Programming by a Sample:
Rapidly Creating Web Applications with d.mix

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http://hci.stanford.edu

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How would you share UIST highlights with colleagues back home?
How would you retrieve the same data programmatically?

It's easy to understand the sites, but not the services.
Web sites and their APIs are correlated... 

...let’s leverage that fact!
Give me the code for this!
d.mix active wiki

Source code generated by d.mix

is executed in the active wiki
Welcome to the Climber's Portal

About our group | When is the next climb? | Contact us

Scotts latest images:

Drews latest images:
sample this stop sampling
Our new portal is online - see for yourself at:
http://valparaiso:3704/tepee/climbersportal/

-Jane
d.mix users

Site owners or lead users define mappings between sites and services (once).
Web developers create d.mix applications
End-users run (and tailor) applications in the d.mix wiki.
Authoring the Site-to-Service Map
...Without Help From the Site Owner

1. Map URL to Page Type
2. Identify visual elements in page to annotate (using XPath/CSS selectors)
3. Extract arguments for service calls from page source
4. Bind arguments to web service code snippet
Why Not *Just Scrape*?

- Scraping at design-time rather than at run-time minimizes brittleness
- Web service calls can be parameterized
- Scraping at run-time can lead to lock-out
El Capitan, late afternoon

El Capitan, seen from the Yosemite Valley road
Page URL: flickr.com/photos/<username>/<photoid>/...

Regular Expression: %r{flickr.com//?photos/[^/]+/\d+/?&script}
El Capitan, late afternoon

El Capitan, seen from the Yosemite Valley road
Extracted from page source:
Within <div> for all tags:
tag=div.at("a.Plain").inner_html

flickr.photos.search(
tags = “yosemite ...”)
Putting it all together...

```ruby
def self.annotate_photopage_tags(doc)
  (doc/"div").reject{...}.each do |div|
    tag = div.at("a.Plain").inner_html
    src = generate_tag_search_source(…)
    doc.at("body").inner_html +=
    make_context_menu(div.at("a.Plain"),
                       ["Images matching tag #\{tag\}",[src]])
  end
```
Putting it all together...

```ruby
def self.annotate_photopage_tags(doc)
  (doc/"div").reject{...}.each do |div|
    tag = div.at("a.Plain").inner_html
    src = generate_tag_search_source(...)
    doc.at("body").inner_html +=
    make_context_menu(div.at("a.Plain"),
                      ["Images matching tag #{tag}",[src]])
  end
```

Extract tag name
Putting it all together...

```ruby
def self.annotate_photopage_tags(doc)
  (doc/"div").reject{...}.each do |div|
    tag = div.at("a.Plain").inner_html
    src = generate_tag_search_source(...)  # Instantiate Source Example
    doc.at("body").inner_html +=
    make_context_menu(div.at("a.Plain"),
                      ["Images matching tag #{tag}"],[src])
  end
end
```
Putting it all together...

```ruby
def self.annotate_photopage_tags(doc)
  (doc/"div").reject{...}.each do |div|
    tag = div.at("a.Plain").inner_html
    src = generate_tag_search_source(...)
    doc.at("body").inner_html +=
    make_context_menu(div.at("a.Plain"),
                      ["Images matching tag #{tag}",[src]])
  end
```

Add annotation to original page
Dataflow Summary

d.mix design time

sends code to

Web site

adds annotation

Web service

invokes

d.mix run time
Active Wiki

- Wiki editor provides syntax-highlighting for Ruby script
- Sandboxed execution runs script with limited capabilities
- Libraries facilitate invoking web services and manipulating results
Beyond the Desktop Browser
What we borrowed and what we wrote

<table>
<thead>
<tr>
<th>Front end</th>
<th>Back end</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Yahoo! UI</td>
<td>• MouseHole (proxy)</td>
</tr>
<tr>
<td>(annotation UI)</td>
<td>• Tepee (wiki)</td>
</tr>
<tr>
<td>• JQuery (selectors)</td>
<td>• Freakyfreakysandbox (safe execution)</td>
</tr>
<tr>
<td>• <strong>Bookmarklet</strong></td>
<td>• Hpriet (selectors)</td>
</tr>
<tr>
<td>• UI logic</td>
<td>• <strong>Annotation code</strong></td>
</tr>
<tr>
<td></td>
<td>• Site-to-service map</td>
</tr>
<tr>
<td></td>
<td>• API wrappers</td>
</tr>
<tr>
<td></td>
<td>• <strong>d.mix library</strong></td>
</tr>
</tbody>
</table>
### Prototype Site-to-Service Library

<table>
<thead>
<tr>
<th>API</th>
<th>Supported Actions</th>
<th>Site-to-Service map code size</th>
</tr>
</thead>
</table>
| **flickr**   | • Get images from a user’s photo stream, with or without meta data  
• Get images from an image set  
• Get images from individual photo pages  
• Get images matching tags, global or per user, from tag clouds and photo pages  
• Get images by global image id  
• Get images from full-text search                                                                                      | 355 lines                    |
| **Yahoo!**   | • Single web search result  
• Web search result set                                                                                                                                     | 54 lines                     |
| **YouTube**  | • Retrieve a user’s videos  
• Retrieve most recent videos  
• Single search result  
• Search result set                                                                                                                                          | 115 lines                    |
First-use Lab Study (n=8)

- All participants had some programming experience, knew HTML
- Four had no experience with web APIs
- 75 minute sessions: Demonstration, warm-up, two design tasks
## Ambidextrous Dashboard

**Total lines of code**: 54

<table>
<thead>
<tr>
<th>Description</th>
<th>Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written by participant</td>
<td>13</td>
</tr>
<tr>
<td>Generated by d.mix</td>
<td>41</td>
</tr>
<tr>
<td>Generated lines modified by participant</td>
<td>4</td>
</tr>
</tbody>
</table>
Newport Corporation | Photonics, Optics and Mechanics, Vibration Control, Motorized Positioning
Offers solutions in photonics, lasers, precision optics, and motion and vibration control.

City of Newport Homepage
Includes city government department pages and phone directory, codified ordinances, employment opportunities, and links to related sites.

Welcome to Go Newport - The Official Site for Newport RI offers all the information you need
Local information for visitors, event planners, movie location scouts, and more.

Oregon Coast Guide - A Guide to Oregon's Central Coast
The home of NewportNet, featuring travel and tourism information for the central Oregon coast. ... THE AREA. MORE PHOTOS. NEWPORT INTERNET INFO. SEARCH THE WEB ...

The Newport Group : Home
Independent investment consulting firm. Includes services, company profile, strategic alliances, career information. Corporate headquarters in Heathrow, FL.

Newport - Wikipedia, the free encyclopedia
... county of Monmouthshire and governed by the unitary Newport City Council. The population of Newport is 140,100 making it the third-largest city in Wales. ...

Newport, Rhode Island - Wikipedia, the free encyclopedia
... is the home of Naval Station Newport, housing the United States Naval War ... Newport was founded in 1639 by William Coddington, John Clarke, and others, who
Lessons Learned

How do I know what I can sample?

Search Results for “uist hci”

Sort by: Relevance | Date Added | View Count | Rating

Under the Table Interaction (UIST 2006)

on our experiences and observations with inverted and two-sided tables. hci research Tabletop interaction direct touch screen bimanual input two-sided inverted (more)

Tags: hci research Tabletop interaction direct touch screen bimanual input two-sided inverted

Time: 02:55

Views: 6,416
Added: 11 months ago

More in Howto & DIY

hybridpointing
Lessons Learned

How do I know what I can sample?
Lessons Learned

Offer multiple ways to sample information.

Sample from link to content

Sample content directly
Limitations

Proxying the *logged-in* web is challenging
Limitations

Proxying the logged-in web is challenging
Limitations

How can one sample APIs that provide interactive widgets instead of data?
## Related Work

### END-USER PAGE MODIFICATION & AUTOMATION

- Greasemonkey
- Chickenfoot [Bolin, UIST2005]
- Koala [Little, CHI2007]

### END-USER PAGE CREATION

- Yahoo! Pipes
- Open Kapow
- Marmite [Wong, CHI2007]
- IBM QEDWiki
- Intel MashMaker
- Relations, Cards, and Search Templates [Dontcheva, UIST2007]

### DEEP COPY & PASTE

- Citrine [Stylos, UIST2004]
- WinCuts [Tan, CHI2004]
- Clip, connect, clone [Fujima, UIST2004]
- Hunter Gatherer [schraefel, WWW2002]
- Facades [Stuerzlinger, UIST2006]

### FINDING API EXAMPLES

- Mica [Stylos, VL/HCC2006]
- Assieme [Hoffmann, UIST2007]
Ordering office products not in the catalog

- go to https://www.buyondemand.com
- scroll down to the “Shop by commodity” section
- click “View commodities”
- from the list of commodities, select “MRO / SUPPLIES”
- from the resulting list, select W14 “GENERAL OFFICE SUPPLIES”
- ignore screen about “Unit of Measure”, click “continue”
- from the resulting screen, click “All other orders”
- the resulting screen is entitled “Full Buyer Item”. For “Item Description” enter “MiniDV digital videotape cassette, 60 minutes at SP mode”. For “Estimated Unit Price” enter “3.25”. For “quantity” enter how many you want.
- Click “Add and go to cart”.
- in the resulting screen click “check out/finish”
END-USER AUTHORING TOOLS

Yahoo! Pipes
Open Kapow
Marmite [Wong, CHI2007]
IBM QEDWiki
Intel MashMaker [Ennals, SIGMOD2007]
Relations, Cards, and Search Templates [Dontcheva, UIST2007]
API SEARCH
TOOLS

Assieme
[Hoffmann, UIST2007]

Mica
[Stylos, VL/HCC2006]
Contributions

- Search for programming examples in the solution domain, not the code domain.
- d.mix instantiates this idea for web service APIs through a site-to-service map.
- Integration of page annotation and script hosting enables rapid experimentation.
Current Work

Re:Mix
Reformatting existing web applications for mobile device use

Juxtapose
Exploring design alternatives in parallel
Acknowledgments

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SAP Stanford Graduate Fellowship
Microsoft New Faculty Fellowship
Intel (equipment donation)

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Wendy Ju, Leith Abdulla, Michel Krieger, whytheluckystiff

Images
morguefile.com
SAMPLING IS MANDATORY!

WE’RE WATCHING

hci.stanford.edu/dmix