Social Accessibility

Jeffrey P. Bigham
Ph.D. Candidate, Computer Science & Engineering

University of Washington
Seattle, Washington, USA
webinsight.cs.washington.edu
Accessible Content Production

Accessibility Standards
- WCAG
- Section 508
- ...
Independent Accessibility
History: JAWS Scripts

Adapts Screen Readers to work with Existing Applications

```
alien()
{
    // they will be 2x2 in size
    width = 2;
    height = 2;

    // lets lay them out across the top of the map
    for int i = 0 to 5 by 1
    {
        alien[i]'s location = make point( mainLevel's width/5 *
            i , mainLevel's height);
    }

    // we will set their AI to dumb_ai,
    // a movement class we will define
    ai = dumb_ai;
}
```
Outline

- Introduction

- Motivating Studies
  Can we rely only on developers?

- Scripting Accessibility

- End User Tools
Blind vs Sighted User Study

- 10 Blind and 10 Sighted (Ages 18-63)
- Observed for One Week
- Either Internet Explorer or Firefox
- Blind participants used JAWS

- 21,442 Pages
- 4,204,904 Events

Geographic Diversity of Users
A Proxy-Based System

- Used UsaProxy\(^1\)

Using Google

<table>
<thead>
<tr>
<th>Task</th>
<th>Blind</th>
<th>Sighted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entering Query</td>
<td>74.6 sec. (p &lt; 0.01)</td>
<td>34.5 sec.</td>
</tr>
<tr>
<td>Selecting Result</td>
<td>155.1 sec. (p &lt; 0.0001)</td>
<td>34.8 sec.</td>
</tr>
</tbody>
</table>

Motivation

- Task
- Blind
- Sighted
- Entering Query
  - 74.6 sec. (p < 0.01)
  - 34.5 sec.
- Selecting Result
  - 155.1 sec. (p < 0.0001)
  - 34.8 sec.
Images & Appropriate Alt. Text

- Influenced Clicking Behavior:

<table>
<thead>
<tr>
<th>Appropriate Alternative Text</th>
<th>Blind</th>
<th>Sighted</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of Images Assigned</td>
<td>72.2%</td>
<td>34.0%</td>
</tr>
</tbody>
</table>

(p < 0.01)

% of Images Assigned Appropriate Alternative Text on Visited Pages
Dynamic Content
- 15.0x fewer pages viewed \( (p < 0.07) \)
- 19.3x fewer interactions with dynamic content \( (p < 0.01) \)

XMLHttpRequest
- 7.5x fewer \( (p < 0.05) \)

Flash
- 44.1% were ads
- Blind participants used for sound content
- Only 5.6% were main content
Non-Visual Access to Images

- Images cannot be read
- W3C accessibility standards
  - “Provide a text equivalent for every non-text element”
- What if no alternative text?
  - Nothing
  - Filename (060315_banner_253x100.gif)
  - Link address (http://www.cs.washington.edu)
Yale ranked among "Most Global Universities"

Newsweek magazine features an essay by President Richard C. Levin on how universities are expanding their global outreach. The Newsweek issue included a list of "The World's Most Global Universities," which ranked Yale in third place. Click here for more.

Margaret G. Warner '71 selected as New Alumni Fellow

PBS News Anchor Margaret Warner '71 has been elected as the New Alumni Fellow to the Yale Corporation. Warner's career in journalism spans more than three decades, during which she has covered important national and international issues for some of the country's leading news organizations. She has also served higher education institutions in several volunteer capacities. Click here for more.

Yale scientist honored in new stamp

Josiah Willard Gibbs is among four historic scientists honored in a new series of stamps from the U.S. Postal Service. Click here for more.

Alumnus wins 2006 Nobel Prize for Economics

Edmund S. Phelps '56 MA, '59 Ph.D., won the 2006 Nobel Prize in Economic Sciences on Monday for elucidating the relationship between unemployment and inflation. The Royal Swedish Academy of Sciences said Phelps' work has "deepened our understanding of the relation between short-run and long-run effects of economic policy." Click here for more.

Association of Yale Alumni Names Yale Medalists

The Yale Medal is the highest award presented by the Association of Yale Alumni, conferred to honor outstanding individual service to the University. This year's recipients are Philip G. Boyle '71; Hon. Howard M. Holtzmann '42, '47 JD; Frederick R. Mayer '50; Howard H. Newman '69, '69 MA; and Deborah Rose '72, '77 MPH, '89 PhD. Click here for more.
Yale ranked among "Most Global Universities"

Newsweek magazine features an essay by President Richard C. Levin on how universities are expanding their global outreach. The Newsweek issue included a list of "The World’s Most Global Universities," which ranked Yale in third place. Click here for more.

Mallory S. Wenzel, PhD

Fellow at the Yale Center on Policing Women’s careers in journalism spans more than three decades, during which she has covered important national and international issues for some of the country’s leading news organizations. She has also served higher education institutions in several volunteer capacities. Click here for more.

Yale scientist honored in new stamp

Nineteenth-century Yale research Josiah Willard Gibbs, who received the nation's first Ph.D. in engineering, is among four historic scientists honored in a new series of stamps from the U.S. Postal Service. Click here for more.

Alumni directory now available

Alumni can now access the Alumni directory online. Click here for more.

Alumna Wins 2006 Nobel Prize for Economics

Edmund S. Phelps ’56 MA, ’59 Ph.D., won the 2006 Nobel Prize in Economic Sciences on Monday for elucidating the relationship between unemployment and inflation. The Royal Swedish Academy of Sciences said Phelps’ work has "deepened our understanding of the relation between short-run and long-run economic policy." Click here for more.

Wallace E. Harrison ’43, MA, PhD

Standing at the top of the stairs, he turned to face the crowd of onlookers. "I'm here to say goodbye," he said, "and to thank you for all your support over the years." Click here for more.

Yale Alumni Association of Yale Alumni Hawley Medalists

The Hawley Medal is the highest award presented by the Association of Yale Alumni, conferred to honor outstanding individual service to the University.

This year’s recipients are Philip G. Boyle ’71; Hon. Howard M. Holtzman ’42, ’47 JD; Frederick R. Mayer ’50; Howard H. Newman ’59, ’69 MA; and Deborah Rose ’72, ’77 MPH, ’89 PhD. Click here for more.

Olympian swimmer donates gold medal to Yale

Former captain Mike Austin ’64, donated his gold medal to Yale in a special ceremony held in the Payne Whitney Gymnasium. "Yale is where my gold medal belongs," said Austin. Austin won the gold medal in the 1964 Olympics in Tokyo as a member of the U.S. 400-
How large is the problem?
Web Studies: All Images !=

- Significant images need alternative text
  - Informative
  - `alt`, `title`, and `longdesc` HTML attributes
    
    ```html
    <img src="graph.gif" alt="sales graph" title="sales graph" longdesc="sales_descrip.txt">
    ```

- Insignificant images need empty alt text

- Automatic Determination?
  - More than one color AND both dimensions > 10 pixels
  - An associated action (clickable, etc.)
Web Studies

- University of Washington CSE Department Traffic
  - ~1 week
  - 11,989,898 images.
  - 40.8% significant
  - 63.2% alt text

Significant images with alternative text.

Significant images without alternative text.
### Study Results

<table>
<thead>
<tr>
<th>Group</th>
<th>Significant</th>
<th>Pages &gt; 90%</th>
<th>Pages</th>
<th>Images</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-traffic</td>
<td>39.6%</td>
<td>21.8%</td>
<td>500</td>
<td>32913</td>
</tr>
<tr>
<td>Computer Science</td>
<td>52.5%</td>
<td>27.0%</td>
<td>158</td>
<td>4233</td>
</tr>
<tr>
<td>Universities</td>
<td>61.5%</td>
<td>51.5%</td>
<td>100</td>
<td>3910</td>
</tr>
<tr>
<td>U.S. Federal Agencies</td>
<td>74.8%</td>
<td>55.9%</td>
<td>137</td>
<td>5902</td>
</tr>
<tr>
<td>U.S. States</td>
<td>82.5%</td>
<td>52.9%</td>
<td>51</td>
<td>2707</td>
</tr>
</tbody>
</table>

Percentage of significant images provided alternative text, pages with over 90% of significant images provided alternative text, number of web sites in group, and number of images examined.
Outline

- Introduction
- Accessibility
- Scripting Accessibility
  - Coding Accessibility
- End User Tools
Greasemonkey\(^1\)  
Firefox Extension

- Allows users to inject custom Javascript
  - Customize look and feel
  - Combine data from multiple sites
  - Alter pages to make them more accessible

<table>
<thead>
<tr>
<th>Digital SLR</th>
<th>Digital Cameras</th>
<th>Camcorders</th>
<th>Printers</th>
<th>Electronics</th>
<th>Binoculars</th>
<th>Memory</th>
<th>Batteries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Search</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**New to Google Checkout? Try it and SAVE $10.**

**FREE SHIPPING on Most Photo Items – Click for Details.**

**& NO SALES TAX**

---

**FEATURED DIGITAL CAMERAS AND ELECTRONICS**

**Nikon**
- D40x DSLR Camera w/Nikon 18-55mm F/3.5-5.6G ED AF-S DX Lens
  - New For 2007!
  - Our Price: **$799.99**

**Canon**
- PowerShot A550 Digital Camera
  - All New 2007 Model!
  - Our Price: **$199.99**

**Nikon**
- D40 DSLR Camera w/18-55mm f/3.5-5.6G ED AF-S DX Zoom-Nikkor lens
  - Our Price: **$599.99**

**Olympus**
- Evolt E-500 DSLR Camera w/Two Lens Kit (14-45mm / 40-150mm)
  - Our Price: **$699.99**

---

**Digital Camera Accessories**

- Film Cameras & Accessories
- Film Camera Lenses
- Digital SLR
- Compact Cameras
- Digital Picture Frames

---

**Mother’s Day Gifts**
- Top 10 Sellers
- Product Finder
- Click for Live Help
- Clearance

**HACKER SAFE**

- CLICK DAILY 3-WAY

---

**SHOP**

- Digital Cameras & Accessories
- Digital Cameras (All)
- Digital SLR
- Compact Cameras
- Digital Picture Frames

---

**FREE when you sign up for Google Checkout for the First Time.**

Shop for the Perfect Mother’s Day Gift. Visit our Gift Center for the latest in Digital Photography & Electronics. 🎁

---

**New to Google Checkout? Try it and SAVE $10.**

**FREE SHIPPING on Most Photo Items – Click for Details.**

**& NO SALES TAX**

---

**FEATURED DIGITAL CAMERAS AND ELECTRONICS**

**Nikon**
- D40x DSLR Camera w/Nikon 18-55mm F/3.5-5.6G ED AF-S DX Lens
  - New For 2007!
  - Our Price: **$799.99**

**Canon**
- PowerShot A550 Digital Camera
  - All New 2007 Model!
  - Our Price: **$199.99**

**Nikon**
- D40 DSLR Camera w/18-55mm f/3.5-5.6G ED AF-S DX Zoom-Nikkor lens
  - Our Price: **$599.99**

**Olympus**
- Evolt E-500 DSLR Camera w/Two Lens Kit (14-45mm / 40-150mm)
  - Our Price: **$699.99**

---

**Digital Camera Accessories**

- Film Cameras & Accessories
- Film Camera Lenses
- Digital SLR
- Compact Cameras
- Digital Picture Frames

---

**Mother’s Day Gifts**
- Top 10 Sellers
- Product Finder
- Click for Live Help
- Clearance

**HACKER SAFE**

- CLICK DAILY 3-WAY

---

**SHOP**

- Digital Cameras & Accessories
- Digital Cameras (All)
- Digital SLR
- Compact Cameras
- Digital Picture Frames

---

**FREE when you sign up for Google Checkout for the First Time.**

Shop for the Perfect Mother’s Day Gift. Visit our Gift Center for the latest in Digital Photography & Electronics. 🎁

---

**New to Google Checkout? Try it and SAVE $10.**

**FREE SHIPPING on Most Photo Items – Click for Details.**

**& NO SALES TAX**
Menu: No Style

- Inefficient to Access
FEATURED DIGITAL CAMERAS AND ELECTRONICS

**Canon**
PowerShot A550 Digital Camera

*All New 2007 Model!*
Our Price: **$199.99**

**Nikon**
D40 DSLR Camera w/18-55mm f/3.5-5.6G ED II AF-S DX Zoom-Nikkor lens

Our Price: **$599.99**

**Olympus**
Evolt E-500 DSLR Camera w/Two Lens Kit (14-45mm / 40-150mm)

Our Price: **$699.99**
FEATURED DIGITAL CAMERAS AND ELECTRONICS

Canon
PowerShot A550 Digital Camera
All New 2007 Model!
Our Price: $199.99

Nikon
D40 DSLR Camera w/18-55mm f/3.5-5.6G ED II AF-S DX Zoom-Nikkor lens
Our Price: $599.99

Olympus
Evolt E-500 DSLR Camera w/Two Lens Kit (14-45mm / 40-150mm)
Our Price: $699.99
### Xbox 360 Games

#### Atari Test Drive Unlimited X360
- **Mfr #**: 26691
- **Our Stock #**: EP5435755

#### Capcom Dead Rising X360
- **Mfr #**: 33001
- **Our Stock #**: EP5436431

#### Eidos Just Cause X360
- **Mfr #**: 20052
- **Our Stock #**: EP5435377

#### Electronic Arts Madden NFL 07 X360
- **Mfr #**: 15231
- **Our Stock #**: EP5435213

---

**Sort by Product Name**

**Sort By Price**

**Our Price**: $38.89

**Our Price**: $38.89

**Our Price**: $47.75

**Our Price**: $49.99
AxsJAX

- http://code.google.com/p/google-axsjax/
CAPTCHAs

- Distorted characters
- Difficult for computers
- Humans can solve

- Rely on visual perception
- Some groups are excluded

1. Completely Automated Public Turing Test to Tell Computers and Humans Apart
Audio CAPTCHAAs

- Same idea but with spoken characters

- CAPTCHA 1 ➔ S3CL92G4
- CAPTCHA 2 ➔ 1778223485
Study Setup

- Collected 10 Examples from 10 Web Sites
  - Presented 1 from each site in random order

- 162 Participants
  - 89 Blind Web Users
    - Solved Audio CAPTCHAs
  - 73 Sighted Web Users
    - Solved Audio CAPTCHAs
    - Solved Visual CAPTCHAs
Visual CAPTCHAs Significantly Faster than Audio CAPTCHAs
Percentage of CAPTCHAs answered correctly per attempt

- 1st try
- 2nd try
- 3rd try
- never

- blind-audio
- sighted-audio
- sighted-visual
Interface to Solving CAPTCHAs

Security Check

To prevent registration fraud, type the code in the image.

*Image: [Image]

Can't see this image?

*Code in Image: [Input Field]

Submit  Cancel
If the file plays in another program, remember the numbers, return to this page, and then type them in the field below.
Compared 2 Interfaces

Original Interface
- Separate Play Button
- Separate Answer Field

Unified Interface
- Keyboard Controls:
  - Rewind 1 Second
  - Play/Pause
  - Forward 1 Second
  - All other keys as normal.
Results

- 59% Higher Success Rate \((p < .0001)\)

- Integrated Into Existing CAPTCHAs
  - Greasemonkey Script Adds to Existing Pages

- Lesson Applies to
  - New CAPTCHAs
  - New Techniques
Outline

- Introduction
- Motivating Studies
- Scripting Accessibility

End User Tools
Do you need to program to improve content?
Accessmonkey

Scripting Accessibility

- Preserves Greasemonkey Features
- Multiple browsers and platforms
- Framework for users and developers

- Web Developers
  - Separate Interface
  - Edit and save
Accessmonkey Framework

- Web developers
  - Suggestions
- Web users
  - Automatic
Example

- Making a Dynamic Menu Accessible
  - Adding keyboard shortcuts
  - Adding ARIA

- Done before screen readers supported it
Writing Scripts

- Who can write scripts?
  - Anyone who can write Javascript
  - Those who would directly benefit (and friends)
  - Web Developers

- Developer interface
  - Implementations provide area
  - Allows users to toggle user/dev mode
*2007 Alumni Fellow Ballot*

The ballots for this year's election of an Alumni Fellow to the Yale Corporation have been mailed and mailed out as of April 2 and all electors should have received their ballots. All graduates of the first degree of five or more years' standing and all persons who have been admitted to any degree higher than the first in the University, whether honorary or in course, may vote. Eligible electors who did not receive an official ballot may make written application to the Secretary of the University for a replacement. Information regarding the election procedure is available on the Secretary's website.

You may also obtain information on the candidates, Sandy Warner '68 B.A. and Mimi Gardner Gates '81 Ph.D., by clicking on the pdf available on the election voting website. The deadline for casting your ballot is 11:59 PM, EDT, on May 27, 2007.

*Yale News*

*Fraudulent alumni contact solicitation*

We have received reports of fraudulent letters sent to alumni asking for updated contact information. The letter contains an email address of alumni@popmail.com and is fraudulent. If you receive an email or letter of this kind, do not respond as it is not authorized by Yale. Please contact us at AYA@yale.edu if you have questions.

*Yale Boasts Five Rhodes Scholars*

Four Yale College seniors and one student in the Yale Graduate School are among the 32 Americans who will study at Oxford University next year as Rhodes Scholars. The four members of the Class of 2007 selected as Rhodes Scholars are Avi Feller, Whitney Harmon-Smith, Maya Shankar and Ania P. Sinha. Doctoral student Aaron F. Mertz is Yale's fifth Rhodes recipient. Click here for more.

*Alumnus Wins 2006 Nobel Prize for Economics*

Edmund S. Phelps '56 MA, '59 Ph.D., won the 2006 Nobel Prize in Economic Sciences on Monday for elucidating the relationship between unemployment and inflation. The Royal Swedish...*
2007 Alumni Fellow Ballot
The ballots for this year’s election of an Alumni Fellow to the Yale Corporation have been emailed and mailed out as of April 2 and all electors should have received their ballots. All graduates of the first degree of five or more years' standing and all persons who have been admitted to any degree higher than the first in the University, whether honorary or in course, may vote. Eligible electors who did not receive an official ballot may make written application to the Secretary of the University for a replacement. Information regarding the election procedure is available on the Secretary’s website.

You may also obtain information on the candidates, Sandy Werner '68 B.A. and Mimi Gardner Gates '81 Ph.D., by clicking on the pdf available on the election voting website. The deadline for casting your ballot is 11:59 PM, EDT, on May 27, 2007.

Fraudulent alumni contact solicitation
We have received reports of fraudulent letters sent to alumni asking for updated contact information. The letter contains an email address of alumni@popmail.com and is fraudulent. If you receive an email or letter of this kind, do not respond as it is not authorized by Yale. Please contact us at AYA@yale.edu if you have questions.

Yale Boasts Five Rhodes Scholars
Four Yale College seniors and one student in the Yale Graduate School are among the 32 Americans who will study at Oxford University next year as Rhodes Scholars. The four members of the Class of 2007 selected as Rhodes Scholars are Avi Feller, Whitney Haring-Smith, Maya Shankar and Ania P. Sinhaivan. Doctoral student Aaron F. Mertz is Yale's fifth Rhodes recipient. Click here for more.

Alumnus Wins 2006 Nobel Prize for Economics
Edmund S. Phelps '56 MA, '59 Ph.D., won the 2006 Nobel Prize in Economic Sciences on Monday for elucidating the relationship between unemployment and inflation. The Royal Swedish
More than Manual Annotation

- Removes dependence on Web Developers
  - Users independently improve content
- Collaborative Accessibility
- Harnessing Human Power
  - Amazon Mechanical Turk\(^1\)
  - ESP Game\(^2\)

Next Steps

- WebInSight Access Tools
  - Script Writing
  - Script Discovery
Easier Script Writing

- Existing tools
  - Programming-by-Demonstration
    - Web Macros\(^1\), WebVCR\(^2\), PLOW\(^3\), etc.
    - Platypus
  - Not targeted for improving accessibility
  - Visual interfaces

Script Discovery

- Online Repository
  - User-contributed scripts

- Discover As-You-Go
  - Finds Applicable Scripts as a User Browses
  - Find even if you can’t write

- Challenges
  - Usability
  - Maintaining Security
IBM Social Accessibility

http://jp.youtube.com/watch?v=iRB72rXXyXo
WebVisum

- Social Tagging
- Solves CAPTCHAs

http://www.webvisum.com/
Conclusion

- Make Accessible Content
- But, it’s important to have an alternative
- Combine Incentive with Ability to Change
Contributors:

Our supporters:
National Science Foundation Grant IIS-0415273
A Boeing Professorship

Thanks to:
T.V. Raman, Sangyun Hahn, and Lindsay Yazzolino