Personalizing Web Sites for Mobile Users

Corin R. Anderson
Pedro Domingos
Daniel S. Weld

University of Washington Seattle, WA, USA

CNET.com - Welcome to CNET! - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://www.cnet.com/
CNET | News | Hardware | Downloads | Builder | Games | Jobs | Auctions | Prices | Tech Help
Free Email
CNET.com
The source for computers and technology.™
Download now! It's free! msn
Monday, November 27
ADVERTISEMENT
Great Deals!
Search
All CNET
Go!
Site Map
Premier desktop sponsor: Gateway
Today on CNET
Malicious mail: Protect your business from viruses
CNET previews the second beta of Microsoft Office 10
Mobile computing news from Comdex
Tech Traveler
Find the perfect present with CNET's Holiday Gift Guide
CNET Services
Hardware Reviews
Desktops, Notebooks, Storage, Monitors...
Latest Prices
Desktops, Memory, Games, Notebooks...
Consumer Electronics
Wireless, Handhelds, Digital Photo, DVDs...
Software Reviews
Operating Systems, Utilities, Internet, Webware...
Enterprise Business
E-commerce, IS, Security, Linux, App Dev...
Web Services
Access, Web Hosting, Web Developers...
Tech News
Enterprise Computing, E-business...
Finance & Investing
Real-Time Stock Quotes, My Portfolio, IPOs...
Tech Auctions
Desktops, Monitors, Storage...
Free Downloads
Games, Internet, Most Popular, Linux, Mac...
Free Newsletters
Keep current on the latest news, products, and business trends.
Tech News CNET NEWS.COM
Merger to create largest maker of computer, TV screens
Commentary: Business has yet to give its stamp to Net postage
E-tail sites crash over holiday weekend
Intel targets Texas Instruments in cell phone chips
Kyocera gets "smart" with cell phone-PDA combo
More CNET News
Quote Snapshot
DJIA 10546.07 +75.84
Internet

PalmVII.x

The problem

- Most web sites designed “one-size-fits-all”
- But one size does *not* fit all
  - Visitors may have small screens
  - Visitors may want different content than immediately available

- *Sites must adapt to information needs and browser constraints of all visitors*

Web personalization

- Content tailored to a specific audience
- Current techniques for mobile browsing
  - Visitor selects content (Mobile channels)
  - Designer builds mobile site (mobile.msn.com)
  - Third-parties simplify complex HTML (AvantGo)
- Useful techniques, but many weaknesses

- Instead, need automatic personalization

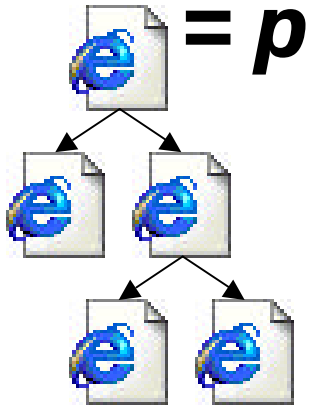
Web site personalizers

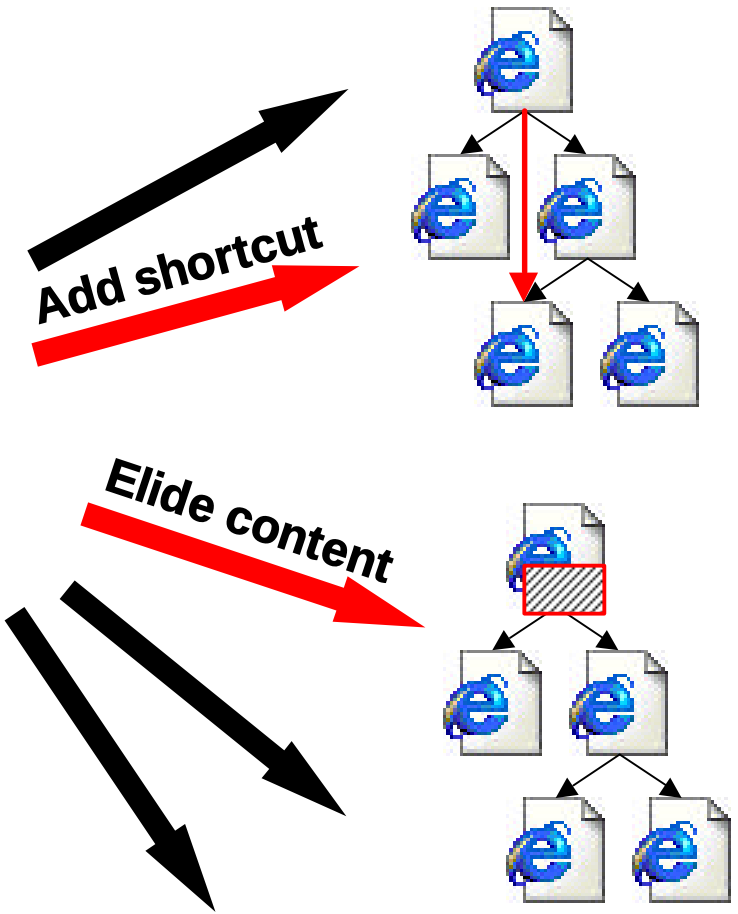
- An intermediary between server and visitor

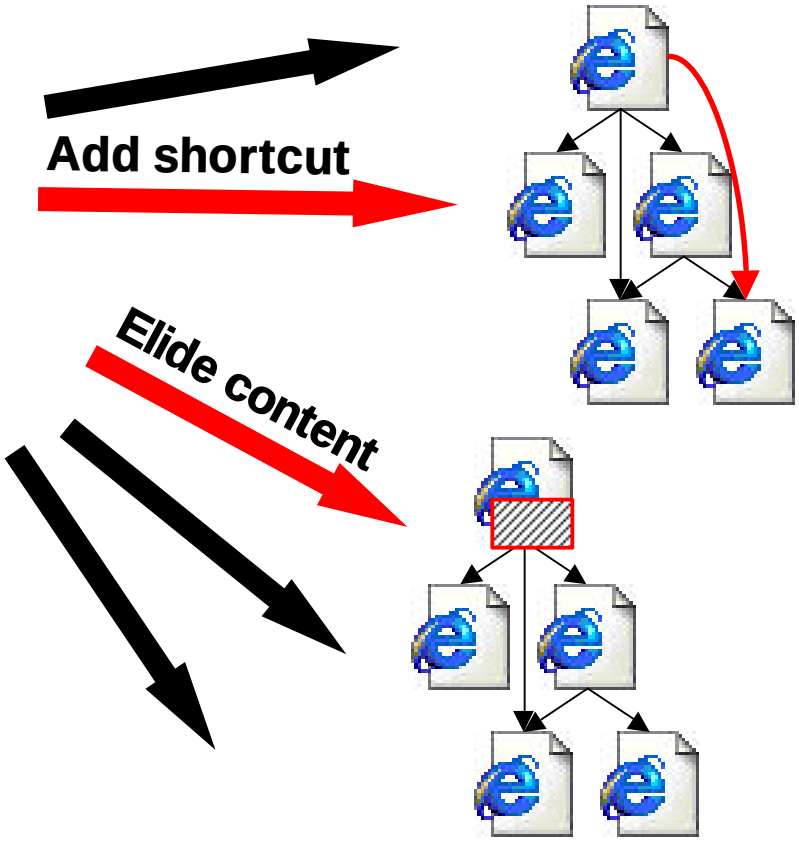
- Automatically adapts and customizes site for each visitor
- Personalizing in two steps:
  1. Learn model of visitor from access logs
  2. Transform content per learned model

Proteus

- Hill-climbing search over personalized web sites:

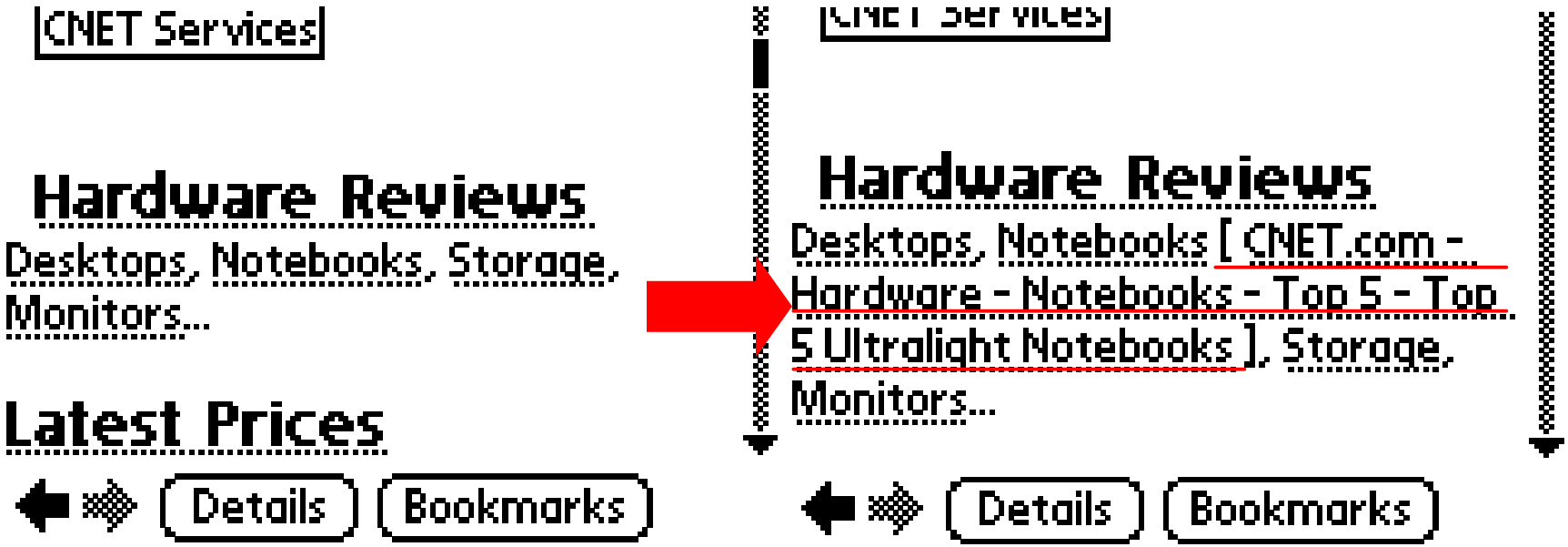



Add shortcut
Elide content

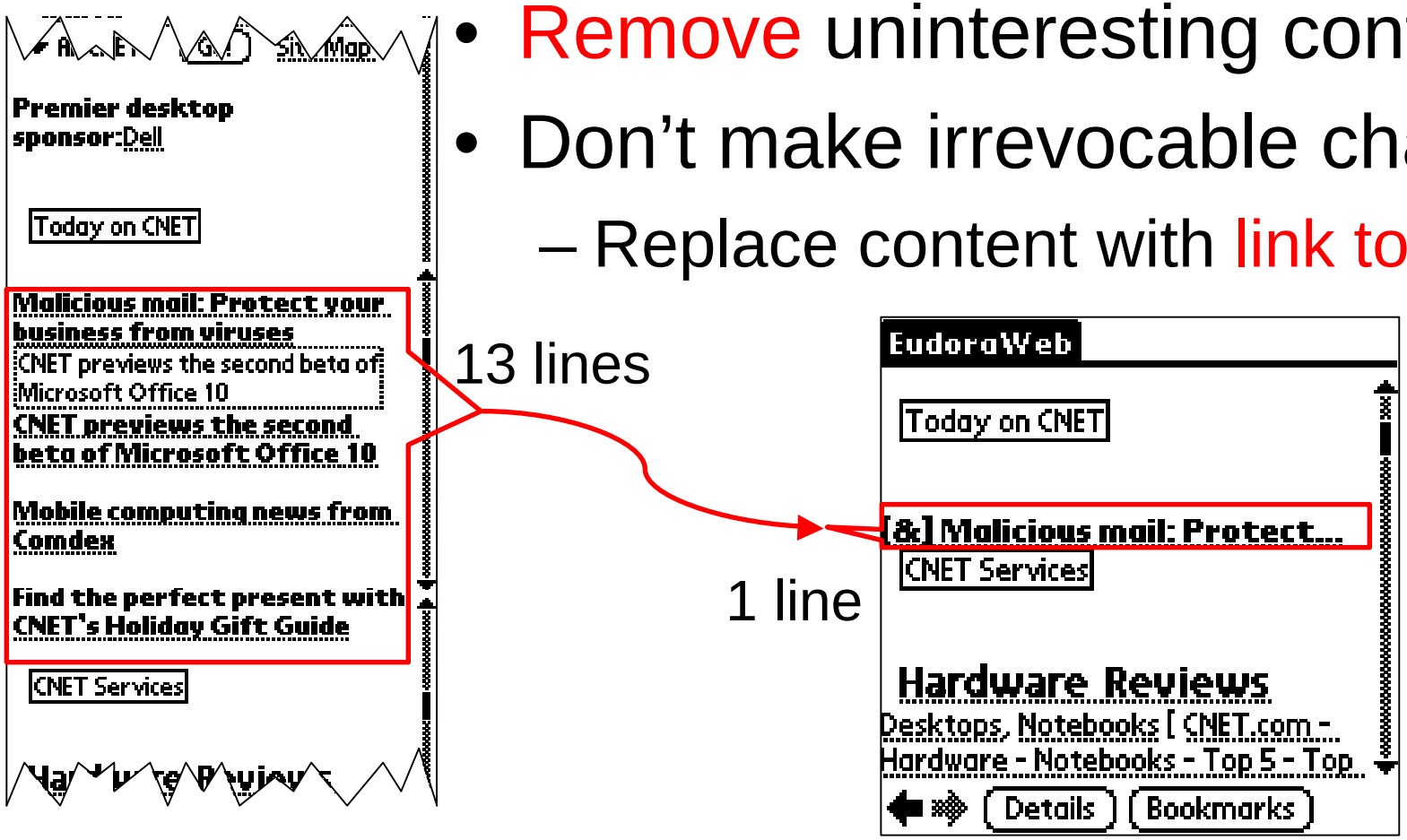

Add shortcut
Elide content

add-shortcut

- A link that makes a long path shorter
  - A → B → C → D suggests adding A → D



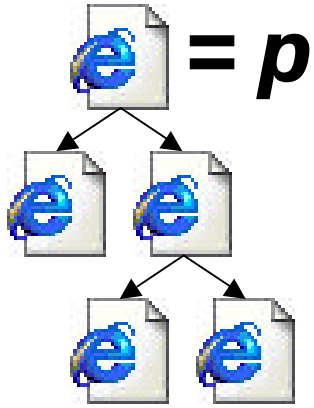
elide-content



- Remove uninteresting content
- Don't make irrevocable changes!
  - Replace content with link to original

Web site evaluation

- Expected utility based on model of visitor
  - Model learned by mining server access logs
- Sum up value of each screen of each page
- Discount by difficulty of reaching screen from ***p***
  - Depends on how many links followed and how much scrolling required



Evaluating a screen of content

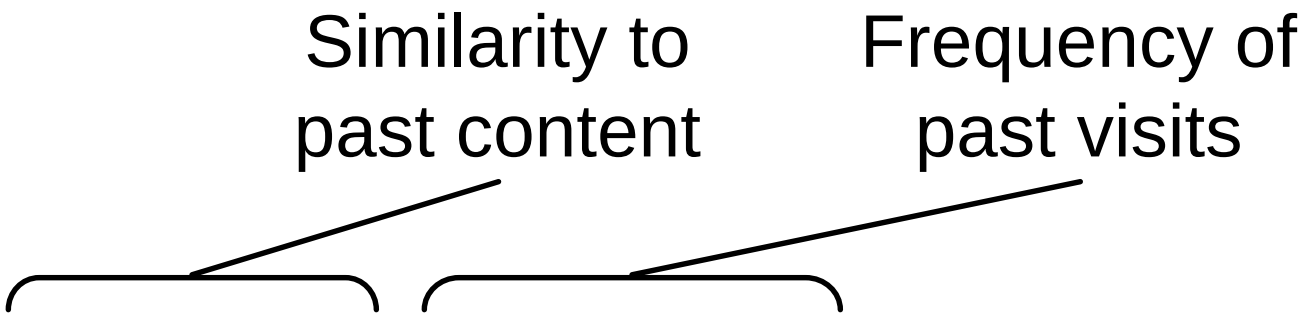
$$E[U(s_{ij})] =$$

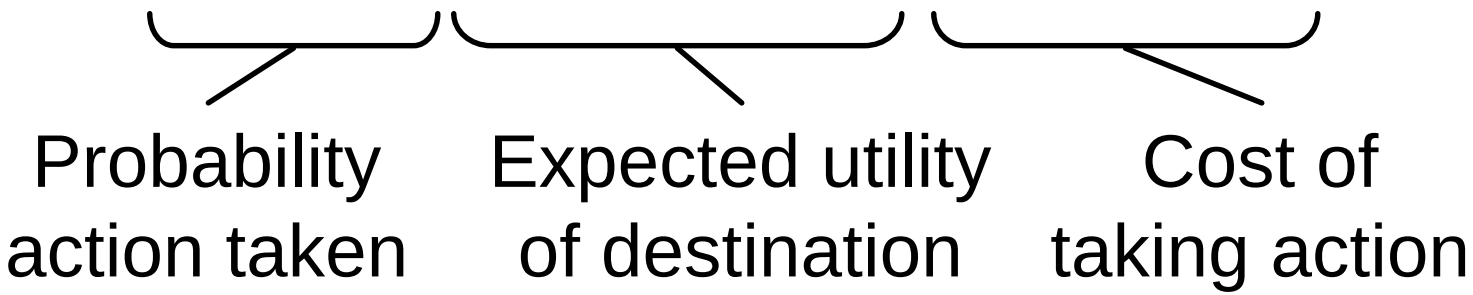
$$w_{sim} sim(s_{ij}) + w_{freq} freq(s_{ij}) +$$

$$P(scroll)\,(E[U(s_{i,j+1})] - g(scroll)) +$$

$$\sum_{\substack{\text{links} \\ L_k}} [P(L_k)\,(E[U(L_k.dest)] - g(L_k))]$$

Expected utility of s_{ij}
Intrinsic utility
Extrinsic utility


Similarity to
past content
Frequency of
past visits


Probability
action taken
Expected utility
of destination
Cost of
taking action

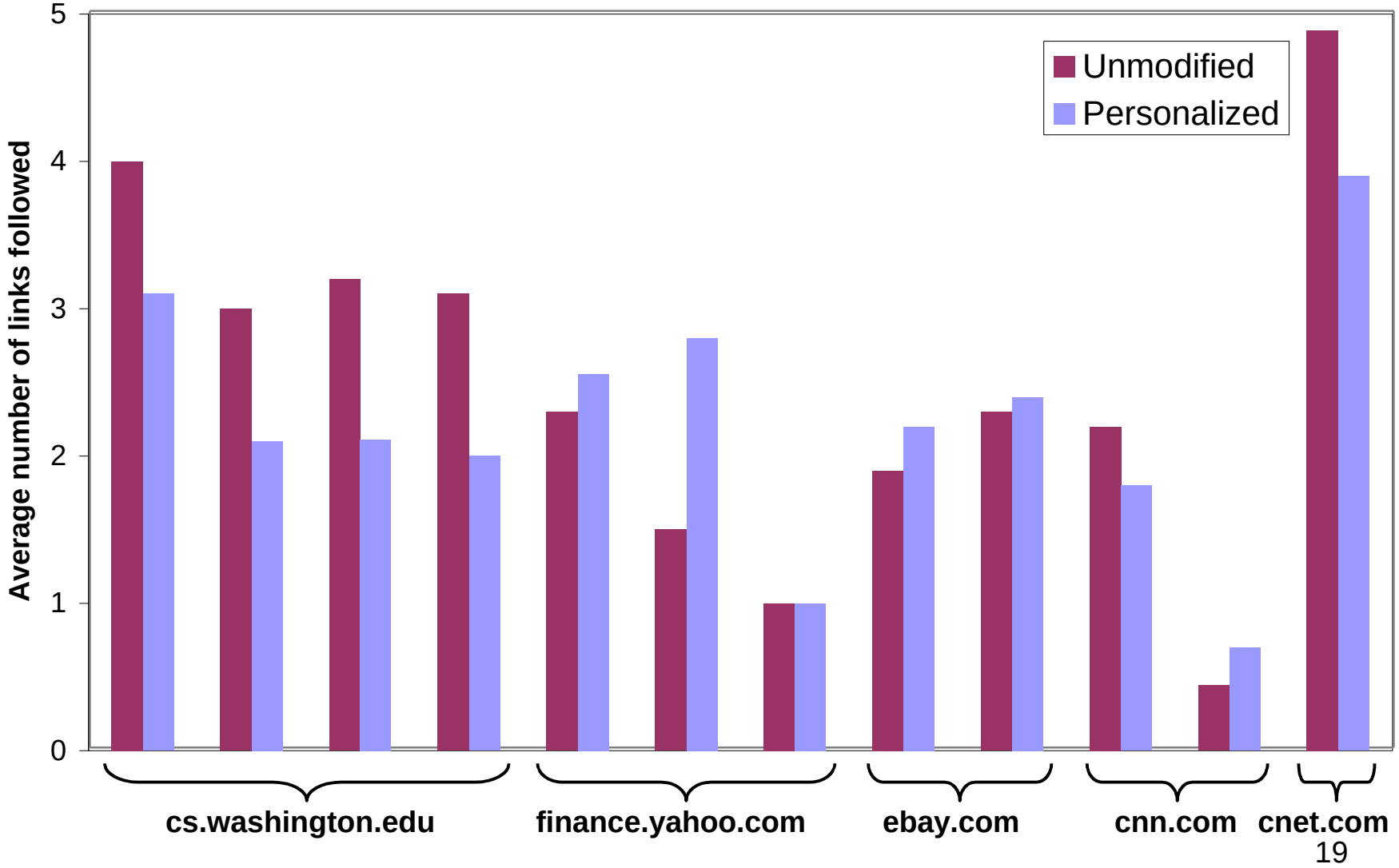
Review of Proteus

- Hill-climbing search
- Search operators
  - add-shortcut
  - elide-content
- Evaluation with expected utility

Empirical study of Proteus

- Observe real users on the desktop
  - Info-seeking goals drawn from random distribution
- Personalize based on observations
- Measure performance on mobile device
  - Number of links and scrolls, amount of time
  - Compare unmodified and personalized sites
    - Half users did unmodified first, others vice versa

Average number links followed



Analysis of Proteus

- Why Proteus worked well
  - Suggested useful shortcuts
  - Elided only unnecessary content
- Why Proteus worked poorly
  - Users did not find shortcut, although it existed
  - Proteus incorrectly elided useful content
  - *Not flaws with Proteus approach – simply weaknesses of implementation*

Related work

- Adapting content for small screens
  - Digestor [Bickmore & Schilit]
  - Pythia [Fox & Brewer]
- Adapting site by mining usage logs
  - PageGather and IndexFinder [Perkowitz & Etzioni]
  - Content recommendation [Mobasher, et. al]

Conclusions

- Mobile web must be personalized
- Web site personalizers are effective at meeting visitor's needs
- Empirical evidence indicates Proteus saves visitors time and effort in mobile web browsing

Future work

- Improve shortcut links
  - Concise, descriptive anchor text
  - Faster shortcut finding algorithm (IJCAI ’01)
- Incorporate declarative model of site
  - Separate personalization of presentation, content, and navigation
  - Make use of site’s “original” data, not obfuscated HTML representation