



Social Accessibility

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

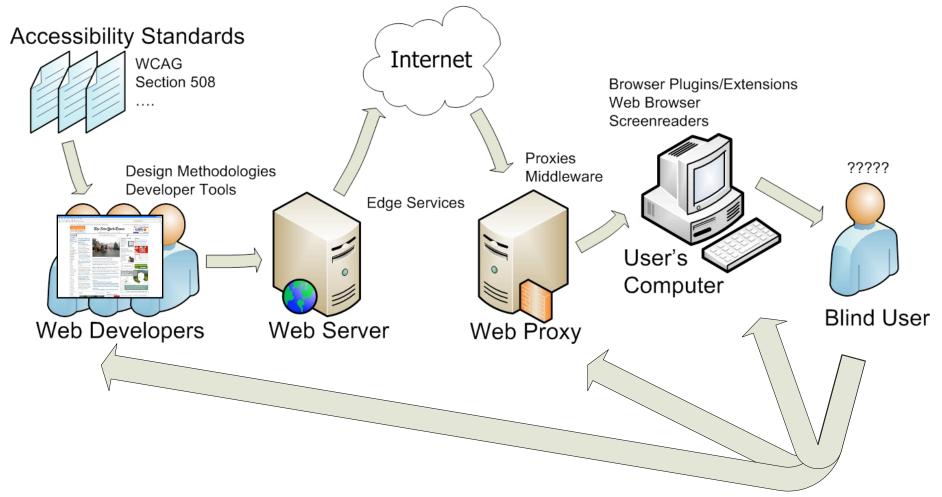


University of Washington Seattle, Washington, USA webinsight.cs.washington.edu

Introduction



Accessible Content Production





Introduction

Independent Accessibility





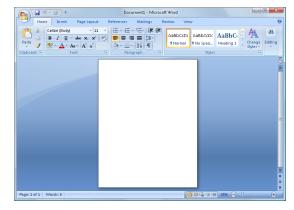


Introduction



History: JAWS Scripts

Adapts Screen Readers to work with Existing Applications





Outline

Introduction

- Motivating Studies Can we rely only on developers?
- Scripting Accessibility
- End User Tools



Blind vs Sighted User Study

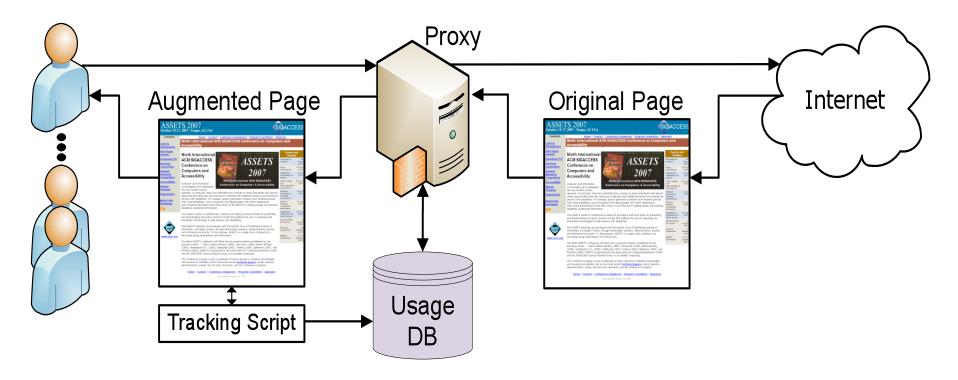
- 10 Blind and 10 Sighted (Ages 18-63)
- Observed for One Week
- Either Internet Explorer or Firefox
- Blind participants used JAWS
- 21,442 Pages
- 4,204,904 Events



Geographic Diversity of Users



A Proxy-Based System



Used UsaProxy¹

[1] Richard Atterer *et al.* Knowing the User's Every Move - User Activity Tracking for Website Usability Evaluation and Implicit Interaction. WWW 2007



Using Google

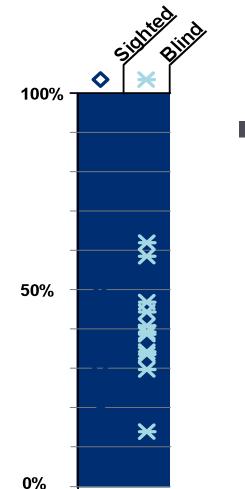
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| Selecting Result | 155.1 sec. (p < 0.0001) | 34.8 sec. |

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Images & Appropriate Alt. Text



Influenced Clicking Behavior:

Appropriate Alternative Text

| Blind | Sighted |
|-------|------------|
| 72.2% | 34.0% |
| | (p < 0.01) |

% of Images Assigned Appropriate Alternative Text on Visited Pages

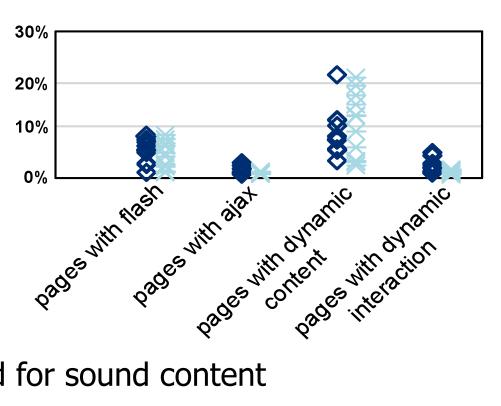


Dynamic Content

- □ 15.0x fewer pages viewed (p < 0.07)
- □ 19.3x fewer interactions with dynamic content (p < 0.01)



□ 7.5x fewer (p < 0.05)



Flash

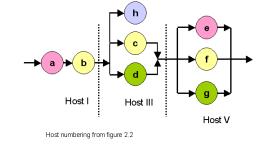
- 44.1% were ads
- □ Blind participants used for sound content
- Only 5.6% were main content





Non-Visual Access to Images

Images cannot be read

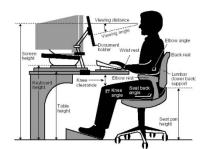




W3C accessibility standards
 "Provide a text equivalent for every non-text element"

What if no alternative text?

- □ Nothing
- □ Filename (060315_banner_253x100.gif)
- Link address (http://www.cs.washington.edu)



Association of Yale Alumni - Microsoft Internet Explorer

File Edit View Favorites Tools Help

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Address 🖉 http://www.aya.yale.edu/

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Yale News

Yale College Classes Clubs and Associations Graduate School Alumni Professional School Alumni Shared Interest Groups For Alumni Yale College Reunions Graduate School Reunions Educational Travel AYA Assemblies Alumni Services Lifelong Learning News Yale Alumni Magazine AYA Blue Print Online Resources Alumni Directory Yale Career Network Message Boards Listservs Virtual Yale Station Student Programs Summer Fellowship Meet the AYA About the AYA Contact Us Leadership Directory Staff @Yale Yale Homepage Giving to Yale Athletics

Affiliations

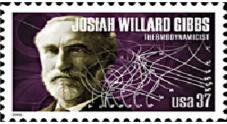
Yale ranked among "Most Global Universities"

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. <u>Click here for more.</u>

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. <u>Click here for more.</u>

Yale scientist honored in new stamp



is among four historic scientists honored in a new series of stamps from the U.S. Postal Service. <u>Click here for more.</u>

Alumni News

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." <u>Click</u> <u>here for more.</u>

Yale Medal

Association of Yale Alumni Names Yale Medalists

The Yale Medal is the highest award presented by the

Nineteenth- by the century Yale Association

researcher

Gibbs, who

received the

nation's first

engineering,

Josiah

Willard

Ph.D. in

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. <u>Click here for more.</u>

Olympian swimmer



Go

AYA Launches Yale Career Network

The Yale Career Network (YaleCN) facilitates interaction among alumni and students and fosters the use of Yale connections in your career pursuits. Enter your profile today! www.aya.yale.edu/career

www.aya.yale.edu/ career/

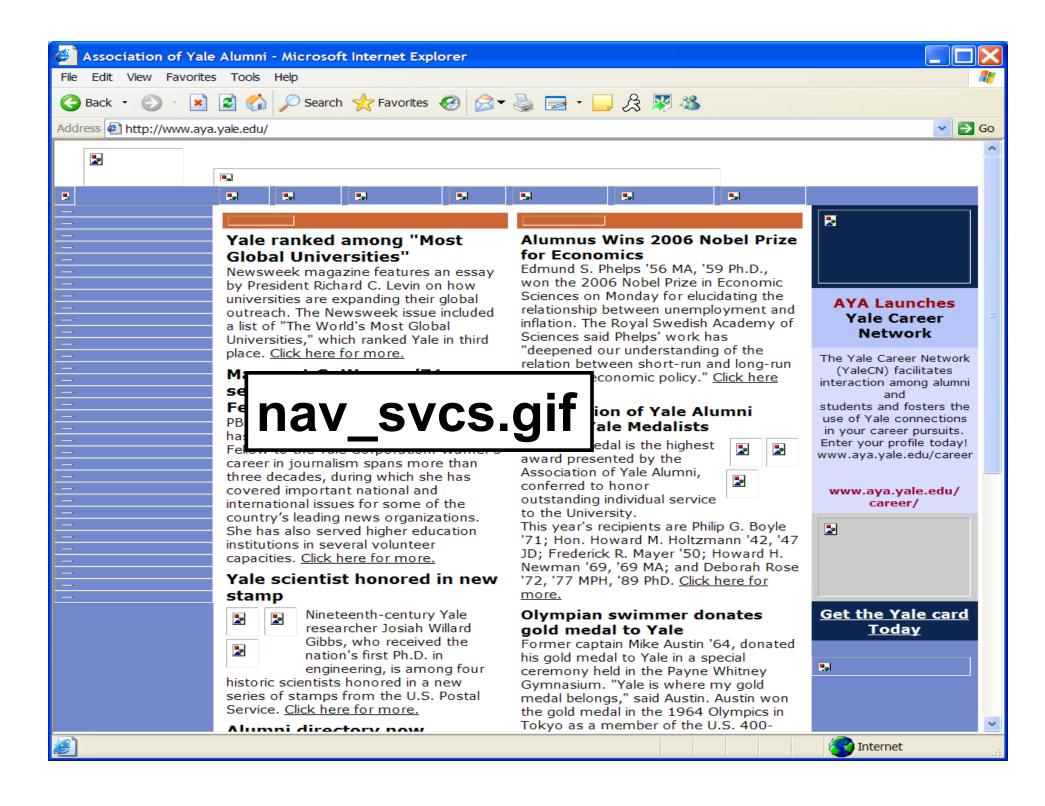


<u>Get the Yale card</u> <u>Today</u>

http://www.aya.yale.edu/clubs/



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How large is the problem?



Web Studies: All Images !=

- Significant images need alternative text
 Informative
 - alt, title, and longdesc HTML attributes

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

 $\square \sim 1$ week

11,989,898 images.

40.8% significant

63.2% alt text

Significant images with alternative text.

Significant images without alternative text.





Study Results

| Group | Significant | Pages > 90% | Pages | Images |
|--------------------------|-------------|-------------|-------|--------|
| High-traffic | 39.6% | 21.8% | 500 | 32913 |
| Computer Science | 52.5% | 27.0% | 158 | 4233 |
| Universities | 61.5% | 51.5% | 100 | 3910 |
| U.S. Federal Agencies | 74.8% | 55.9% | 137 | 5902 |
| U.S. States | 82.5% | 52.9% | 51 | 2707 |

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

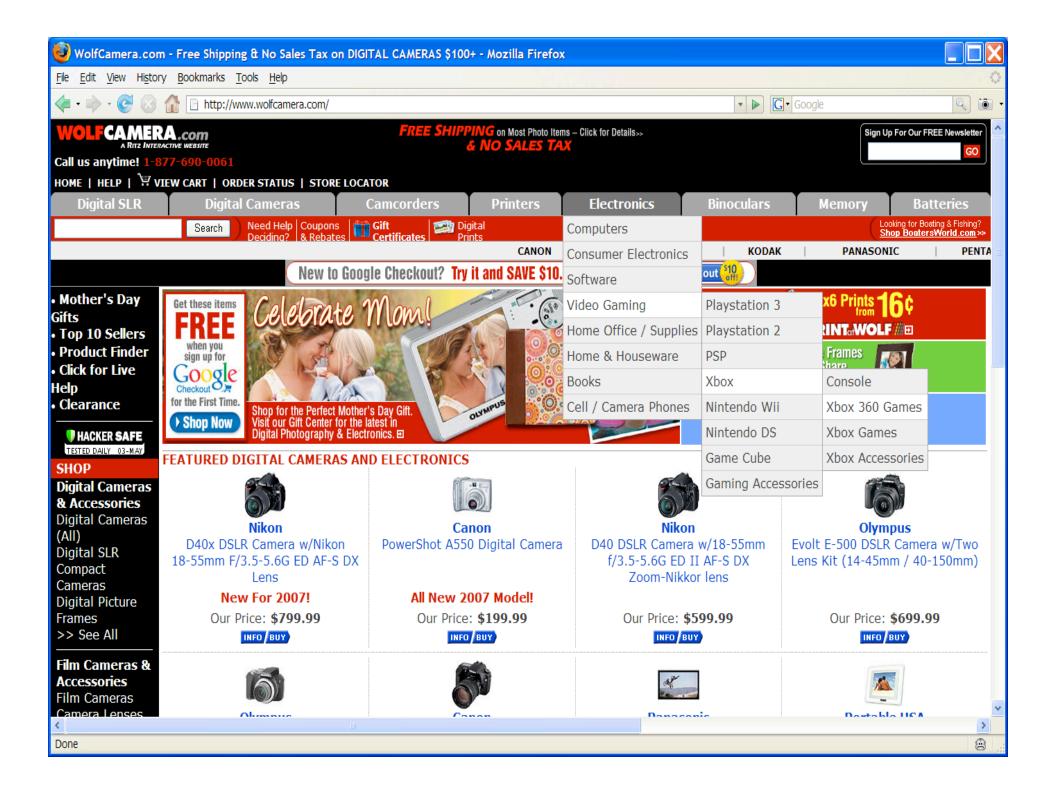


Greasemonkey¹ Firefox Extension

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







Digital SLR Digital Cameras (All) **Compact Cameras** Camera & Printer Kits Lenses Memory **Batteries** Bags & Cases Filters Tripods Flashes/Motor Drives Tutorials Studio Lighting Slide Projectors Light Meters Albums & Frames Film Cameras Film Darkroom Digital Cameras (All) Digital SLR **Compact Cameras Digital Picture Frames** Camera & Printer Kits Lenses Memory **Batteries** Bags & Cases Filters Tripods Flashes Tutorials Studio Lighting

Docking Stations

Menu: No Style

Inefficient to Access

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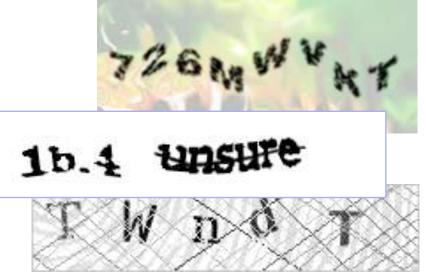


http://code.google.com/p/google-axsjax/



CAPTCHAs¹

- 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 CAPTCHAs

- Same idea but with spoken characters
- CAPTCHA 1 🍕 > S3CL92G4
- CAPTCHA 2
 1778223485





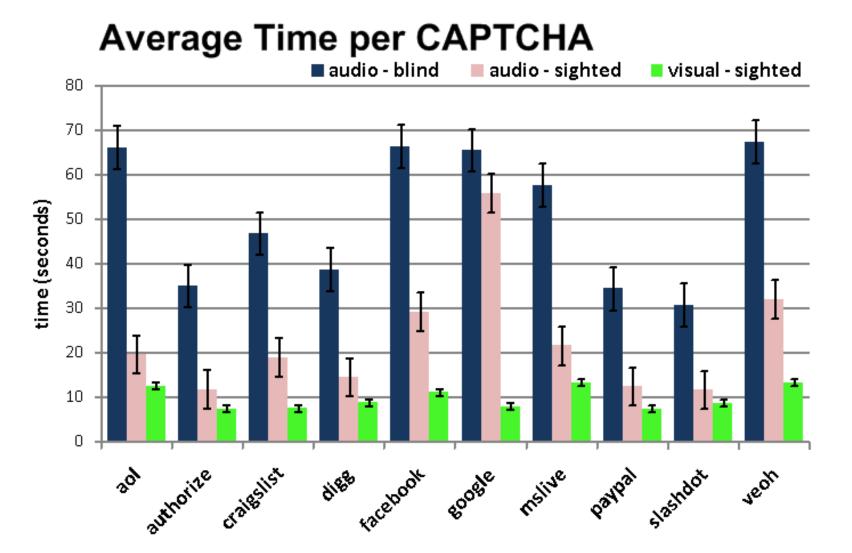
Study Setup

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

162 Participants

- Blind Web Users
 - Solved Audio CAPTCHAs
- □ 73 Sighted Web Users
 - Solved Audio CAPTCHAs
 - Solved Visual CAPTCHAs

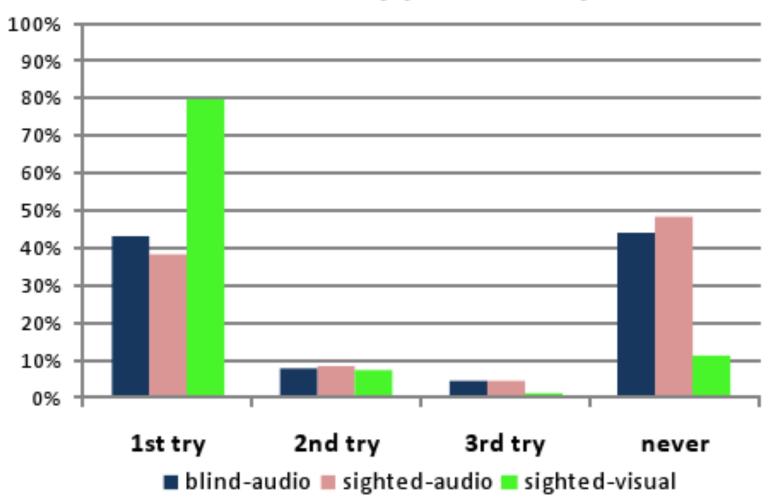




Visual CAPTCHAs Significantly Faster than Audio CAPTCHAs



Percentage of CAPTCHAs answered correctly per attempt





Interface to Solving CAPTCHAs

Security Check

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

| *Image: | EB39FEW4 |
|-----------------|-----------------------|
| *Code in Image: | Can't see this image? |
| couc in image. | Submit Cancel |



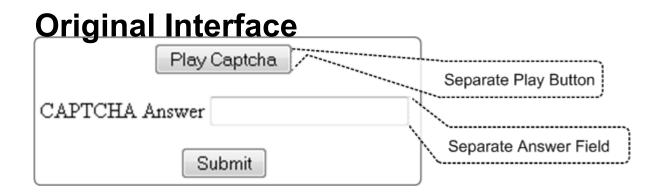


| Audio Numbers - Mozilla Firefox | |
|--|--|
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| Type the numbers you hear In the box below, type the numbers you hear, and | then click |
| Continue. The numbers you typed will appear under | |
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| Numbers you hear: | |
| Done accountservices, | Done |





Compared 2 Interfaces



Keyboard Controls: CAPTCHA Answer . Submit . Submit . 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

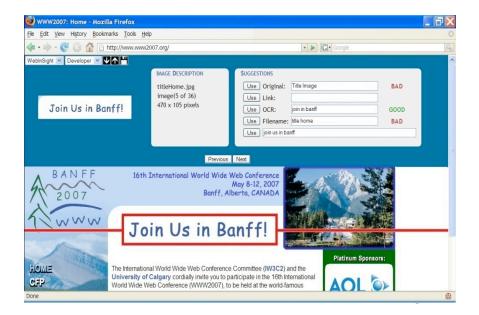
Scripting Accessibility

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

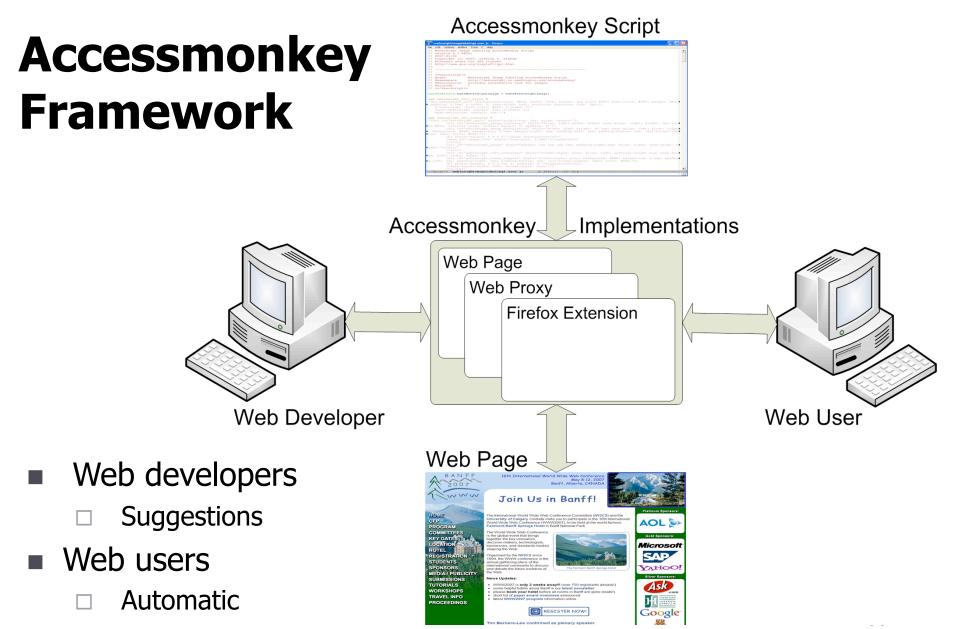




- Preserves Greasemonkey Features
- Multiple browsers and platforms
- Framework for users and developers
- Web Developers
 - □ Separate Interface
 - Edit and save









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

| 🕹 Association of Yale Alumni - Mozilla Firefox | | | |
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| Clubs and Associations Graduate School Alumni Professional School Alumni Shared Interest Groups For Alumni | Fraudulent alumni contact solicitati We have received reports of fraudulent letters asking for updated contact information. The le | sent to alumni | |

AYA Launches Yale Career

Network

The Yale Career Network (YaleCN) facilitates interaction among alumni and students and fosters the use of Yale connections in your career pursuits. Enter your profile today! www.aya.yale.edu/career

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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 <u>Secretary's website</u>.

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 <u>election voting website</u>. **The deadline for casting your ballot is 11:59 PM, EDT, on May 27, 2007.**

Yale Podcasts Now Available

We have received reports of fraudulent letters sent to alumni asking for updated contact information. The letter contains an email address of alumniyale@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 Amia P. Srinivasan. Doctoral student Aaron F. Mertz is Yale's fifth Rhodes recipient. <u>Click here for more.</u>

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 Deval Swedich

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| Clubs and Associations Graduate School AlumniProfessional School Alumni2007 Alumni Fellow BallotProfessional School AlumniThe 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 | asking for updated contac email address of alumniya you receive an email or le | ale@popmail.com and is fraudulent. If atter of this kind, do not respond as it is rease contact us at AVA@vale adu if | aunches Career twork |

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

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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 Amia P. Srinivasan. Doctoral student Aaron F. Mertz is Yale's fifth Rhodes recipient. Click here for more.

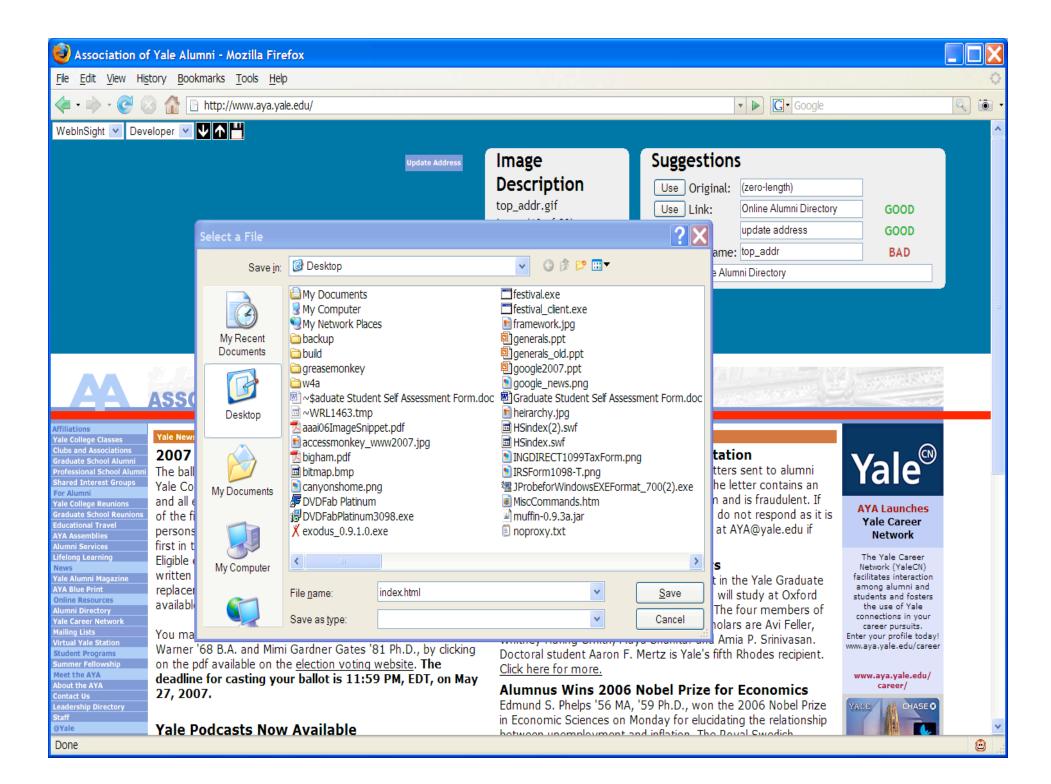
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CHASE C



56



More than Manual Annotation

- Removes dependence on Web Developers
 Users independently improve content
- Collaborative Accessibility
- Harnessing Human Power
 - Amazon Mechanical Turk¹
 - □ ESP Game²

Artificial Artificial Intelligence

[1] http://www.mturk.com/

[2] von Ahn et al. Labeling Image with a Computer Game. (CHI '04).

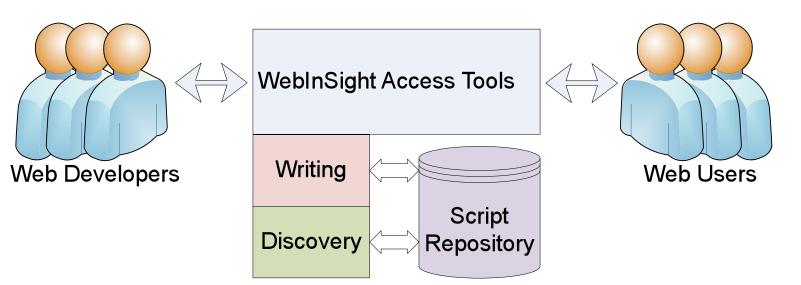
Future Work



Next Steps

WebInSight Access Tools Script Writing

Script Discovery





Easier Script Writing

Existing tools

Programming-by-Demonstration

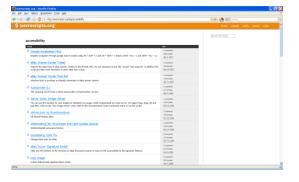
- Web Macros¹, WebVCR², PLOW³, etc.
- Platypus
- Not targeted for improving accessibility
- Visual interfaces
- [1] Safonov et al. Web macros by example: users managing the www of applications.
- [2] Anupam et al. Automating web navigation with WebVCR.
- [3] Jung et al. One-shot procedure learning from instruction and observation.





Script Discovery

- Online Repository
 User-contributed scripts
- Discover As-You-Go

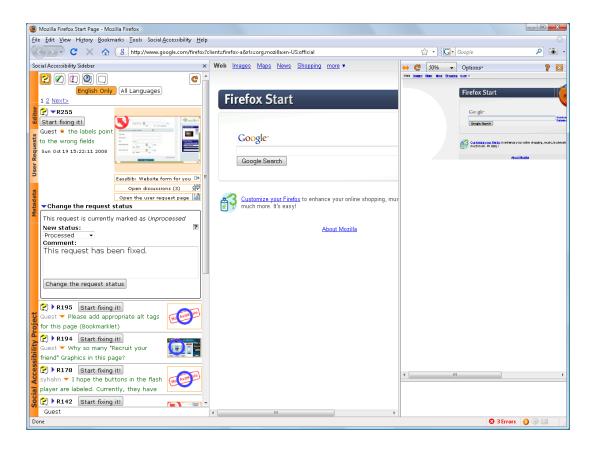


- Finds Applicable Scripts as a User Browses
- □ Find even if you can't write
- Challenges
 - Usability
 - Maintaining Security



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





http://webinsight.cs.washington.edu

jbigham@cs.washington.edu

Contributors:

Jeremy T. Brudvik, Anna Cavender, Jessica DeWitt, Jessica Leung, Daniel Otero, Craig Prince, Jacob O. Wobbrock, and Richard E. Ladner.

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