Automated Accessibility Testing: A Literature Review

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http://ihsed.org/program.html
The Web is Evolving

**URI**

http://weather.example.com/oaxaca

**Identifies**

Resource

Oaxaca Weather Report

**Represents**

**Metadata:**

Content-type: application/xhtml+xml

**Data:**

```html
<!DOCTYPE html PUBLIC ""http://www.w3.org/..."
<html xmlns="http://www...<head>
<title>5 Day Forecast for Oaxaca</title>
...
</html>
```

The Web Architecture

Dereference a URI, get a representation

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Image from: https://www.w3.org/TR/webarch/
The Web is Evolving… And using JavaScript!

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Live ticker
https://www.espn.com/

Ads

Embedded Video

Personalization

Image from: https://www.w3.org/TR/webarch/
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Image from: https://www.w3.org/TR/webarch/
Deferred Representations

HTTP GET

http://maps.google.com

Identifies

Delivered to

HTTP Response
(200 OK)

Represents

JavaScript
A Confluence of Research

Accessibility Assessments

- Puppeteer
- W3C WCAG 2.1 Web Content Accessibility Guidelines
- Scripted interactions
- No ability to handle unknown dynamic content
- JavaScript

Web Crawling

- Google
- Heretrix
- Naive inspection of dynamic content
- Scripted interactions for exposing dynamic content

Modeling Web Users

Automated Accessibility Assessments

- <iframe>
- <script>
- ?

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Web Accessibility

- Permanent and temporary conditions

- Standards exist

https://brailleworks.com/508-document-compliance/
Tools Exist

- Screen readers

  ![JAWS](https://help.ensemblevideo.com/hc/article_attachments/360000496286/JAWS-Screen-Reader.png)

  https://www.freedomscientific.com/products/software/jaws/

- Testing suites

  ![Pa11y](https://abstracta.us/wp-content/uploads/2018/07/pa11y-logo.jpg)

  https://pa11y.org/

https://help.ensemblevideo.com/hc/article_attachments/360000496286/JAWS-Screen-Reader.png
Web applications support many interactions...

Increased JavaScript -> increases in missing embedded resources in archives

“Archiving Deferred Representations Using a Two-Tiered Crawling Approach”, *iPRES2015*


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**Web archiving framework for archiving deferred representations**
Web Archiving as Inspiration … For Automated Accessibility Testing

A Confluence of Research

Accessibility Assessments

- Scripts for exposing dynamic content
- Use of JavaScript

Web Crawling

- Naive inspection of dynamic content
- Use of JavaScript

Modeling Web Users

Automated Accessibility Assessments

- Use of <iframe> and <script>
- Integration of dynamic content

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Backups
Testing for JavaScript & Deferred Representations

- **Ripley**  

- **Mugshot**  

- **ActionShot**  

- **Ajax testing and states**  

- **Crawling Ajax**  
Deep Web Research


Web Browsing Process

Deferred representations

HTTP GET Request: URI-R

HTTP 200 OK: Representation

HTTP GET Request for Resource R

HTTP 200 OK Response: R content

Browser renders and displays R

JavaScript in R requests embedded resource X from the server (XMLHttpRequest)

Server returns X as a XMLHttpRequest

R updates its representation
Expanding the crawl frontier

Click events lead to the most descendants

<table>
<thead>
<tr>
<th>Event Type</th>
<th>Percent of URI-Rs</th>
<th>Contribution to $RP_{new}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Deferred</td>
<td>Nondeferred</td>
</tr>
<tr>
<td>click</td>
<td>62.11%</td>
<td>4.29%</td>
</tr>
<tr>
<td>mouseover</td>
<td>25.26%</td>
<td>3.00%</td>
</tr>
<tr>
<td>mousedown</td>
<td>16.84%</td>
<td>1.72%</td>
</tr>
<tr>
<td>blur</td>
<td>14.74%</td>
<td>0.86%</td>
</tr>
<tr>
<td>change</td>
<td>11.58%</td>
<td>2.14%</td>
</tr>
</tbody>
</table>

A web archiving example...

Accessibility Assessments

Automated Accessibility Assessments

Web Crawling

Modeling Web Users

Scripted interactions;
No ability to handle
unknown dynamic
content

Naive
inspection
of dynamic
content

Scripted interactions
for exposing
dynamic content

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Accessibility Assessments

WS: WCAG 2.1 Web Content Accessibility Guidelines

Puppeteer

Scripted interactions; No ability to handle unknown dynamic content

JavaScript

Naive inspection of dynamic content

Web Crawling

Google

HERITRIX

Scripted interactions for exposing dynamic content

Automated Accessibility Assessments

<iframe><script>

Modeling Web Users

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A Confluence of Research

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