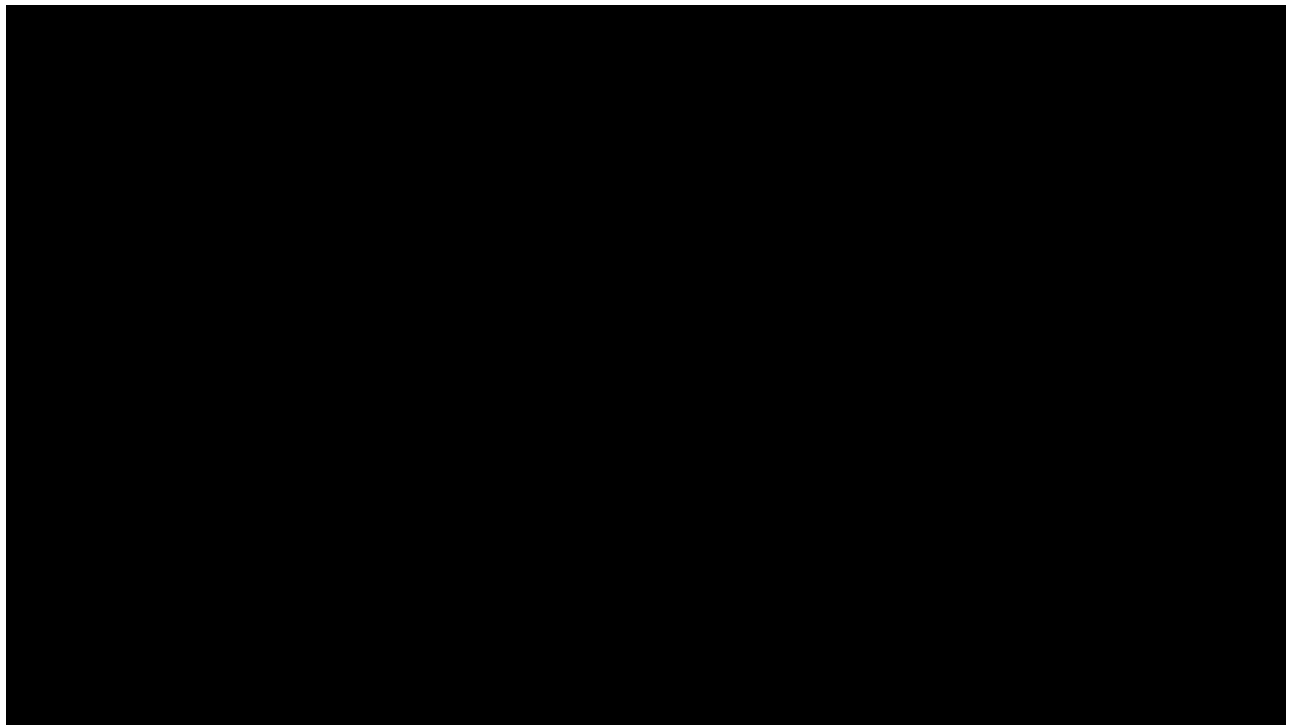
Appdiff, Inc.

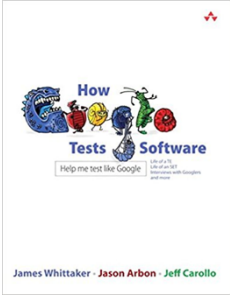

Jason Arbon is the CEO of Appdiff, which is redefining how enterprises develop, test, and ship mobile apps with zero code and zero setup required. He was formerly the director of engineering and product at Applause.com/uTest.com, where he led product strategy to deliver crowdsourced testing via more than 250,000 community members and created the app store data analytics service. Jason previously held engineering leadership roles at Google and Microsoft and coauthored *How Google Tests Software* and *App Quality: Secrets for Agile App Teams*.

Machine Learning Heralds the End of Selenium

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so 2004

4 Big Problems with Selenium / Appium

1

You Have To Code

2

Element Selection

3

Hard-Coded Step Sequencing

4

Little Reuse

Google Testing Blog

My Selenium Tests Aren't Stable!

Tuesday, June 02, 2009

By Simon Stewart

It's a complaint that I've heard too many times to ignore: "My Selenium tests are unstable!" The tests are flaky. Sometimes they work, sometimes they don't. How deeply, deeply frustrating! After the tests have been like this for a while, people start to ignore them, meaning all the hard work and potential value that they could offer a team in catching bugs and regressions is lost. It's a shameful waste, but it doesn't have to be.

Automation breaks just
when you need it.

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Why AI?

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People can deal with
change and the
unexpected.

Test code can't.

How does AI fix all this?

AI works like People

1

You Have To Code

Approach #1

Use Machine Learning to smartly update/repair Selectors when they break.

Approach #2

Use Machine Learning directly instead of Selectors.

Approach #1

Old / Past

Element Identification



The screenshot shows the Selenium IDE interface. A test case named 'sample-test-case-selenium-ide' is displayed with the following commands:

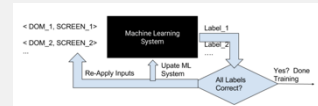
Command	Target	Value
open	/markdowntutorial/tutorial/empasis.html	
click	css=button.primary.button-next	
verifyElement...	id=btn_answer_1-1	The music video for Rihanna's song "Ame...
verifyElement...	id=editor_1-1	
verifyElement...	//body/div[s]	

Below the commands, there is a 'Log' section with a 'Log Reference' tab. It shows the error message: 'Invalid XPath locator, using which no element on the Web Page can be'.

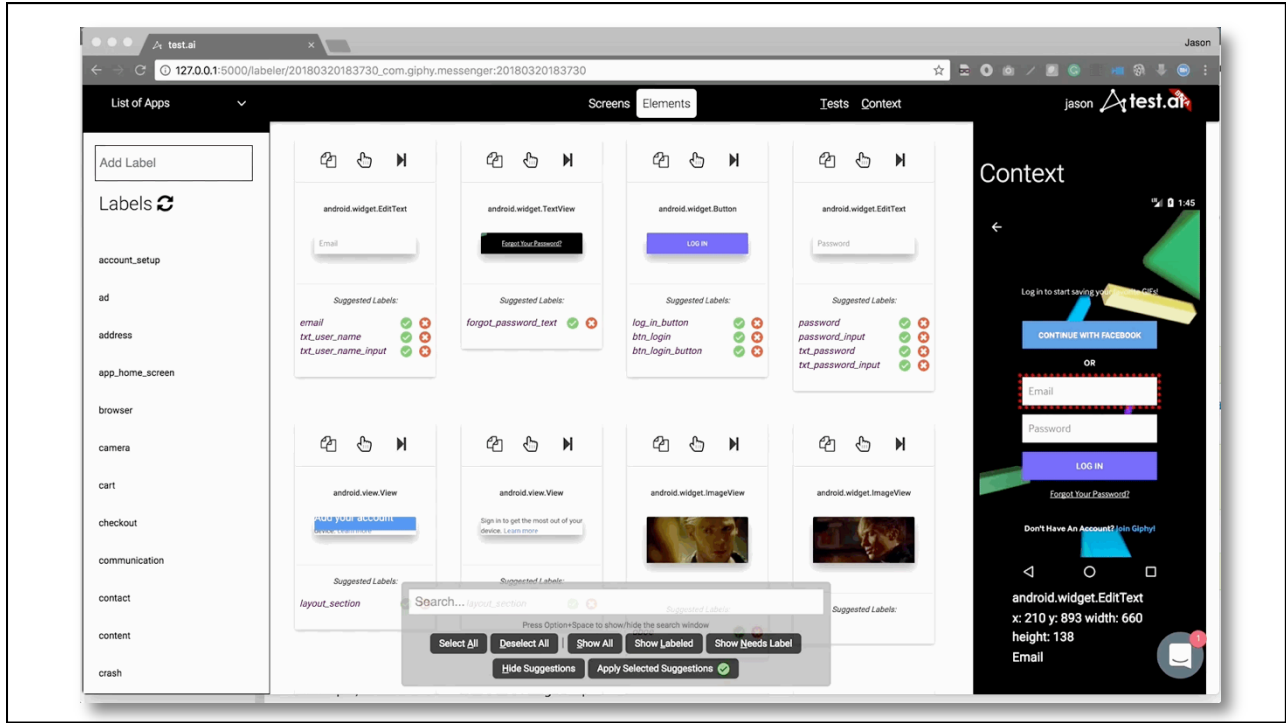
Selenium IDE
 Pain Finding Identifiers
 Have to write code (brittle)

VS

The screenshot shows the test.ai interface. It displays a visual grid of elements from a web page, each with a label and a small thumbnail. A 'Context' sidebar on the right provides additional information about the selected element. The interface is designed for quick visual identification and labeling of elements.



Test.ai
 Auto Labeled
 Quick Visual Custom Labeling

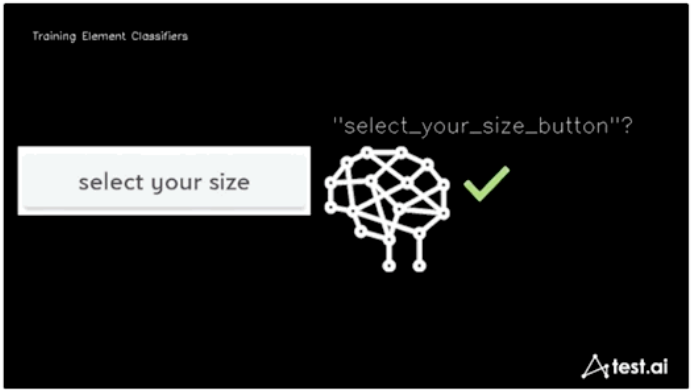


2

Element Selection

Jason Arbon
CEO @ test.ai
6d

Updated 'Test AI' Training video thanks to feedback!




25 Likes · 1 Comment · 1,300 Views

Like Comment Share

▶ 1,300 views of your video

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Android Emulator - Nexus5-5554

OfferUp
buy. sell. simple.

```
test.ai Version:0.8.3
test.ai Version Note:Address user feedback issues. Performance improvements.
Add test case expansion. Add OCR to bot brain.
Refactor file storage layout (~/.carbon -> ~/.test_ai).
Fix verification issues. Labeler syntax searching.

By your command.

CARBON Main Menu:
0. Exit
1. Explore/crawl an app build
2. Start the Labeler UI web server
3. Run regressions on an app build
4. Upload an app build to the cloud
5. Download an app build locally
6. Clean the crawled app builds list

What would you like to do? 1

Path to app file: ~/Downloads/OfferUp.apk
emulator: ## WARNING: /etc/localtime does not point to /usr/share/zoneinfo/, can't determine zoneinfo timezone name
Success
```



3

Hard-Coded Step Sequencing

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Old / Past

Step Sequencing



```

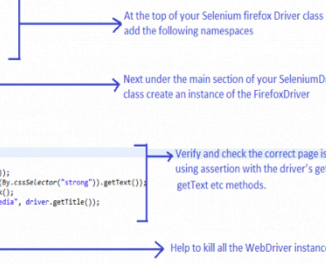
import java.util.regex.Pattern;
import java.util.concurrent.TimeUnit;
import org.junit.*;
import static org.hamcrest.CoreMatchers.*;
import org.openqa.selenium.*;
import org.openqa.selenium.firefox.FirefoxDriver;
import org.openqa.selenium.support.ui.Select;

public class testClass {
    private WebDriver driver;

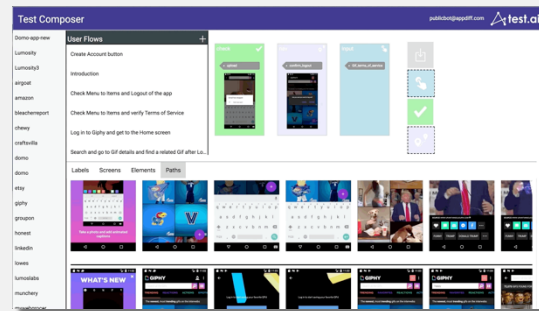
    @Before
    public void setUp() throws Exception {
        driver = new FirefoxDriver();
    }

    @Test
    public void testtestClass() throws Exception {
        driver.get("http://www.wikipedia.org/");
        Assert.assertEquals("wikipedia", driver.getTitle());
        Assert.assertEquals("English", driver.findElement(By.cssSelector("strong")).getText());
        driver.findElement(By.cssSelector("strong")).click();
        Assert.assertEquals("wikipedia, the free encyclopedia", driver.getTitle());
    }

    @After
    public void tearDown() throws Exception {
        driver.quit();
    }
}
    
```



VS



Selenium IDE

Have to code exact steps.
Brittle when app changes.

Test.ai
Familiar Cucumber/Gherkin
Only list labels of interesting
steps and verifications.
Also, GUI Editor

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The screenshot shows the Test Composer interface. At the top, it says "Test Composer" and "publicbot@appdiff.com test.ai". On the left is a sidebar with a list of app names: Domo-app-new, Lumosity, Lumosity3, airgoat, amazon, bleacherreport, chewy, craftsvilla, domo, domo, etsy, giphy, groupon, honest, linkedin, lowes, lumoslabs, munchery, and moonshonor. The main area is titled "User Flows" and contains a list of tasks: "Create Account button", "Introduction", "Check Menu to Items and Logout of the app", "Check Menu to Items and verify Terms of Service", "Log in to Giphy and get to the Home screen", and "Search and go to Gif details and find a related Gif after Lo...". Below this are three flow diagrams labeled "check", "input", and "confirm_login". At the bottom, there are tabs for "Labels", "Screens", "Elements", and "Paths", with "Screens" selected. This tab shows a grid of app screenshots. At the bottom left, there is a "STAR EAST" logo and the text "A TECHWELL EVENT #STAREAST #AI @jarbon @testdotai". At the bottom right is the "test.ai" logo.

The diagram compares traditional test execution with a modern AI-based approach. On the left, under "Old / Past", there is a terminal window showing test logs for actions like "adding and manipulating a dream" and "log out user". In the center, a large "VS" separates the two methods. On the right, under "Test Execution", the "test.ai" logo is shown. A "Graph of App" is a network diagram with nodes for Search, Profile, Home, Video, Cart, and Post. Below it is the "QLearn Brain" matrix:

	State	0	1	2	3	4	5
$R =$	0	-1	-1	-1	0	-1	
	1	-1	-1	0	-1	100	
	2	-1	-1	-1	0	-1	
	3	-1	0	-1	0	-1	
	4	0	-1	-1	0	-1	100
	5	-1	0	-1	-1	0	100

Below the matrix is the "AIT Test Case" section with a code block. To the right, a smartphone displays a Giphy app screen, and next to it is a diagram for "Element and Screen Classification" showing a tree structure with nodes like "App", "body", "head", "title", "ul", "li", and "p". At the bottom right, the text "Step Actions + Verifications" is present. At the bottom left, there is a "STAR EAST" logo and the text "A TECHWELL EVENT #STAREAST #AI @jarbon @testdotai". At the bottom right is the "test.ai" logo.

4

Little Reuse

AIT - Open - Manual Too

Demo AIT Test Definition

Test Name: Remove Beanie Baby from item from cart

Description: Make sure we can remove an item from the shopping cart.

Tags: cart, remove

Step: Search for Beanie Baby

Context: SCREENNAME "Search"

Input: ACTION SEARCH "Beanie Babies"

Step: Add Item

#Step: Add Item Any item will do.

Context: SCREENNAME "Product" and HASWORD "Beanie Baby"

Input: ACTION ADDCART

Step: Remove Item

Context: Cart and HASWORD "Beanie Baby"

Input: Remove Item

Step: Verify Item Removed

Context: SCREENNAME Cart and NOTHASWORD "Beanie Baby"








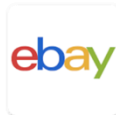




Write Once, Run Cross Platform



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Game-Changer: Write Once, Run on All Similar Apps

 Gyft - Mobile Gift Cards Gyft, Inc. ★★★★★ FREE	 Zoomingo Weekly App Zoomingo Local Sales ★★★★★	 Wanelo Shopping Wanelo ★★★★★	 JackThreads: Men's Fashion JackThreads ★★★★★	 The Hunt - Style & Shopping Style Hunter LLC ★★★★★	 Zappos - Shoe shopping Zappos.com ★★★★★
 Fancy thingd ★★★★★	 eBay - Buy, Sell & Save eBay Mobile ★★★★★	 LivingSocial - Local Deals LivingSocial, Inc. ★★★★★	 Modcloth - Unique Fashion ModCloth ★★★★★	 Groupon - Shop Deals Groupon, Inc. ★★★★★	 Etsy: Handmade & Vintage Etsy, Inc. ★★★★★

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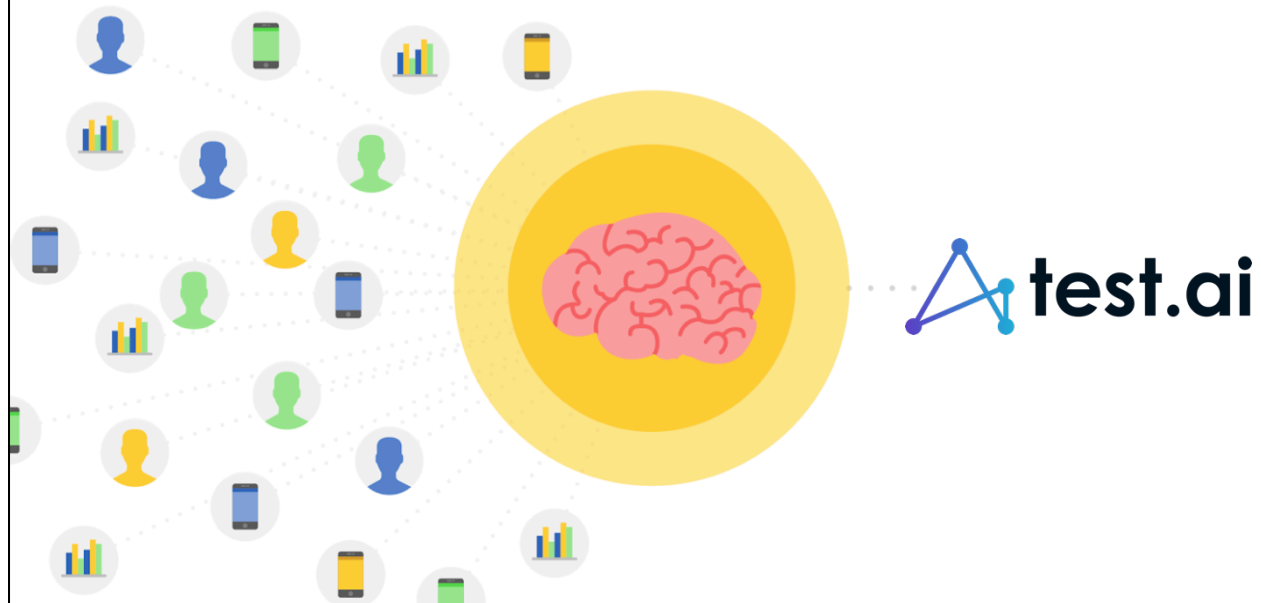


Many Companies Working on AI for Testing

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Harnessing Collective Intelligence For Testing



Leverage AI



The brain of the Digital Automation Intelligence Suite. Eggplant AI achieves intelligent test automation powered by AI, machine learning, and analytics. Advanced bug-hunting algorithms predict

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Approach #1



Record and auto
repair selectors



Approach #2

Visual Differencing Cross
Platform



Approach #3



Record and look for



Anomalies

Approach #4

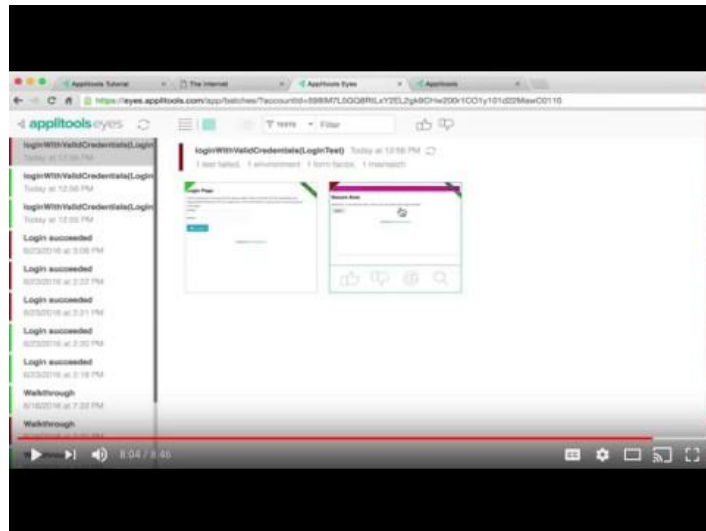
Drag and Drop test  test.ai

creation. AI executes tests
like a human.

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Approach #1

Approach #2



Approach #3



Approach #4

Approach #4



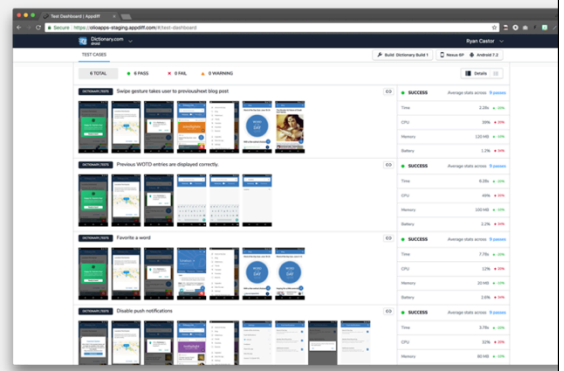
Old / Past

Test Reporting



Chart	See details	Build Number = Package Class: Translated name 1	16	15	14	13	12	11	10	9	8	7	6	5
org.common.sampleb		FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	N/A
SampleATest		FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	N/A
testA		PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	N/A
testB		PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	N/A
testC		FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	N/A
testD		PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	N/A
org.common.sampleb		FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	FAILED	N/A
org.common.samplec		PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	N/A
SampleDTest		PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	N/A
testA		PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	N/A
testB		SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	N/A
testC		SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	SKIPPED	N/A
testD		PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	PASSED	N/A

VS



Selenium IDE
 Many tests flaky/break as app changes
 Simple pass/fail

Test.ai
 Q-Learning test step generation
 Element Classifiers at runtime
 See test steps
 Presentable

Test Dashboard | test.ai
Secure https://testserver.appspot.com/results?build_id=20180314122019_com_twitter_android.20180329004250

TEST CASES

Build 20180314122019_com_twitter_android.20180329004250

5 TOTAL 5 PASS 0 FAIL 0 WARNING Show Hidden

Test Case	Status	Time
View tweets	SUCCESS	4.012 ms
log in	SUCCESS	4.275 ms
view your profile	SUCCESS	4.146 ms
Pin a tweet	SUCCESS	3.986 ms

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Google jmk

Groups

My groups Home My discussions Starred

Results for jmk in Chromium-reviews Search all groups

Sorted by relevance Sort by date

- Implementing webdriver advanced APIs. (issue6657001)
..._fession/sessionId/button_fession/sessionId/doubleclick This task is turned over from Joe (jmk_@google.com) to Tomohiro (ka...@google.com) ... 4/14/11 by In...@google.com - 4 posts by 2 authors - 1 view
- Fix chromedriver for multi-dll build... (issue3167025)
Reviewers: Joe, Description: Fix chromedriver for multi-dll build. R:jmk_@google.com BUO=none TEST=chromedriver pass on multi-dll build Please ... 8/19/10 by vic...@chromium.org - 2 posts by 2 authors - 0 views
- Re: Added the execute command will run javascript on the remote (issue3618018)
On Fri, Oct 22, 2010 at 12:46 AM, Joe Mikhail <jmk_@google.com> wrote: You are correct, I added that code just now. I asked John about it, 10/22/10 by John Grabowski - 10 posts by 4 authors - 1 view
- Re: Adding modifications to allow chrome to navigate to URLs... (issue3338010)
No. Please do not defer it. On Mon, Sep 20, 2010 at 17:46, Joe Mikhail <jmk_@google.com> wrote: I did comment on then duplicate code. Removing ... 9/21/10 by Pawel Hajdan, Jr. - 14 posts by 4 authors - 0 views
- Re: Base implementation of WebDriver for Chrome. This checkin includes... (issue3064012)
Glad to see this making progress. Are you ready for re-review? jg On Tue, Aug 3, 2010 at 10:31 AM, <jmk_@google.com> wrote: Note: I am a ... 8/3/10 by John Grabowski - 7 posts by 4 authors - 0 views
- [chromium-reviews] Re: Implement UI automation on the Mac... (issue1701006)
Thanks for the LGTM, but... does it work? What did you try? jg On Thu, Apr 29, 2010 at 11:57 AM, Joe Mikhail <jmk_@google.com> wrote: 4/29/10 by John Grabowski - 11 posts by 4 authors - 0 views
- Re: Fix for webdriver to use Anonymous Proxy (issue6260041)
On Thu, Feb 3, 2011 at 22:44, Joe Mikhail <jmk_@google.com> wrote: The issue isn't just disable-preconnect, that's just one example. The problem ... 2/3/11 by Pawel Hajdan, Jr. - 8 posts by 3 authors - 1 view
- Re: Implements the commands in webdriver to perform searching of elements on a page. (issue3643002)
On Mon, Dec 8, 2010 at 07:43, Joe Mikhail <jmk_@google.com> wrote: Could you explain which situation are you referring to? The scenario of ... 12/8/10 by Pawel Hajdan, Jr. - 13 posts by 3 authors - 4 views
- Re: Implements the mouse commands for webdriver. (issue4681007)
On Tue, Nov 16, 2010 at 12:14, Joe Mikhail <jmk_@google.com> wrote: Is there also an API for key events? I think so, RVH has also ... 11/16/10 by Pawel Hajdan, Jr. - 10 posts by 3 authors - 0 views
- Re: Python bindings for the remote webdriver protocol... (issue3358016)
Ping. We want you to finish this. What's up? jg On Thu, Sep 9, 2010 at 1:30 PM, Joe Mikhail <jmk_@google.com> wrote: yes, I made the fix on our ... 9/20/10 by John Grabowski - 10 posts by 3 authors - 0 views
- Revert 70015 - Implements the commands in webdriver to perform searching of... (issue5659005)
URL: http://codereview.chromium.org/3643002 TBH-jmk_@google.com Please review this at http://codereview.chromium.org/5659005/ SVN Base: ... 12/22/10 by jmk_@google.com - 1 post by 1 author - 0 views

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