

“Re-authoring” User Interfaces

Jeffrey Nichols

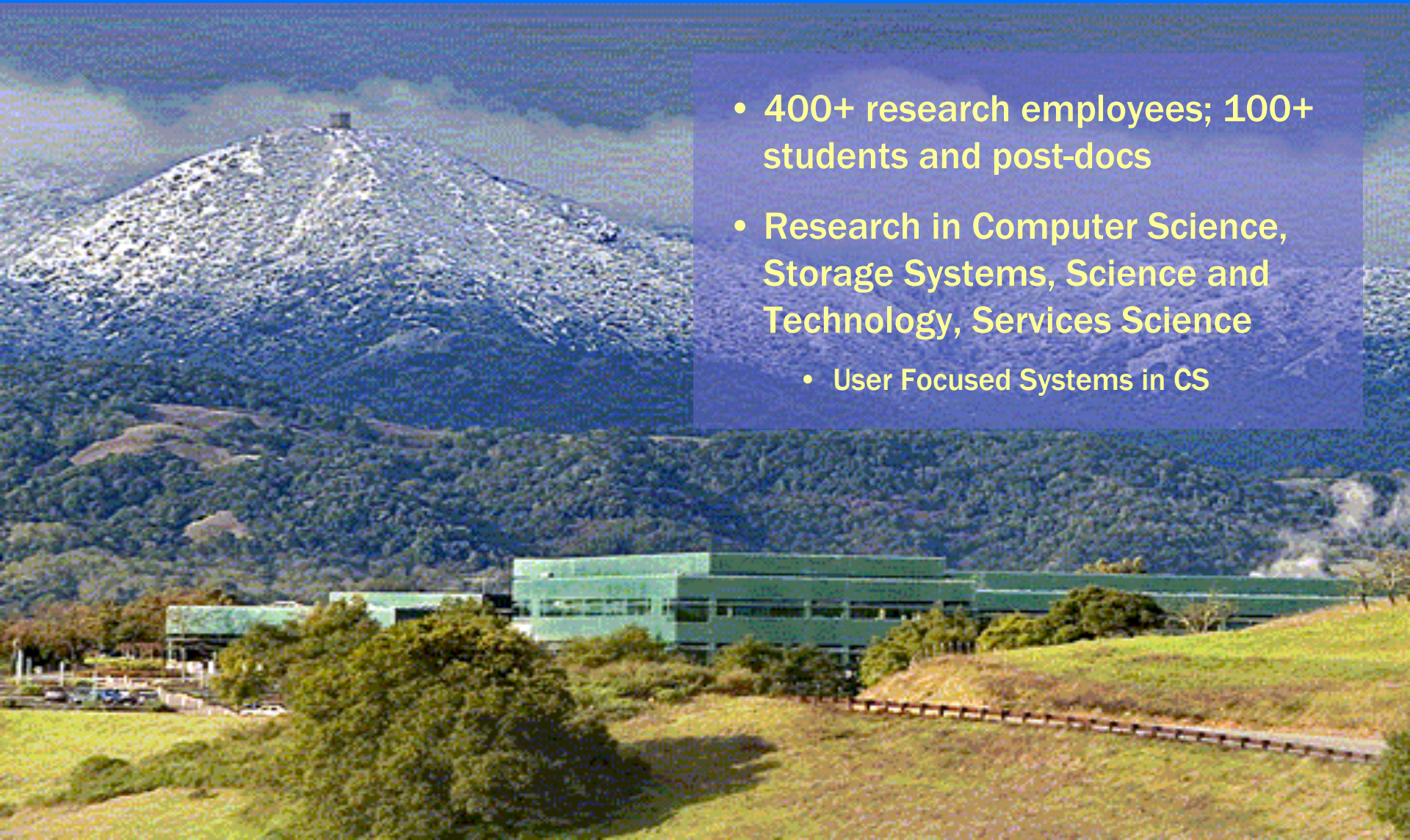
IBM Research – Almaden

October 1, 2010

University of Rochester

IBM Research – Almaden

- 400+ research employees; 100+ students and post-docs
- Research in Computer Science, Storage Systems, Science and Technology, Services Science
 - User Focused Systems in CS



An increasing variety of interactive devices...

smartphone

Search

SafeSearch moderate ▼

About 12,400,000 results (0.18 seconds)

[Advanced search](#)



Page 2



tablet

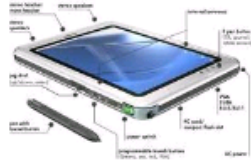
Search

SafeSearch moderate ▼

About 16,000,000 results (0.34 seconds)

[Advanced search](#)

Related searches: [blackberry tablet](#) [drawing tablet](#) [ancient tablet](#) [stone tablet](#) [wacom tablet](#) [apple tablet pc](#)



Microsoft Surface

interactive device

About 9,150,000 results (0.50 seconds)




Perceptive Pixel Wall Display

**All of these devices need user
interfaces...**

Where will they come from?

1. Code new user interfaces from scratch
2. Recode existing user interfaces
3. “Re-author” existing user interfaces

A large, colorful graphic on the right side of the banner features a variety of app icons, including a speech bubble, a snowflake, a red stick figure, and many others, arranged in a cascading, 3D effect. Below the icons, a black smartphone is shown at an angle, displaying a grid of app icons on its screen.

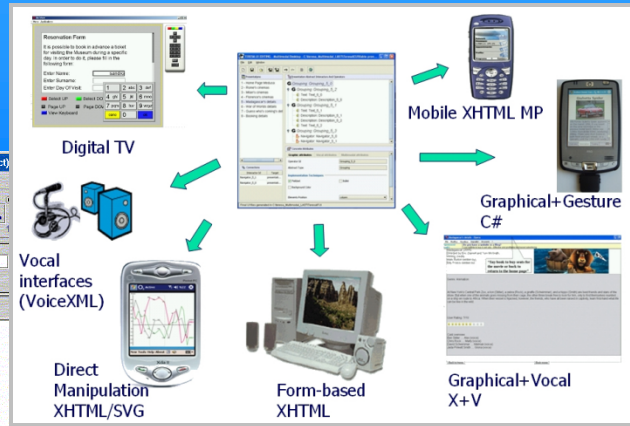
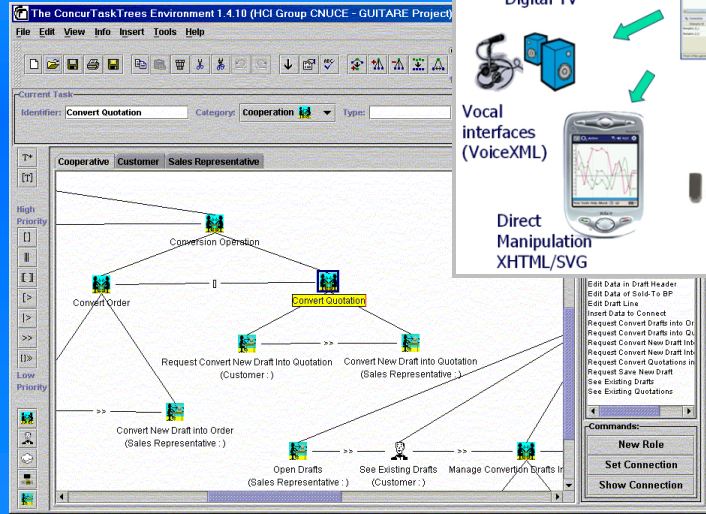
Thanks a billion.

Over 1 billion downloads in just nine months.
Only on the App Store. [Learn more ▶](#)

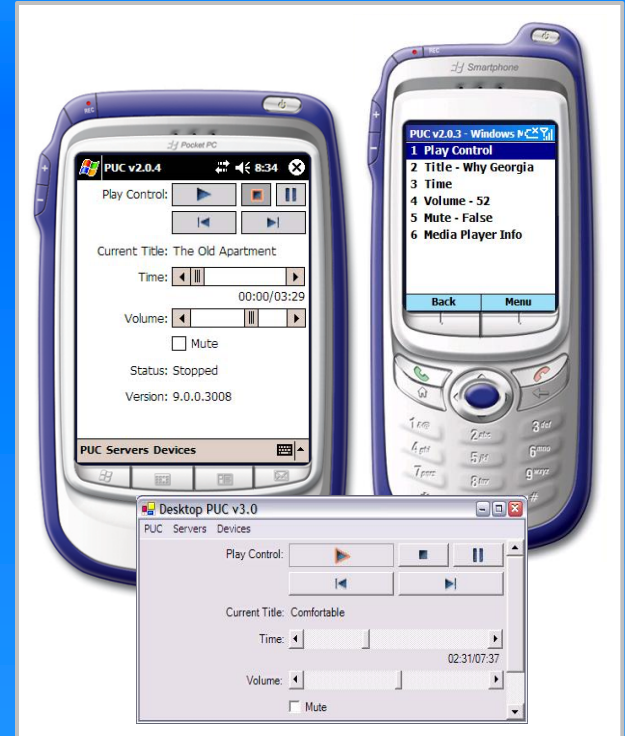
The Billion App Countdown promotion has ended.
Please come back to this page soon to see who won.
[Official Rules ▶](#) [Reglas Oficiales ▶](#)

1. Code new user interfaces from scratch
2. Recode existing user interfaces
3. “Re-author” existing user interfaces

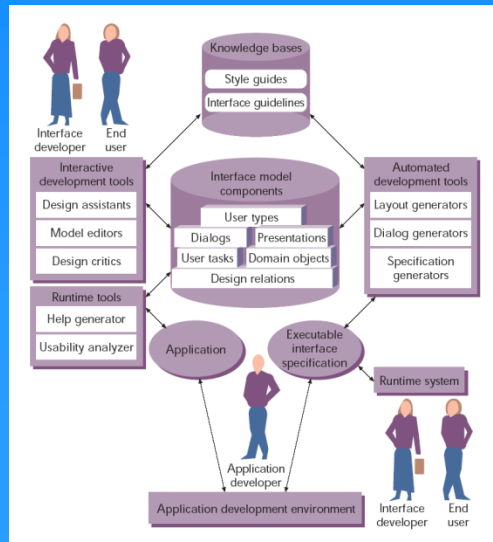
ConCurTaskTrees & TERESA, Paterno et al.



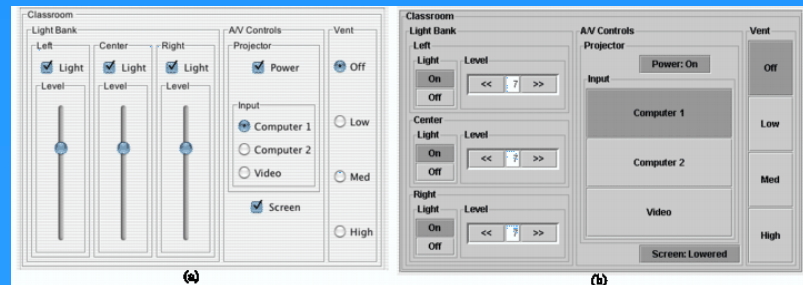
Personal Universal Controller, Nichols et al.



Mobi-D, Puerta et al.



SUPPLE, Gajos et al.



1. Code new user interfaces from scratch
2. Recode existing user interfaces
3. “Re-author” existing user interfaces

“Re-authoring” ...

- may be done by end users
- is done only at the interactive level
- specifies transformations from the original interface to a new interface design
- uses a “remote control” metaphor

Example: AA.com – Flight Tracking

The image shows two overlapping browser windows from the American Airlines website. The left window displays the main homepage with navigation links and promotional banners. The right window shows the 'Flight Information' section, which includes a search form and a detailed flight status table for flight #144. The flight status table is highlighted with a red border.

American Airlines
AA.com

Flight Information

For Flight Status Notification:
• Click Create

Modify Search

From: To: Flight Number:
and/or 144

Date: Time: Choose Airline:
Today Early Morning AMERICAN AIRLINES

☐ Departure ☐ Arrival **RESUBMIT**

AMERICAN AIRLINES - Flight #144 **FLIGHT STATUS - ON TIME**

Carrier	City	Date	Time			Terminal	Gate	Baggage Claim	Flight Status Notification	
			Scheduled	Estimated	Actual					
AMERICAN AIRLINES	Departing									
	LAX Los Angeles,	01/13/2008	2:50 PM			T4	47A		CREATE	
	Arriving									
	IAD Washington,	01/13/2008	10:35 PM				D19	13		

Did You Know?
You can also access flight status information using your [WAP phone](#), [two-way pager](#) or [wireless Palm device](#).

Contact [AA Reservations](#) for Flight Status information if American Airlines or American Eagle does not operate the flight.

[Travel Help And Resources](#)

AA.com Flight Tracking: *Mobilized*

Flight Number:



FLIGHT STATUS - ARRIVED			
Detailed Flight Information			
Carrier	City	Date	Time
			Scheduled
			Estimate
Departing			
AMERICAN AIRLINES	LAX Los Angeles,	09/29/2007	2:30 PM
Arriving			
	IAD Washington,	09/29/2007	10:20 PM

AA.com Flight Tracking: *Speechified*

User: “What is the status for my American Airlines flight?”

System: “What is the flight number?”

User: “144”

System: “Flight Status – Arrived”

AA.com Flight Tracking: *Reusing Design*

airline Reservations from American Airlines | AA.com - Mozilla Firefox

history del.icio.us Tools Help

http://www.aa.com/index_us.jhtml

Login | My Account | Worldwide Sites | Contact AA | FAQ Search... GO

American Airlines® AA.com™

Welcome to AA.com. [Login](#)

**Fulfill Your Resolution
With Our New Year
SALE FARES** JAN -

Net SAAver Alerts

Boston, MA to Toronto, ON [\\$342 Restrictions](#)

Los Angeles, CA to Panama City, Panama [\\$609 Restrictions](#)

Los Angeles, CA to Orlando, FL [\\$188 Restrictions](#)

[EDIT CITIES](#)

AA News and Offers

- Get The Best Fares Delivered Directly To Your Desktop
- Fly Now, Pay Later - 6 Months No Payments, No Interest
- Manage All Your Reservations On AA.com

[ALL NEWS](#) [ALL OFFERS](#)

Password Help

Trouble signing in? Need a new password?

[GO](#)

Book: Flights Hotel Car Vacation Cruise Deals

Book Flights ? View/Change Reservations Flight Check-In

☒ Round-Trip ☐ One-Way ☒ Multi-City ☐ Redeem ☐ Advantage Miles [Español](#)

From: [Lookup](#) Departure Date: Jan 14 Morning

To: [Lookup](#) Return Date: Jan 16 Afternoon

airports within 0 Miles Search by **New** ☐ Price & Schedule ☒ Schedule ☐ Price

Passengers: 1

Promotion Code [My Dates are Flexible](#)

☒ Advanced Search Cabin Preference, Children, Country of Residence [GO](#)

Gates & Times ? Schedules Flight Status Notification

From: [Lookup](#) To: [Lookup](#) Flight Number: and/or

Date: Today Time: Early Morning ☐ Arrival ☒ Departure [GO](#)

View My Miles ? Buy Upgrades Email Subscriptions

Login to View Your Miles

[Need a password?](#) [Instant AA Advantage Enrollment](#)

AA Advantage # Password

[Open Notebook](#)

United Airlines - Airline Tickets, Airline Reservations, Flight Airfare - Mozilla Firefox

File Edit View History Delicious Bookmarks Tools Help

http://www.united.com/

P90X Journal Yahoo! Sports Fant... Jeffrey Nichols - ... Jeff Nichols Schedule United A

UNITED

[My profile](#) | [Worldwide sites](#) | [Customer service](#)

Planning & booking Reservations & check-in Mileage Plus® Services & information Search site

#1 ON TIME United. #1 in on-time arrivals. [Details](#) Shop for flights Special deals Travel Op

Flights Check-in Flight Status

Check-in

Please select:

Confirmation or E-Ticket® number

Enter:

Confirmation or E-Ticket number

Last name

[Continue to check in >>>](#)

You may check in up to 24 hours before your flight. Check-in closes 45 minutes before flights within the U.S. and 1 hour before international flights. [FAQs](#)

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Las Vegas — Honolulu	\$225
San Francisco — Honolulu	\$190

[Get details](#)

5 of 8

United news and deals

- Travel notices for Madrid and Brussels
- E-Fares: Save on weekend getaways

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Mileage Plus # or email address

Password [Forgot pass...](#) [Need pass...](#)

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Start with

☒ My Mileage Plus ☐ My reservations

Start earning miles today! Join United Mileage Plus today!

united.com benefits and features

- Low Fare Guarantee
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Travel information

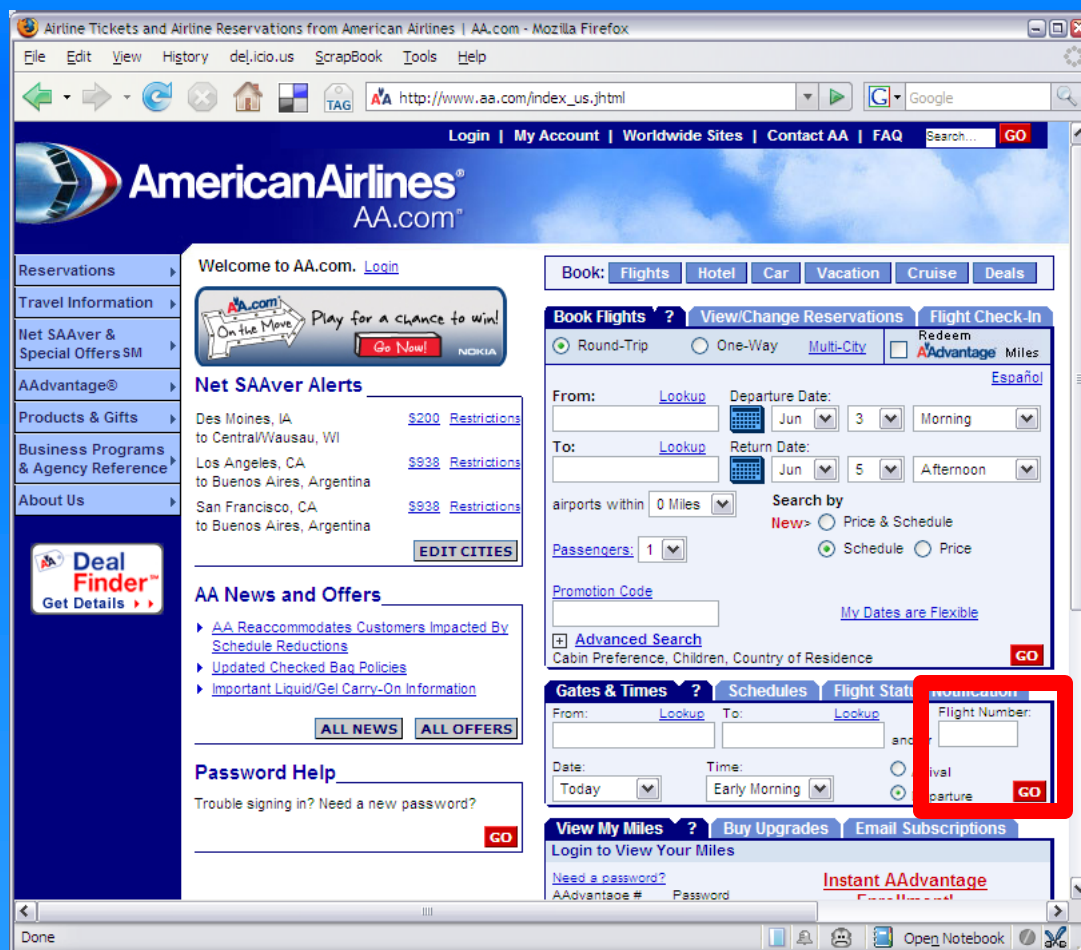
- Updates to baggage & standby
- View travel requirements and restrictions

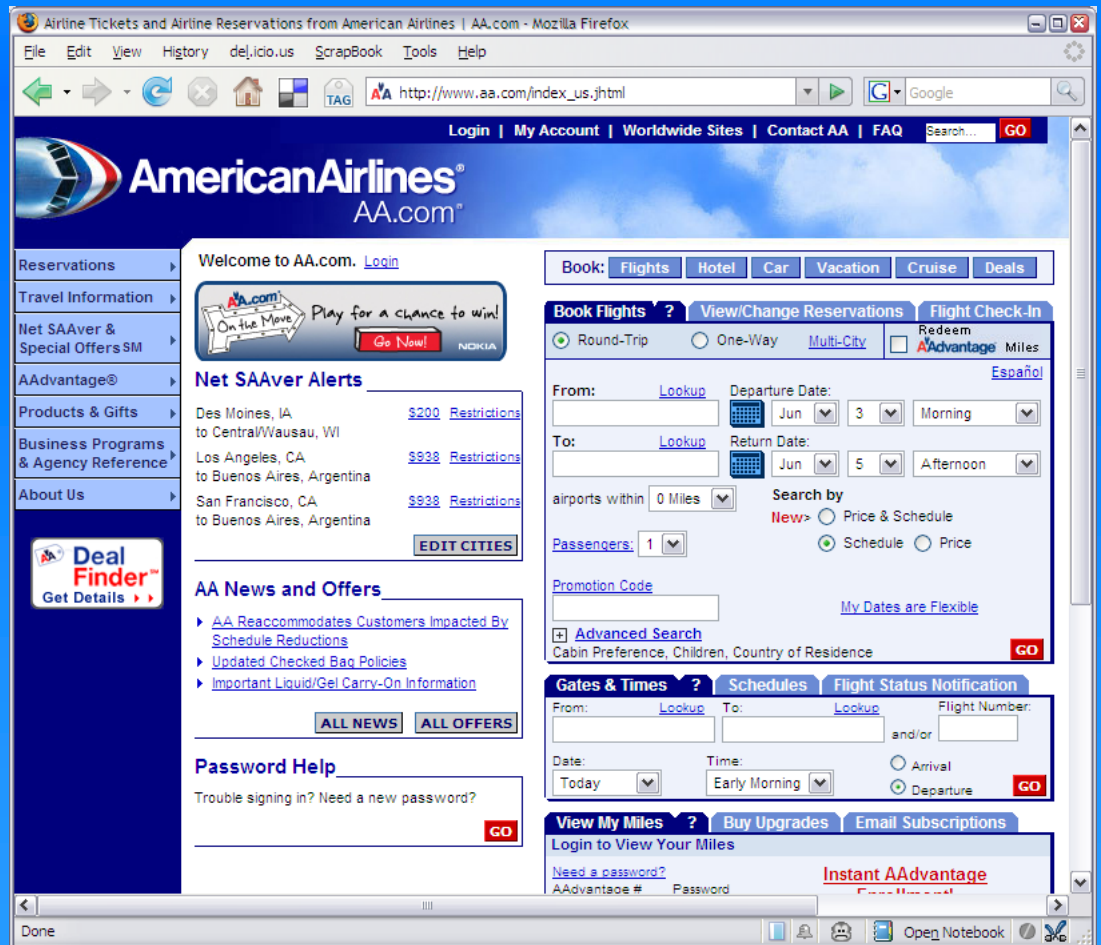
[Add more lea...](#)

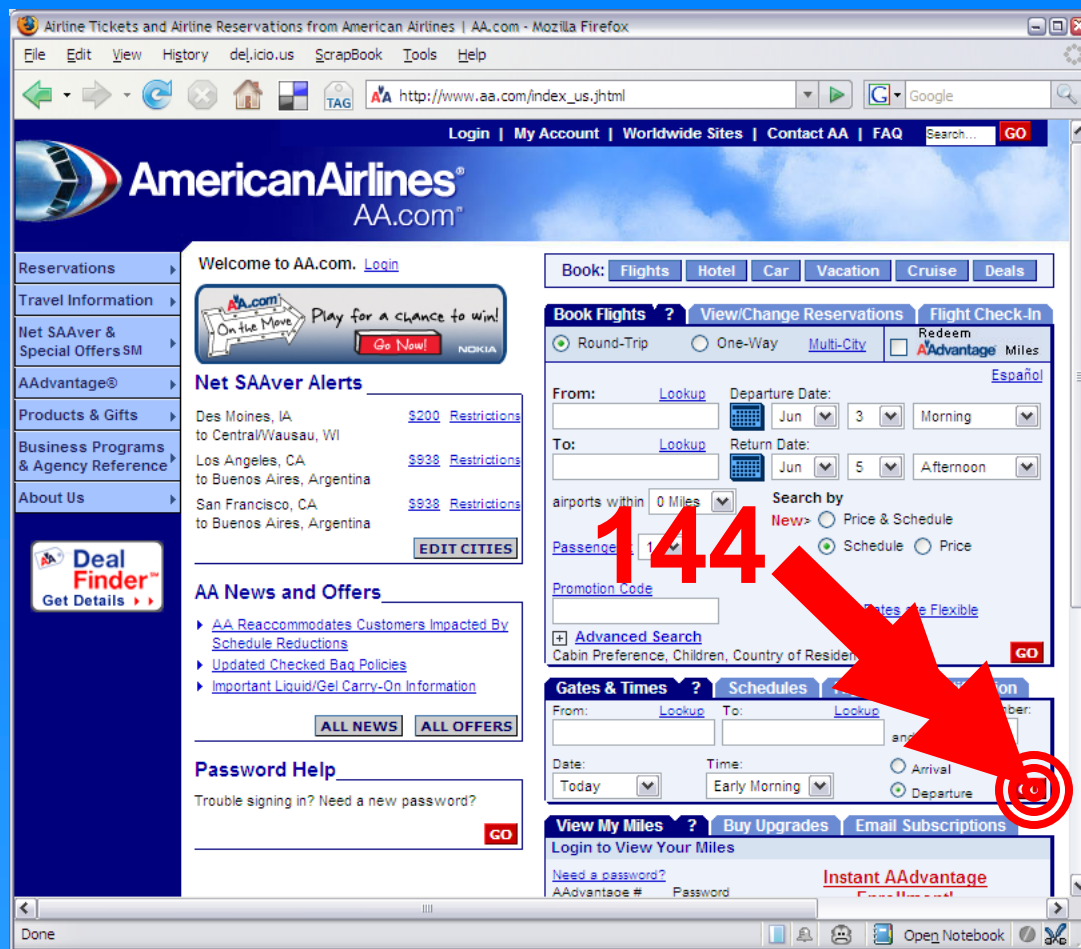
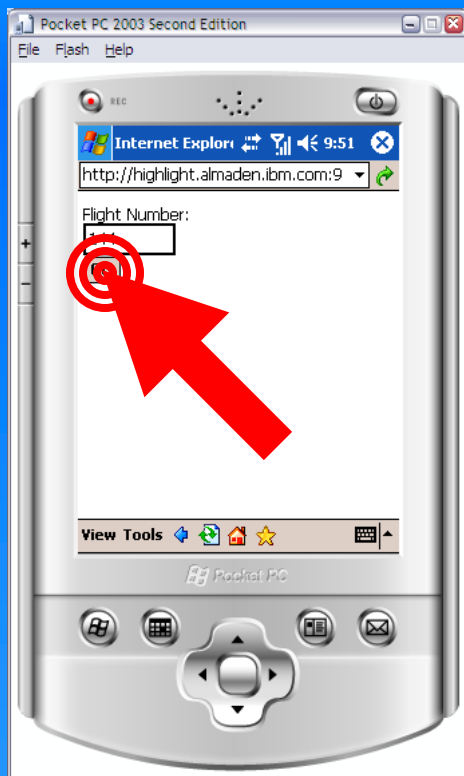
click the "Check-in" link

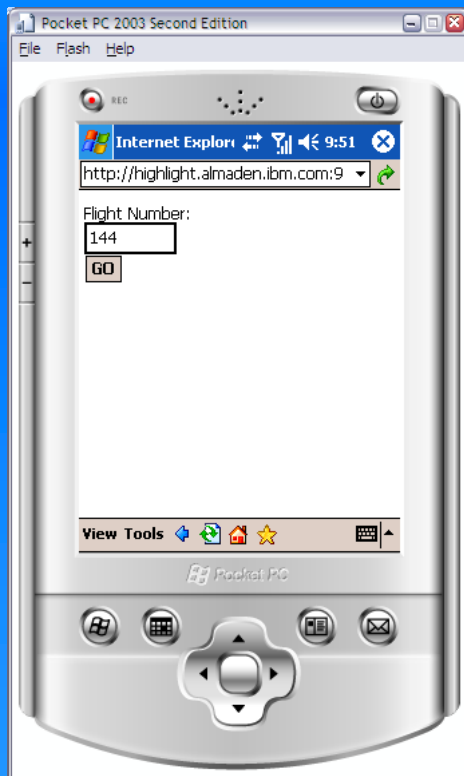
javascript:ff29click(2)

Remote Control Metaphor









Travel Information - Flight Information - Mozilla Firefox

File Edit View History del.icio.us ScrapBook Tools Help

http://www.aa.com/apps/travelInformation/SearchGateTime

Google

Home | Login | My Account | Worldwide Sites | Contact AA | FAQ Search... GO

American Airlines
AA.com

Flight Information

For Flight Status Notification:
Click Create

Modify Search

From: City or Airport Code To: City or Airport Code Flight Number: 144 and/or

Date: Today Time: Early Morning Choose Airline: AMERICAN AIRLINES

☒ Departure ☐ Arrival **RESUBMIT**

AMERICAN AIRLINES - Flight #144

FLIGHT STATUS - IN TRANSIT

Detailed Flight Information

Carrier	City	Date	Time			Terminal	Gate	Baggage Claim	Flight Status Notification
			Scheduled	Estimated	Actual				
AMERICAN AIRLINES	Departing								
	LAX Los Angeles	06/02/2008	3:50 PM		7:10 PM	T4	42A		
AMERICAN AIRLINES	Arriving								
	IAD Washington	06/02/2008	11:45 PM	2:37 AM			R11	13	

Did You Know?
You can also access flight status information using your [WAP phone](#), [two-way pager](#) or [wireless Palm device](#).

Contact [AA Reservations](#) for Flight Status information if American Airlines or American Eagle does not operate the flight.

Travel Help And Resources

Done

Open Notebook

Benefits

- Working at the interactive level lets authors work with what they can “see.”
- No need to understand underlying code or describe application with complex models
- Possible for end users, extensible by programmers
- If easy enough, allows users to create user interfaces that reflect their own needs and abilities

Drawbacks

- Always running original interface in the background
- Constrained by original design
- How to communicate those constraints to the author?

Highlight:

Mobilizing Existing Web Sites

Goals

Allow end users to create their own mobile “applications” for particular tasks

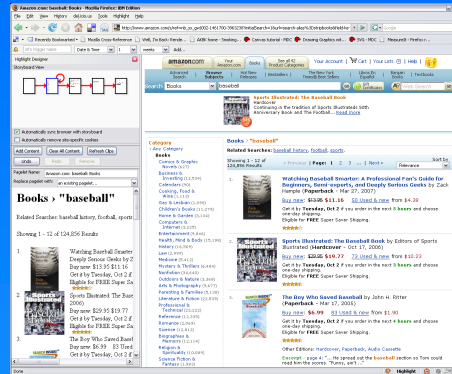
- No programming required
- Possible for any existing site
- All design decisions made by users

Allow programmers to extend capabilities of mobile applications

Highlight

mobile app designer
(browser extension)

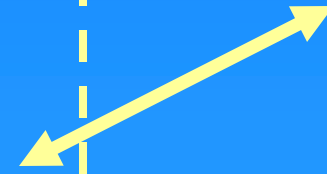
user



web
server



mobile user

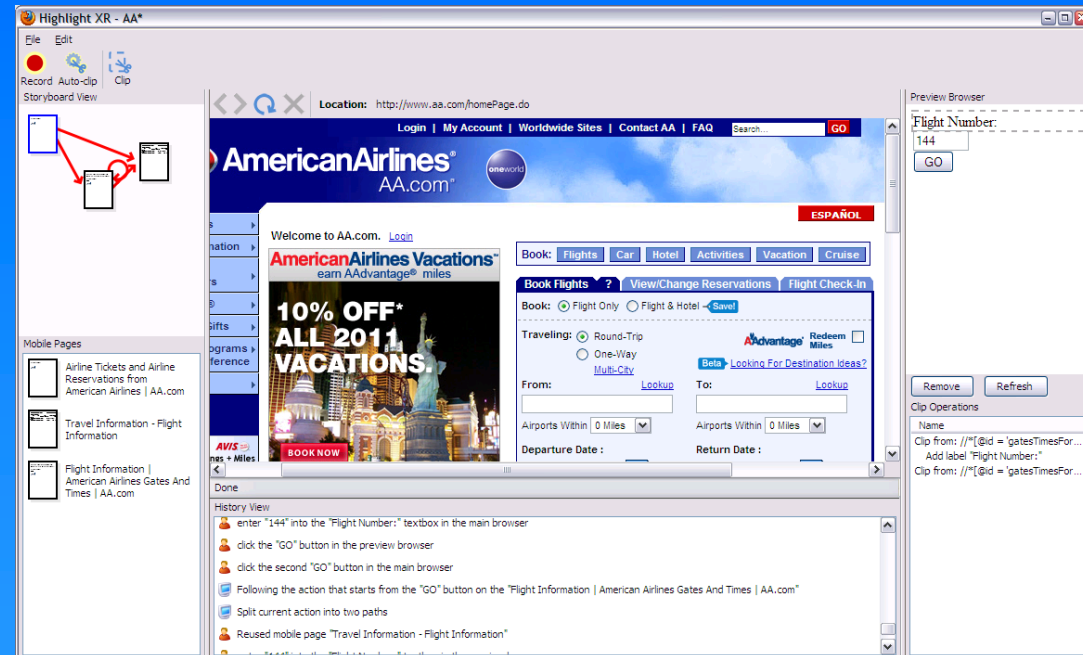


web server proxy browser
proxy server

How do end users create applications?

Highlight Designer

- Built using Firefox web browser
- Allows user to demonstrate a “trace” of interaction
- Direct manipulation tools
- Generalization allows creation of mobile apps with complex structure

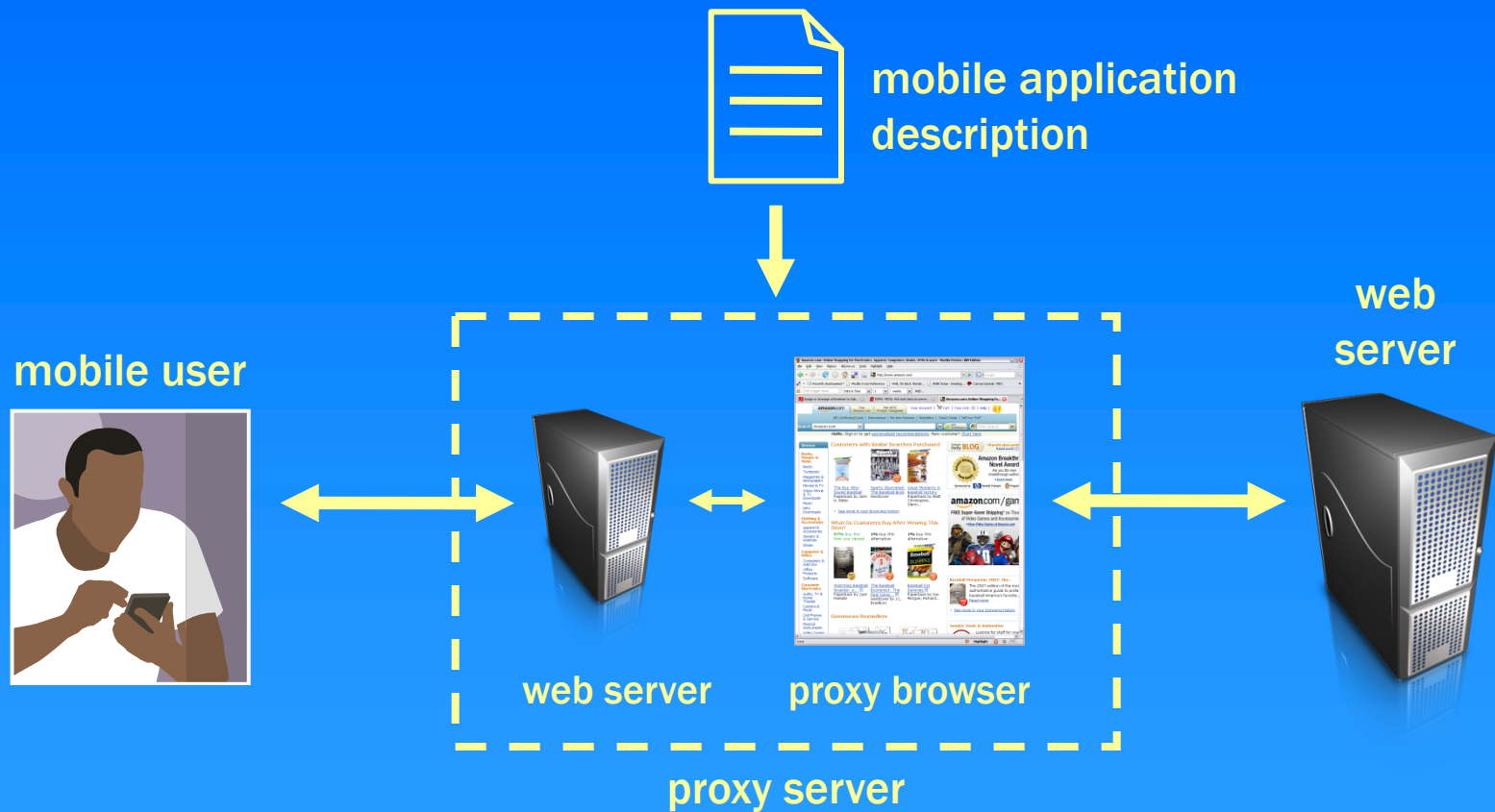


Demonstration

Ceiling on End User Authoring

- Complex page manipulations
- Sites with Ajax/dynamic JavaScript
- Adding new functionality
- Mashing up multiple sites

Highlight Server Architecture



Mobile Application Descriptions

Requirements

- Support end user authoring environment
- Increase possibilities through programming

Implementation

- Structured JavaScript
- Built on top of standard web APIs (e.g., DOM)
- Set of Highlight API methods to make programming with remote control metaphor easier

Writing Application Descriptions

End-user authoring environment generates JavaScript code in this format

- Programmers can edit this code to modify an app

We have written several apps from scratch

- BackpackIt.com To Do List
- BlueMail
- Fitday.com

Highlight Evaluation

- Breadth of possible applications
- Formative evaluations of authoring (end user and programming)
- Code analysis

Breadth of possible applications

Created applications from a variety of different sites

- AA.com
- Amazon.com
- Google Image Search
- Mapquest.com
- SFGate.com
- Weather.com
- Ebay
- Fitday.com
- Buy.com
- Barnes & Noble.com
- IBM internal directory (BluePages)
- ...

Formative evaluation – End User

Goals

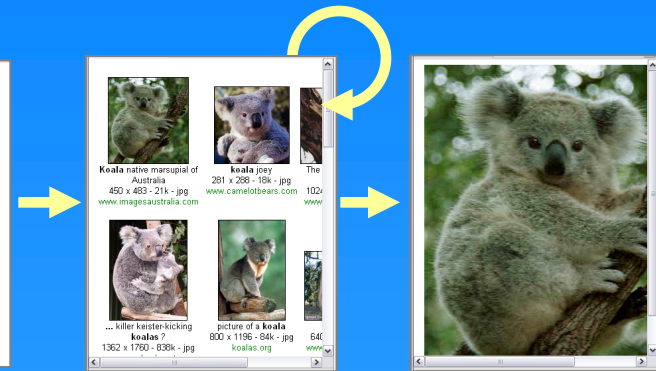
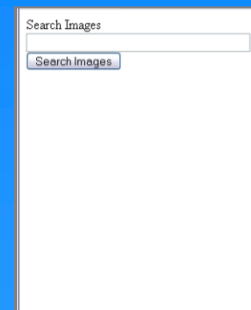
- Will users understand how to interact with the system?
- Can they create applications of their own?

Three subjects from our research lab

- Not regular users of mobile web
- All able to recall instances in which they wished they could access the web in a mobile setting

Procedure

- Brief verbal introduction to the system
- Asked users to create two mobile applications of our choice:
 - Mapquest.com
 - Google Image Search —
- Asked users to brainstorm their own mobile app idea and then try to implement it



Results

- All subjects were able to build the first two applications
- Definite learning curve
 - When is human interaction required vs. when will the system do something smart?
 - Users formed a clearer model with use

Results, cont.

Subject-chosen applications:



SF Chronicle's Bargain Bites



Weather.com 10-day Forecast



www.beatthetraffic.com

Formative evaluation – Programmer

Goals

- Will programmers understand the concepts/API?
- Can they create applications of their own?

Two subjects from our research lab

- Not regular users of mobile web
- Experienced web programmers (JavaScript, DOM, etc.)

Procedure

- 1 hour verbal introduction to the system
- Provided with programmer guide
 - Complete Backpack todo list example with source code
 - API reference
- Provided with choice of authoring/debugging tools
 - Eclipse Web Tools Platform editor, Firebug, Venkman
- Asked users to brainstorm their own mobile app idea and then try to implement it

Results

Subject-chosen applications:



CBS 5 Traffic Reports



Facebook Status

Results, cont.

- All subjects were able to build their chosen application
- Typical problems of learning a new API
 - What methods are available? How are they used?
- Conceptual model of remote control not immediately intuitive
- Clip/event method grouping does not match expectations of web programmers

Mobile App Code Numbers

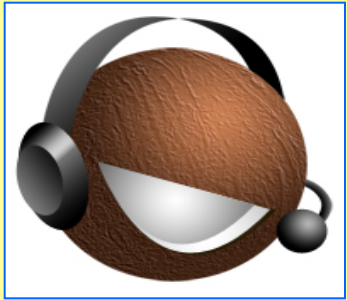
Application Name	# of Pagelets	Lines	Average Lines/Pagelet	Average Clip Lines/Pagelet
BluePages*	5	353	69.40	44.80
Google Image Search*	3	130	41.00	27.00
AEO Store Locator*	2	81	37.00	27.50
BlueMail	3	127	36.33	22.00
AA Flight Tracker*	3	112	35.33	22.33
Home Depot Store Finder*	2	73	33.00	24.00
Traffic #2*	1	33	26.00	26.00
Traffic #1	3	58	18.33	15.67
Facebook Status	4	59	14.75	7.50
BackPack To-Do	3	46	14.33	5.67

* Indicates some code automatically generated by our end-user authoring tool

Conclusion

Mobile applications *can* be created by re-authoring existing web sites

- Demonstrational interface is quite powerful
- Proxy browser/remote control metaphor allows re-authoring of sites with AJAX and dynamic JavaScript
- Evaluation demonstrates end users and programmers can create mobile applications
- Low floor and high ceiling



CoCo:

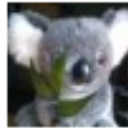
A Conversational Interface to the Web

The CoCo research vision

- Explore the use of conversational user interfaces to web-based tasks
- *Design and build* intelligent agents that:
 - **Interact** with the web on a user's behalf
 - **Converse** with the user to clarify meaning
 - **Learn** new knowledge over time
 - Are **personalized** for a user's needs
- Goal: improve user productivity and increase access to information technology through simpler interfaces

CoCo does things
for you on the web

twitter



user @coco4532 get employee phone number for name Jeffrey W
Nichols
2 minutes ago

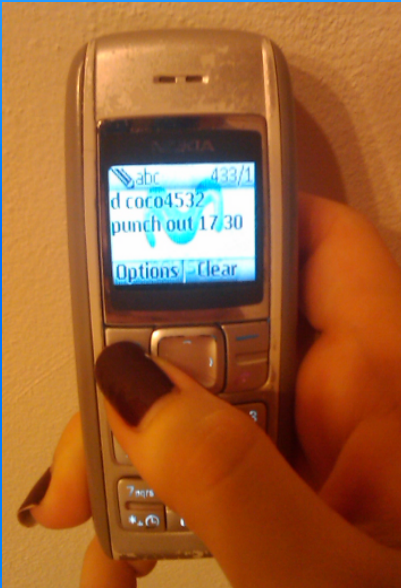


And tells you the
result

twitter



coco4532 @user 1-408-927-1172
less than 10 seconds ago



Alice: punch out 17 30

CoCo: Extracted this script from your logs:

Go to timecard.com/cocompany, enter your password into the textbox, click Go...

Run it?

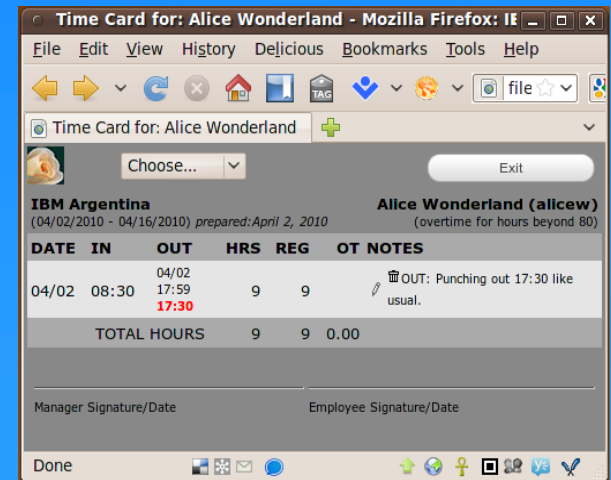
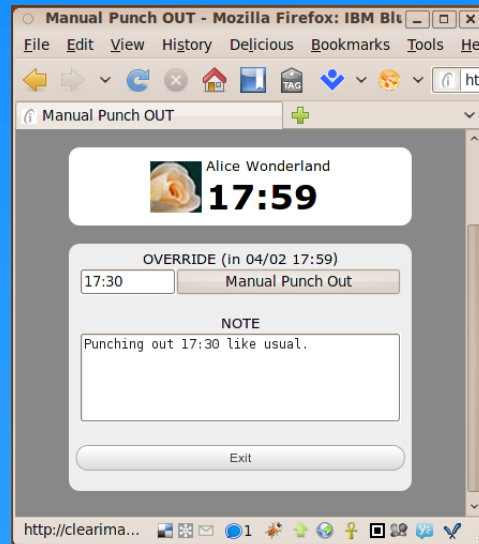
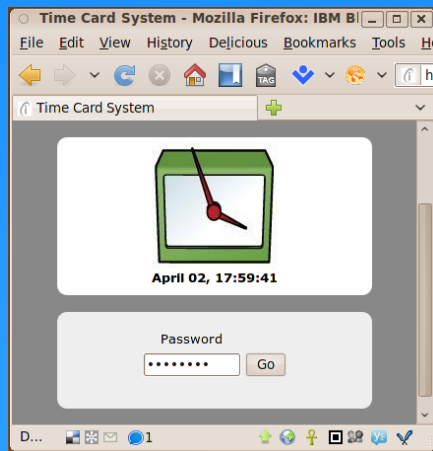
Alice: yes

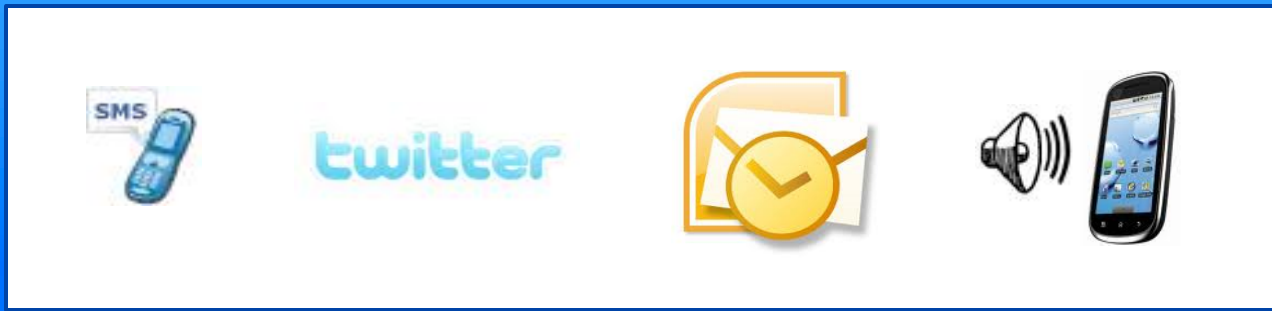
CoCo: I don't know what "password" to use

Alice: punch out 17 30 using alice00 as password

CoCo: I will run your script using params
password=alice00

CoCo: 17:30 Exit





CoScripter



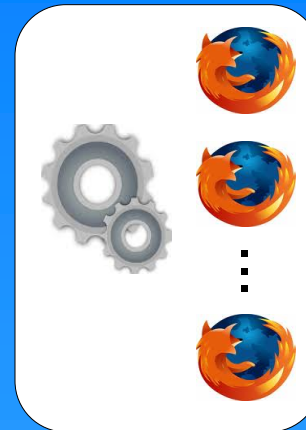
scripts



CRH
(browser logs)



Highlight



clips



Task knowledge



Web automation

Two paths to determining process:

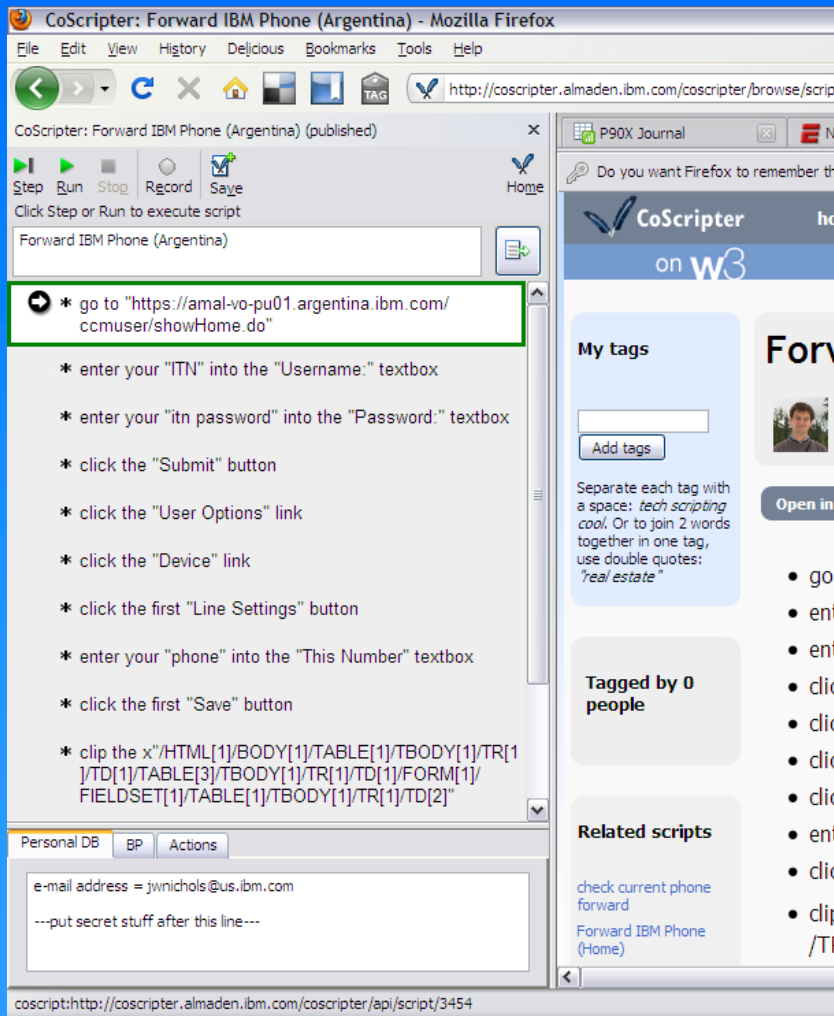
Automatic

- System finds existing script in database or infers script from web history
- Content is clipped based on heuristics matching original command

Manual (“re-authoring”)

- User creates a script in CoScripter
- Specifies parameters as “personal database” values
- Specifies “clip” commands to return information

Re-authoring with CoCo



Current Situation

- Record in CoScripter
- Xpaths generated by user (e.g. Firebug)

Future Work

- What's a better design?
- Can it be a interactive "teaching"-like process?

Conclusion

- An intelligent conversational assistant for the web
- Performs tasks for users thru a simple textual interface
- Can determine how to execute tasks without explicit teaching, using a database of scripts and the user's web history
- Can be explicitly taught through a “re-authoring” process, though more refinement work is needed

“Re-authoring” Conclusions

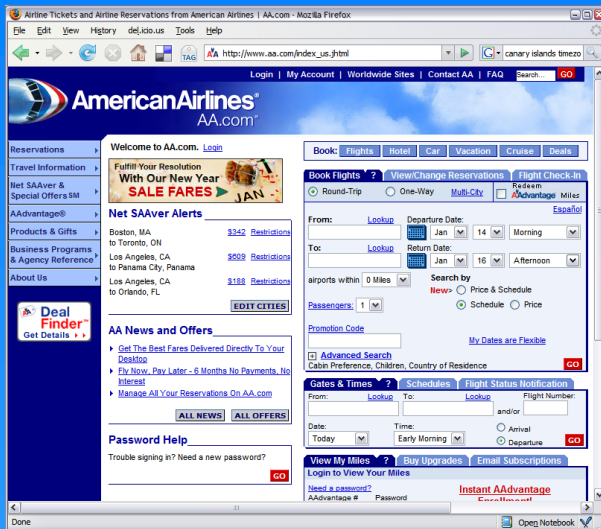
Re-authoring

- Designing on top of the existing interface works
- Highlight and CoCo enable re-authoring the web in different ways
- Re-authoring possible by End Users, and extensible by Programmers

Future Work

- Design of re-authoring tools
- Re-authoring to very different interaction styles
- Partial re-authoring
- Bridge from re-authoring to re-coding

Re-authoring to very different interaction styles



Future Work

- Design of re-authoring tools
- Re-authoring to very different interaction styles
- Partial re-authoring
- Bridge from re-authoring to re-coding

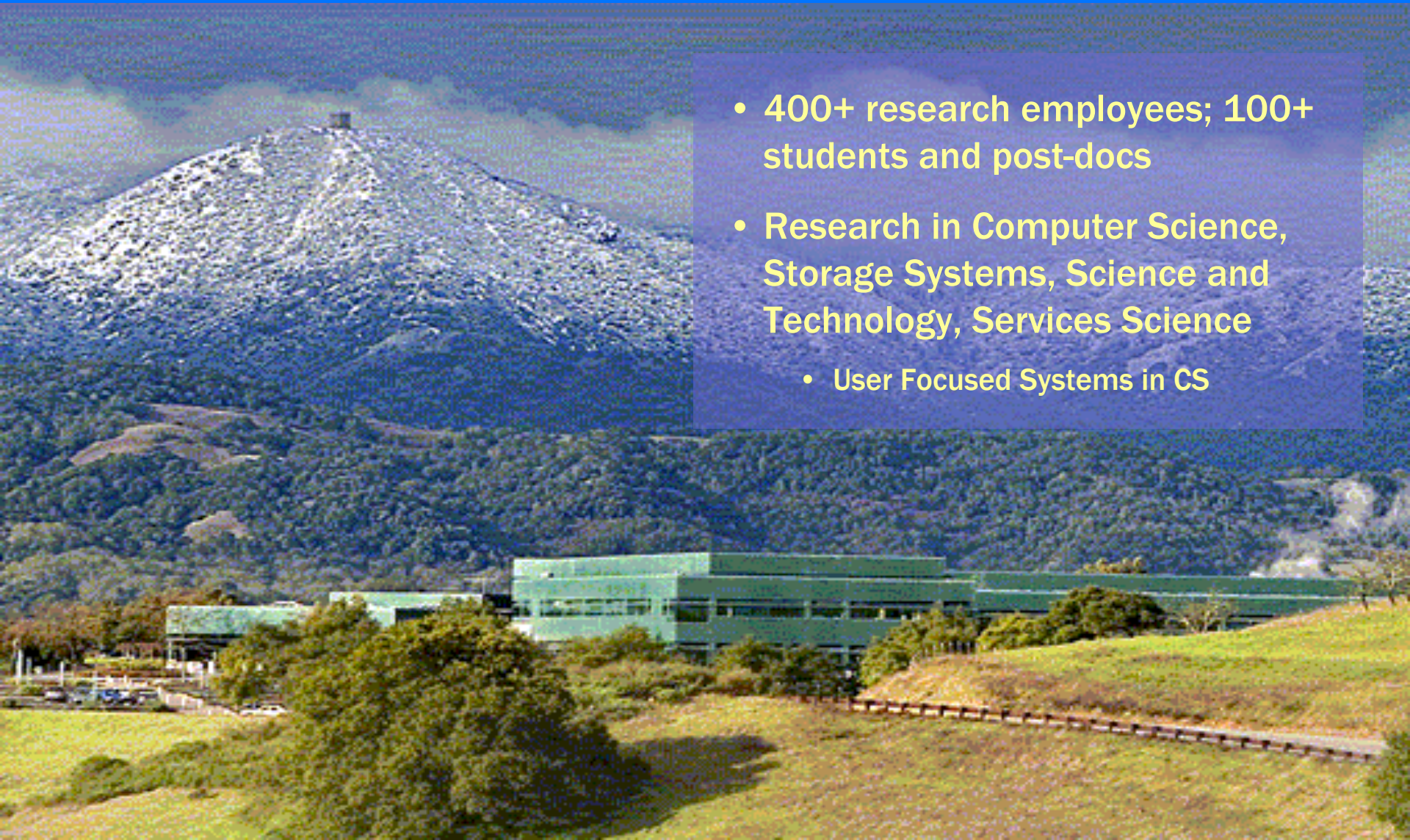
Thanks!

jwnichols@us.ibm.com

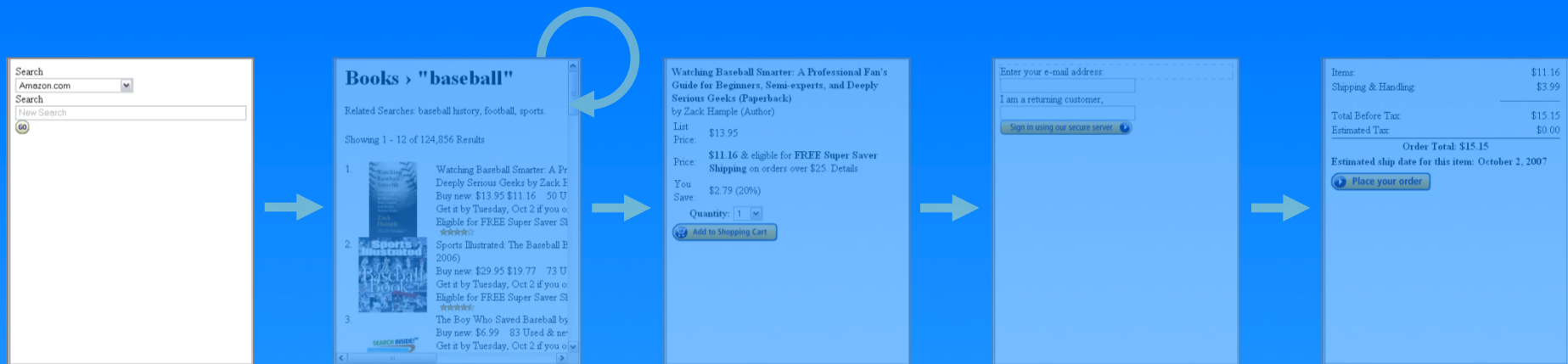
<http://www.jeffreynichols.com/>

IBM Research – Almaden

- 400+ research employees; 100+ students and post-docs
- Research in Computer Science, Storage Systems, Science and Technology, Services Science
 - User Focused Systems in CS



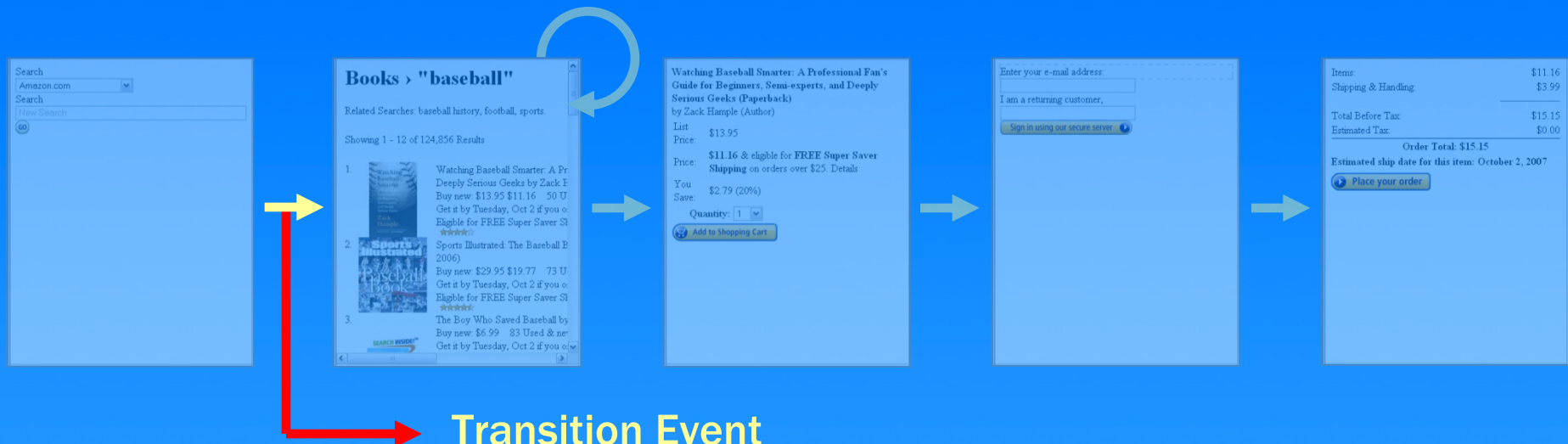
Stored model of a mobile app



Set of Content Operations

- Clip <item> from browser page into mobile page
- Move item within mobile page
- Delete item from mobile page
- Add new content to mobile page (e.g. label)

Stored model of a mobile app

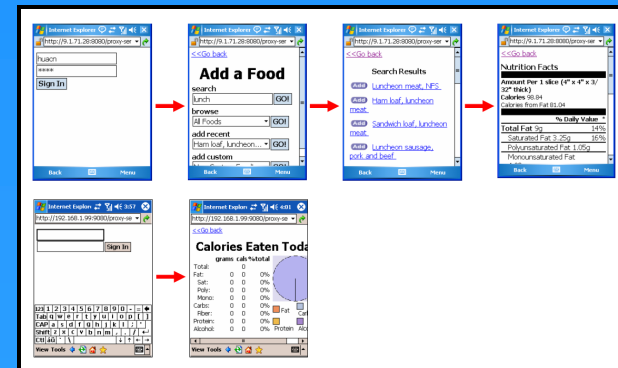
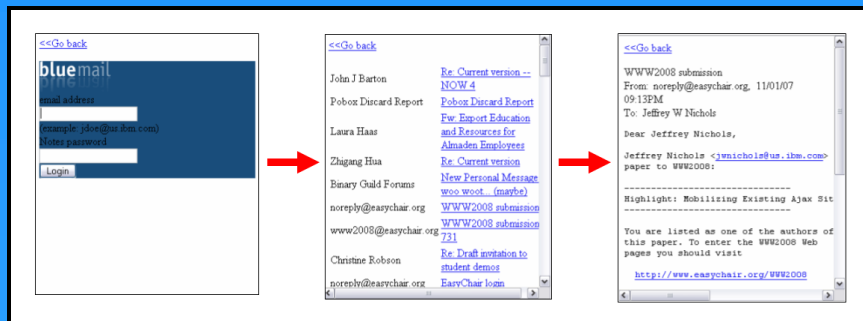
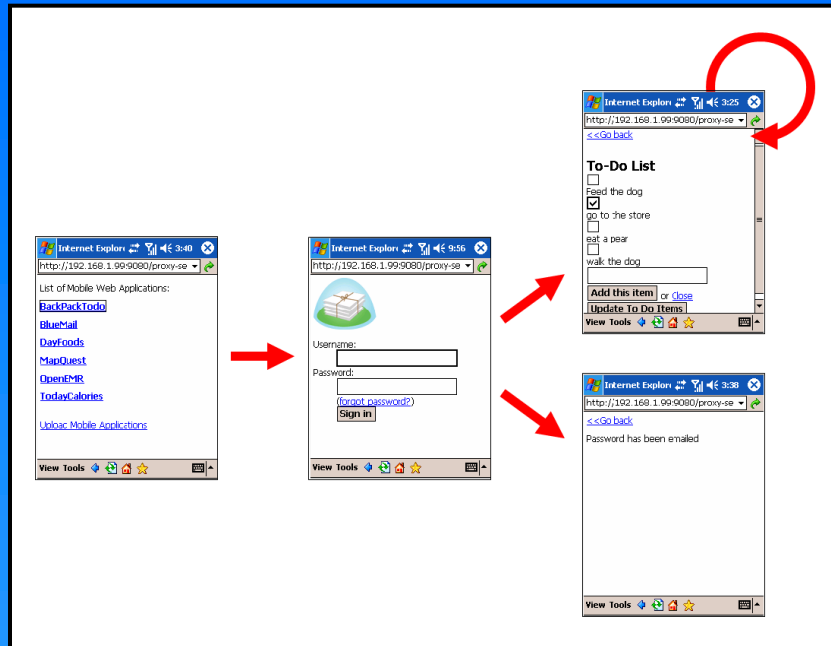


- Interaction on the mobile page that advances to next mobile page
- Corresponding interactions to execute in the browser to reach content for next mobile page
- Pointer to next set of content operations

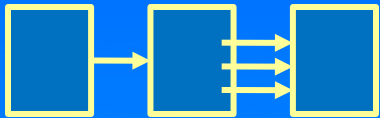
Breadth and Benefits

Description	Interactive Elements		Size (kB)		Percent Size
	Orig	Hilght	Orig	Hilght	
Check status of AA flight	736	3	711	3.6	0.5%
Update Facebook status	217	5	296	0.5	0.2%
Find nearby Wi-fi hotspot	74	18	1072	2.8	0.3%
Get weather in my area	486	6	1079	7	0.6%
Sprint cellphone usage	175	6	739	4.6	0.6%
Log today's exercise	128	4	393	0.9	0.2%
Update Fitday food diary	169	38	145	12.7	8.8%
Get calories for food	88	16	63	11.5	18.3%
Real estate in my area	274	35	1036	194.1	18.7%
Show trip itineraries	77	17	726	42.7	5.9%
Find Amazon book price	823	4	844	4.1	0.5%

Highlight Programmed Applications



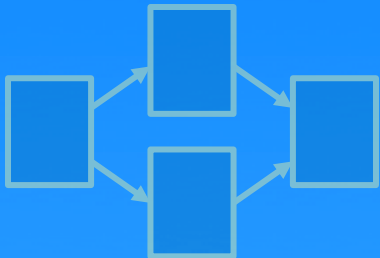
Common Page Structures



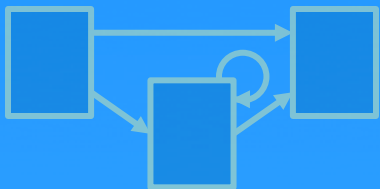
Query/results/detail



Multiple result pages



Diverge/converge



Query/error/result

Link generalization



Link generalization, cont.

The screenshot shows a Mozilla Firefox browser window displaying the Amazon.co.uk website. The address bar shows the URL: `http://www.amazon.co.uk/s/ref=nb_ss_w_h?url=search-alias%3Dstripbooks&field-keywords=user+interfa`. The page title is "Amazon.co.uk: user interfaces: Books - Mozilla Firefox".

A "Generalize?" dialog box is open in the center of the screen. It contains the text: "Highlight has detected that this action is similar to your previous actions that led to pagelet2. Should Highlight automatically generalize your action?". The "Yes" button is highlighted with a red rectangle.

The background page shows the Amazon.co.uk homepage with the "Books" category selected. The search results for "user interfaces" are displayed, showing 1 - 12 of 3,617 Results. The first result is "User Interface Design for Programme" by Joel Spolsky and Dave Winer (Paperback - 1 May 2001). The second result is "Designing the User Interface: Strategy for Effective Human-Computer Interaction" by Ben Shneiderman and Catherine Plaisant (Paperback - 6 May 2004), which is highlighted with a red rectangle.

The left sidebar shows the "Highlight Designer" tool with a storyboard view and a list of actions: "Add Content", "Clear All Content", "Refresh Clips", "Undo", "Redo", and "Remove". The "Pagelet Name" is "Amazon.co.uk: user interfaces: Books" and the "Replace pagelet with" dropdown is set to "an existing pagelet...".

Link generalization, cont.

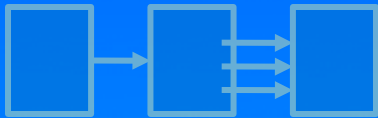
/HTML[1]/.../TBODY[1]/TR[2]/TD[1]/A[1]

/HTML[1]/.../TBODY[1]/TR[1]/TD[1]/A[1]

Link generalization, cont.

/HTML[1]/.../TBODY[1]/TR[*]/TD[1]/A[1]

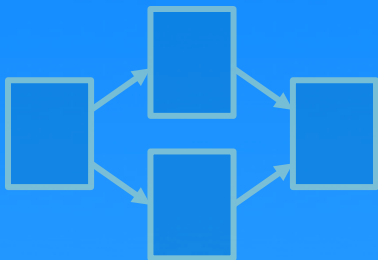
Common Page Structures



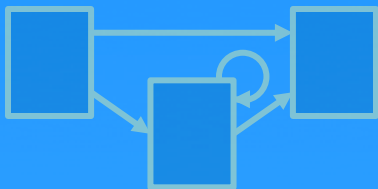
Query/results/detail



Multiple result pages



Diverge/converge



Query/error/result

Mobile Page Re-use

The screenshot shows a Mozilla Firefox browser window displaying the Amazon.co.uk website. The address bar shows the URL: http://www.amazon.co.uk/s/ref=nb_ss_w_h_/202-9593418-5739836?url=search-alias%3Dstripbooks&field-. The browser window has a menu bar (File, Edit, View, History, Bookmarks, Tools, Highlight, Help) and a toolbar with navigation buttons and a search bar.

On the left side of the browser window, a "Highlight Designer" storyboard window is open, showing a sequence of five frames connected by arrows. The first frame is highlighted with a blue border. Below the storyboard, there are checkboxes for "Automatically sync browser with storyboard" and "Automatically remove site-specific cookies", both of which are checked. There are also buttons for "Add Content", "Clear All Content", "Refresh Clips", "Undo", "Redo", and "Remove".

The main content area of the browser window shows the Amazon.co.uk website. The header includes the Amazon logo, a greeting "Hello. Sign in to get personalised recommendations. New Customer? Start here.", and a navigation bar with links like "Your Amazon.co.uk", "Deals of the Week", "Gift Certificates", "Gifts & Wish Lists", and "Your". The search bar contains the text "user interfaces". Below the search bar, there are tabs for "All Departments", "Books", "Advanced Search", "Browse Genres", "New & Future Releases", "Bestsellers", "Paperbacks", "Audio Books", "Bargain Books", and "Special Offers".

The search results for "user interfaces" are displayed. The first result is "A Comparison of Cell Phone User Interface Design" by Jhangiani, published on 16 April 2008. The price is £45.00, and the current price is £42.75, saving £2.25 (5%). The second result is "User Interface Design and Evaluation" by Stone, Jarrett, Woodroffe, and Shai, published on 29 April 2005. The price is £39.99, and the current price is £32.79, saving £7.20 (18%). The third result is "DirectX 9 User Interfaces: Design and Implementation" by Alan Thorn, published on 10 April 2005. The price is £29.99, and the current price is £21.92, saving £8.07 (27%).

A red box highlights the "Next" button in the pagination controls, which are located below the search results. The pagination controls show "Showing 1 - 12 of 4,614 Results" and "Page: 1 2 3 ... Next".

Mobile Page Re-use

The screenshot shows a Mozilla Firefox browser window displaying the Amazon.co.uk website. The address bar shows the URL: http://www.amazon.co.uk/user-interfaces-Books/s/ref=sr_pg_2?ie=UTF8&rs=266239&keywords=user%20. The search bar contains the text "user interfaces".

On the left side of the browser window, there is a sidebar for a mobile application storyboard. The sidebar has a "Storyboard View" section with a sequence of five page icons connected by arrows. Below this, there are checkboxes for "Automatically sync browser with storyboard" and "Automatically remove site-specific cookies". There are also buttons for "Add Content", "Clear All Content", "Refresh Clips", "Undo", "Redo", and "Remove".

The "Pagelet Name" is set to "Amazon.co.uk: baseball: Books". The "Replace pagelet with:" dropdown menu is set to "an existing pagelet...".

The main content area of the browser shows the Amazon.co.uk homepage. The search results for "user interfaces" are displayed, showing 13 to 24 of 4,614 results. The first result is "Learning the Yahoo! User Interface Library (Paperback - 31 Mar 2008)" by Peter Dinkley, priced at £27.99 (reduced to £26.59). The second result is "The Elements of User Interface Design by (Paperback - 7 Mar 1997)" by Alan Cooper, priced at £28.99 (reduced to £26.59). The third result is "Observing the User Experience: A Practitioner's Guide to User Experience" by Mike Kuniavsky, priced at £33.99 (reduced to £32.29).

The sidebar also includes a "Search Inside Books:" section with a search bar containing "user interfaces" and a "GO!" button. Below this, there is a "Category" section with a list of categories and their respective book counts: Computers & Internet (4,363), Study Books (3,223), Science & Nature (431), Scientific, Technical & Medical (196), Society, Politics & Philosophy (91), Business, Finance & Law (287), Sports, Hobbies & Games (38), Art, Architecture & Photography (103), Reference (144), Health, Family & Lifestyle (85), and Children's Books (85).

Mobile Page Re-use

The screenshot displays a Mozilla Firefox browser window with the address bar showing the URL: http://www.amazon.co.uk/user-interfaces-Books/s/ref=sr_pg_2?ie=UTF8&rs=266239&keywords=user%20. The browser's menu bar includes File, Edit, View, History, Bookmarks, Tools, Highlight, and Help. The toolbar features navigation buttons (back, forward, home, stop, reload) and a search bar with the Google logo.

On the left side, a 'Highlight Designer' sidebar is open, showing a 'Storyboard View' with a sequence of five pagelets connected by arrows. Below this, there are checkboxes for 'Automatically sync browser with storyboard' and 'Automatically remove site-specific cookies'. A section with buttons includes 'Add Content', 'Clear All Content', 'Refresh Clips', 'Undo', 'Redo', and 'Remove'. The 'Pagelet Name' field is set to 'Amazon.co.uk: baseball: Books'. The 'Replace pagelet with:' dropdown menu is open, showing a list of pagelets for reuse, with 'Amazon.co.uk: baseball: Books' highlighted. Below the dropdown, there is a text area that says 'This area will show the page in the application and continue creating...' and a list of instructions: 'Navigate to the window', 'Use the Add Content button above to add content from the current page to your mobile application.', and 'Select a previous existing pagelet to use'.

The main content area of the browser shows the Amazon.co.uk homepage. The header includes the Amazon logo, a sign-in prompt, and navigation links for 'Your Amazon.co.uk', 'Deals of the Week', 'Gift Certificates', and 'Gifts & Wish Lists'. A search bar is present with the text 'Books' and 'user interfaces'. Below the search bar, there are links for 'Shop All Departments', 'Advanced Search', 'Browse Genres', 'New & Future Releases', 'Bestsellers', 'Paperbacks', 'Audio Books', and 'Bargain Books'. The search results for 'user interfaces' are displayed, showing 13 to 24 of 4,614 results. The first result is 'Learning the Yahoo! User Interface Library (Paperback - 31 Mar 2008)' by Robert Romano, priced at £27.99 (reduced to £26.59). The second result is 'The Elements of User Interface Design by (Paperback - 7 Mar 1997)' by Alan Cooper, priced at £28.99 (reduced to £26.59). The third result is 'Observing the User Experience: A Practitioner's Guide to User Interface Design' by Mike Kuniavsky, priced at £33.99 (reduced to £32.29).

Mobile Page Re-use

Amazon.co.uk: user interfaces: Books - Mozilla Firefox

File Edit View History Bookmarks Tools Highlight Help

http://www.amazon.co.uk/user-interfaces-Books/s/ref=sr_pg_2?ie=UTF8&rs=266239&keywords=user%20

Getting Started Latest Headlines

Highlight Designer Storyboard View

Storyboard View

Amazon.co.uk

Hello. Sign in to get personalised recommendations. New Customer? Start here. We've a look.

Your Amazon.co.uk Deals of the Week Gift Certificates Gifts & Wish Lists

Shop All Departments

Search Books user interfaces GO

Books Advanced Search Browse Genres New & Future Releases Bestsellers Paperbacks Audio Books Bargain Books

Search Inside Books: user interfaces GO

What's this? Search Inside! allows you to search millions of pages to find exactly the book you want to buy.

Category < Any Category Books

Computers & Internet (4,363)
Study Books (3,223)
Science & Nature (431)
Scientific, Technical & Medical (196)
Society, Politics & Philosophy (91)
Business, Finance & Law (287)
Sports, Hobbies & Games (38)
Art, Architecture & Photography (103)
Reference (144)
Health, Family & Lifestyle (85)
Children's Books (85)

Books > "user interfaces"

Showing 13 - 24 of 4,614 Results < Previous Page: 1 2 3 ... | N

13. Learning the Yahoo! User Interface Library (Paperback - 31 Mar 2008)
Buy new: £27.99 £26.59 15 Used & new from £26.59
You save: £1.40 (5%)
Get it by **Wednesday, Jun 4** if you order in the next 10 hours. Eligible for **FREE** Super Saver Delivery.

14. The Elements of User Interface Design by Alan Cooper (Paperback - 7 Mar 1997)
Buy new: £28.99 £26.59 30 Used & new from £26.59
You save: £2.40 (8%)
Get it by **Wednesday, Jun 4** if you order in the next 10 hours. Eligible for **FREE** Super Saver Delivery.
★★★★★ (9)

15. Observing the User Experience: A Practitioner's Guide to User Experience by Mike Kuniavsky (Paperback - 10 Mar 2003)
Buy new: £33.99 £32.29 40 Used & new from £32.29

Pagelet Name: Amazon.co.uk: baseball: Books

Replace pagelet with: an existing pagelet...

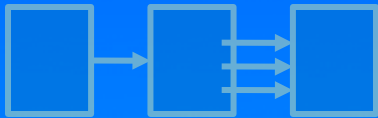
Books > "user interfaces"

Showing 13 - 24 of 4,614 Results

13. Learning the Yahoo! User Interface Library (Paperback - 31 Mar 2008)
Buy new: £27.99 £26.59
You save: £1.40 (5%)

Done

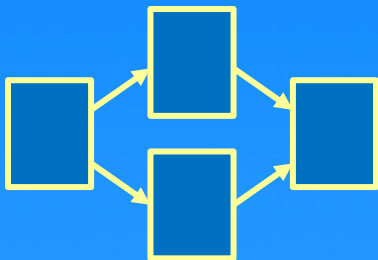
Common Page Structures



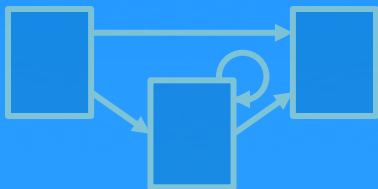
Query/results/detail



Multiple result pages

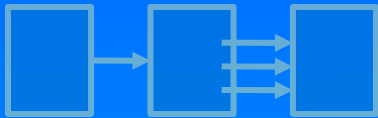


Diverge/converge



Query/error/result

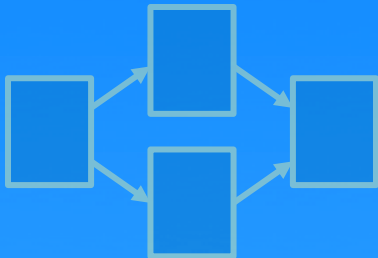
Common Page Structures



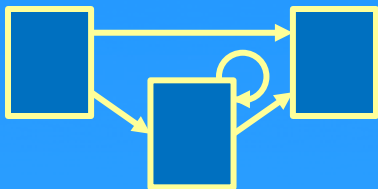
Query/results/detail



Multiple result pages



Diverge/converge



Query/error/result

Testing for Different Content

The screenshot shows the Amazon.co.uk website in a Mozilla Firefox browser window. A storyboard overlay is visible on the left side of the browser, indicating a sequence of page layouts for testing. The storyboard consists of five frames connected by arrows, with the second frame highlighted in blue. Below the storyboard, there are checkboxes for "Automatically sync browser with storyboard" and "Automatically remove site-specific cookies", both of which are checked. There are also buttons for "Add Content", "Clear All Content", "Refresh Clips", "Undo", "Redo", and "Remove". The "Pagelet Name" is set to "Amazon.co.uk: low prices in Electronics, Books, I" and the "Replace pagelet with" dropdown is set to "an existing pagelet...". The "Search in" dropdown is set to "Amazon.co.uk" and the "Search for" field is empty.

Amazon.co.uk: low prices in Electronics, Books, Music, DVDs & more - Mozilla Firefox

File Edit View History Bookmarks Tools Highlight Help

http://www.amazon.co.uk/

Getting Started Latest Headlines

Highlight Designer
Storyboard View

Amazon.co.uk

Hello. Sign in to get [personalised recommendations](#). New Customer? [Start here](#). [We've a look](#)

Your Amazon.co.uk Deals of the Week Gift Certificates Gifts & Wish Lists

Search Amazon.co.uk GO

Huge Stock Clearance
1000s of low prices

Shop All Departments

- Books
- Music, DVD & Games
- Electronics & Computing
- Home & Garden
- Toys, Children & Baby
- Jewellery & Watches
- Shoes & Accessories
- Sports & Leisure
- Health & Beauty

Check This Out

- Huge Stock Clearance**
1000s of low prices across all our stores.
- Health & Beauty**
Visit our new store today.
- Festival CDs**
Summer Festivals 2008
Your guide to the summer festivals.
- High-Def 101**
Learn all you need

DVD
Up to **75% off**

Books
From **£1**

Camera & Photo
Up to **30% off**

Shoes & Accessories
Up to **65% off**

Housewares
Up to **50% off**

Video Games
Up to **60% off**

Office & Computing
Up to **33% off**

Sports & Leisure
Up to **60% off**

Portable Audio & Accessories
Up to **50% off**

Toys & Games
Up to **75% off**

Music
From **£3.96**

Watches
Up to **70% off**

Done

Testing for Different Content

Amazon.co.uk: hurkle durkle burkle - Mozilla Firefox

File Edit View History Bookmarks Tools Highlight Help

http://www.amazon.co.uk/s/ref=nb_ss_w_h_/026-0416160-8537248?url=search-alias%3Daps&field-keywo Google

Getting Started Latest Headlines

Highlight Designer
Storyboard View



☒ Automatically sync browser with storyboard
☒ Automatically remove site-specific cookies

Add Content Clear All Content Refresh Clips

Undo Redo Remove

Pagelet Name: Amazon.co.uk: hurkle durkle burkle

Replace pagelet with: an existing pagelet...

amazon.co.uk Hello. Sign in to get personalised recommendations. New Customer? Start here. We've a look.

Your Amazon.co.uk Deals of the Week Gift Certificates Gifts & Wish Lists

Shop All Departments Search Amazon.co.uk hurkle durkle burkle GO

Welcome International Gift Certificates Sell Your Stuff Deals Of The Week Har

Category Any Category

Your search "hurkle durkle burkle" did not match any products

Bestsellers



Devil May Care (James Bond)
Hardcover by Sebastian Faulks



A History of Modern Britain
Paperback by Andrew Marr

> See more Bestsellers

SPONSORED LINKS (What is this?)

[SUPERFICI finishing lines](#)
www.scmhitech.co.uk ■ Spraying , Roller coating Application and d

[Cabela's - Fishing](#)
www.Cabelas.com ■ Shop Cabela's for fishing gear for Dad. 100%

Done

Testing for Different Content

Amazon.co.uk: hurkle durkle burkle - Mozilla Firefox

File Edit View History Bookmarks Tools Highlight Help

http://www.amazon.co.uk/s/ref=nb_ss_w_h_/202-0947725-9875036?url=search-alias%3Daps&field-keywo Google

Getting Started Latest Headlines

Highlight Designer

Storyboard View

☒ Automatically sync browser with storyboard
☒ Automatically remove site-specific cookies

Add Content Clear All Content Refresh Clips

Undo Redo Remove

Pagelet Name: Amazon.co.uk: hurkle durkle burkle

Replace pagelet with: an existing pagelet...

Your search "hurkle durkle burkle" did not match any products.

Search in
Amazon.co.uk

Search for
hurkle durkle burkle

amazon.co.uk Hello. Sign in to get personalised recommendations. New Customer? Start here. We've a look.

Your Amazon.co.uk Deals of the Week Gift Certificates Gifts & Wish Lists

Shop All Departments Search Amazon.co.uk hurkle durkle burkle GO

Welcome International Gift Certificates Sell Your Stuff Deals Of The Week Har

Category
Any Category

Your search "hurkle durkle burkle" did not match any products

Bestsellers

Devil May Care (James Bond)
Hardcover by Sebastian Faulks

A History of Modern Britain
Paperback by Andrew Marr

> See more Bestsellers

SPONSORED LINKS (What is this?)

SUPERFICI finishing lines
www.scmhitech.co.uk Spraying, Roller coating Application and d
Berkle
www.Cabelas.com Shop for fishing gear at Cabela's. Rods, reels,

Done

Mobile Internet



Accessing the Mobile Web



Site designed for mobile use

- Designed for low-end devices
- Limited functionality chosen by designer
- Costly to create
 - Only available for popular, consumer sites



Normal site through a mobile viewport

- Most functionality of existing site
- Greater costs of navigation
 - Many items per page
 - More pages than needed

Previous Work: Transcoding



Traditional proxy server techniques

- Mostly automated
 - www.skweezer.com
 - mobile google search
- Quality of result varies based on site
- Often includes all content of a page

Doesn't work with AJAX/dynamic JavaScript sites

Highlight Designer

Storyboard
Sidebar
View

Toolbar

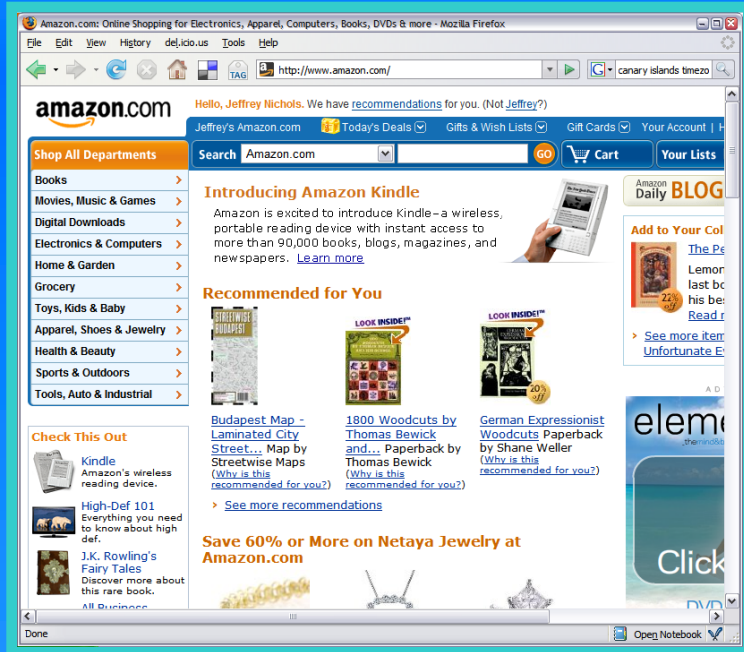
Preview
Browser

The screenshot displays the Highlight Designer application window, which is divided into three main sections:

- Storyboard Sidebar View:** Located on the left, it shows a sequence of five storyboard frames connected by arrows. The second frame is highlighted with a blue border and a red circular arrow, indicating a loop or a specific action.
- Toolbar:** Positioned below the storyboard view, it contains several controls:
 - Checkboxes for "Automatically sync browser with storyboard" (checked) and "Automatically remove site-specific cookies" (unchecked).
 - Buttons for "Add Content", "Clear All Content", and "Refresh Clips".
 - Buttons for "Undo", "Redo", and "Remove".
 - A "Pagelet Name" field set to "Amazon.com: baseball: Books".
 - A "Replace pagelet with:" dropdown menu set to "an existing pagelet...".
- Preview Browser:** The main area on the right, displaying the Amazon.com website for "baseball" books. It includes a search bar, navigation links, and a list of book results. The first three results are visible:
 - Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks** by Zack Hample (Paperback - Mar 27, 2007). Buy new: \$13.95 \$11.16. 50 Used & new from \$4.38.
 - Sports Illustrated: The Baseball Book** by Editors of Sports Illustrated (Hardcover - Oct 17, 2006). Buy new: \$29.95 \$19.77. 73 Used & new from \$10.23.
 - The Boy Who Saved Baseball** by John H. Ritter (Paperback - Mar 17, 2005). Buy new: \$6.99. 83 Used & new from \$1.90.

Main
Browser
Area

amazon.com – Buy one item



Search

Amazon.com

Search


New Search


GO


Books > "baseball"

Related Searches: baseball history, football, sports.

Showing 1 - 12 of 124,856 Results

- 

Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks (Paperback)
by Zack Hample (Author)
List Price: \$13.95
Price: **\$11.16** & eligible for **FREE Super Saver Shipping** on orders over \$25. Details
You Save: \$2.79 (20%)
Quantity: 1
Add to Shopping Cart
- 

Sports Illustrated: The Baseball Book 2006
Buy new: \$29.95 \$19.77 73% off
Get it by Tuesday, Oct 2 if you order by Sunday, Oct 1
Eligible for **FREE Super Saver Shipping**
★☆☆☆
- 

The Boy Who Saved Baseball
Buy new: \$6.99 83% used & new
Get it by Tuesday, Oct 2 if you order by Sunday, Oct 1

Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks (Paperback)
by Zack Hample (Author)
List Price: \$13.95
Price: **\$11.16** & eligible for **FREE Super Saver Shipping** on orders over \$25. Details
You Save: \$2.79 (20%)
Quantity: 1
Add to Shopping Cart

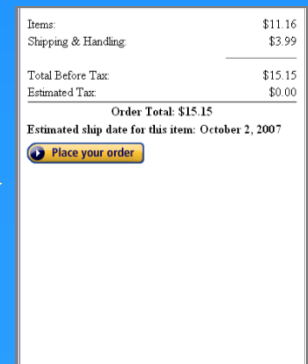
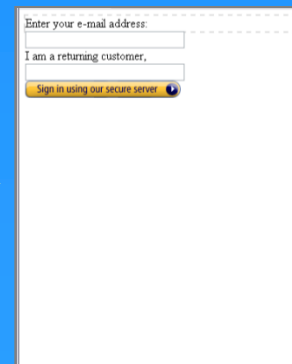
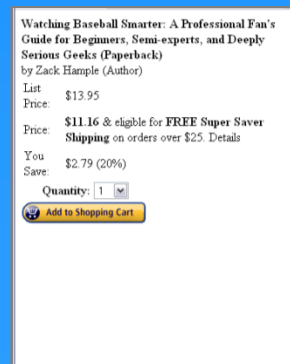
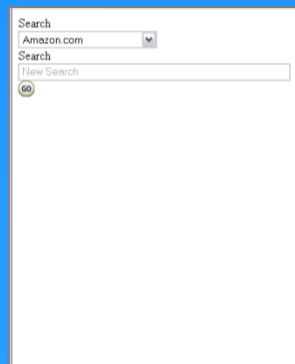
Enter your e-mail address:

I am a returning customer,

Sign in using our secure server

Items:	\$11.16
Shipping & Handling:	\$3.99
Total Before Tax:	\$15.15
Estimated Tax:	\$0.00
Order Total: \$15.15	
Estimated ship date for this item: October 2, 2007	
Place your order	

amazon.com – Buy one item



amazon.com – Buy one item



Search
Amazon.com
Search
New Search
GO

Books > "baseball"

Related Searches: baseball history, football, sports.

Showing 1 - 12 of 124,856 Results

- Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks (Paperback) by Zack Hample
Buy new: \$13.95 \$11.16 50 U
Get it by Tuesday, Oct 2 if you order by Tuesday, Oct 2
Eligible for FREE Super Saver Shipping
★★★★☆
- Sports Illustrated: The Baseball Book (2006)
Buy new: \$29.95 \$19.77 73 U
Get it by Tuesday, Oct 2 if you order by Tuesday, Oct 2
Eligible for FREE Super Saver Shipping
★★★★☆
- The Boy Who Saved Baseball by Bud Lewis
Buy new: \$6.99 \$3.99 53 U
Get it by Tuesday, Oct 2 if you order by Tuesday, Oct 2
Eligible for FREE Super Saver Shipping
★★★★☆

SEARCH RESULTS

Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks (Paperback)
by Zack Hample (Author)

List Price: \$13.95
Price: \$11.16 & eligible for FREE Super Saver Shipping on orders over \$25. Details
You Save: \$2.79 (20%)

Availability: In Stock. Ships from and sold by Amazon.com. Gift-wrap available.

Want it delivered Tuesday, January 15?
Order it in the next 33 hours and 27 minutes, and choose **One-Day Shipping** at checkout. [See details](#)

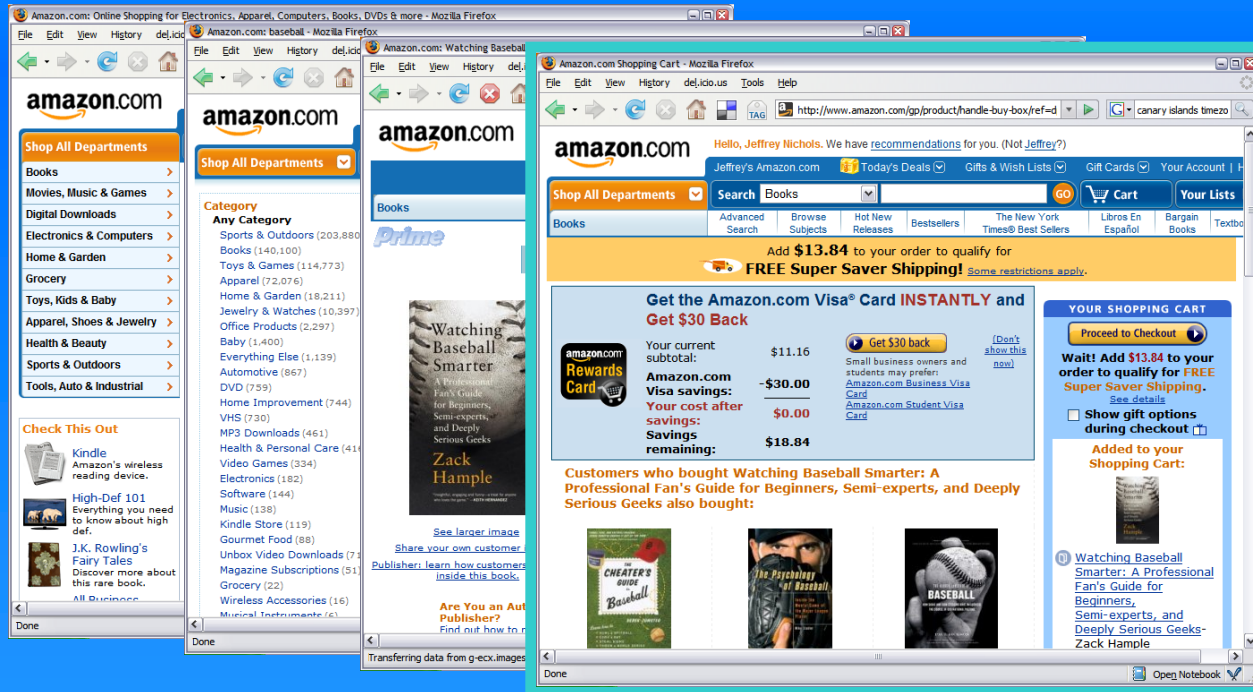
Quantity: 1
[Add to Shopping Cart](#)

Enter your e-mail address:

I am a returning customer,
[Sign in using our secure server](#)

Items:	\$11.16
Shipping & Handling:	\$3.99
Total Before Tax:	\$15.15
Estimated Tax:	\$0.00
Order Total: \$15.15	
Estimated ship date for this item: October 2, 2007	
Place your order	

amazon.com – Buy one item





Search
Amazon.com
Search
New Search
GO


Books > "baseball"

Related Searches: baseball history, football, sports.

Showing 1 - 12 of 124,856 Results

- 

Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks by Zack Hample (Author)
Buy new: \$13.95 \$11.16 50 U
Get it by Tuesday, Oct 2 if you order by 11:59 PM
Eligible for FREE Super Saver Shipping
- 

Sports Illustrated: The Baseball Book by Sports Illustrated (2006)
Buy new: \$29.95 \$19.77 73 U
Get it by Tuesday, Oct 2 if you order by 11:59 PM
Eligible for FREE Super Saver Shipping
- 

The Boy Who Saved Baseball by Peter Jackson (2006)
Buy new: \$6.99 83 Used & new
Get it by Tuesday, Oct 2 if you order by 11:59 PM

SEARCH RESULTS

Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks (Paperback) by Zack Hample (Author)

List Price: \$13.95

Price: \$11.16 & eligible for FREE Super Saver Shipping on orders over \$25. Details

You Save: \$2.79 (20%)

Quantity: 1

Add to Shopping Cart

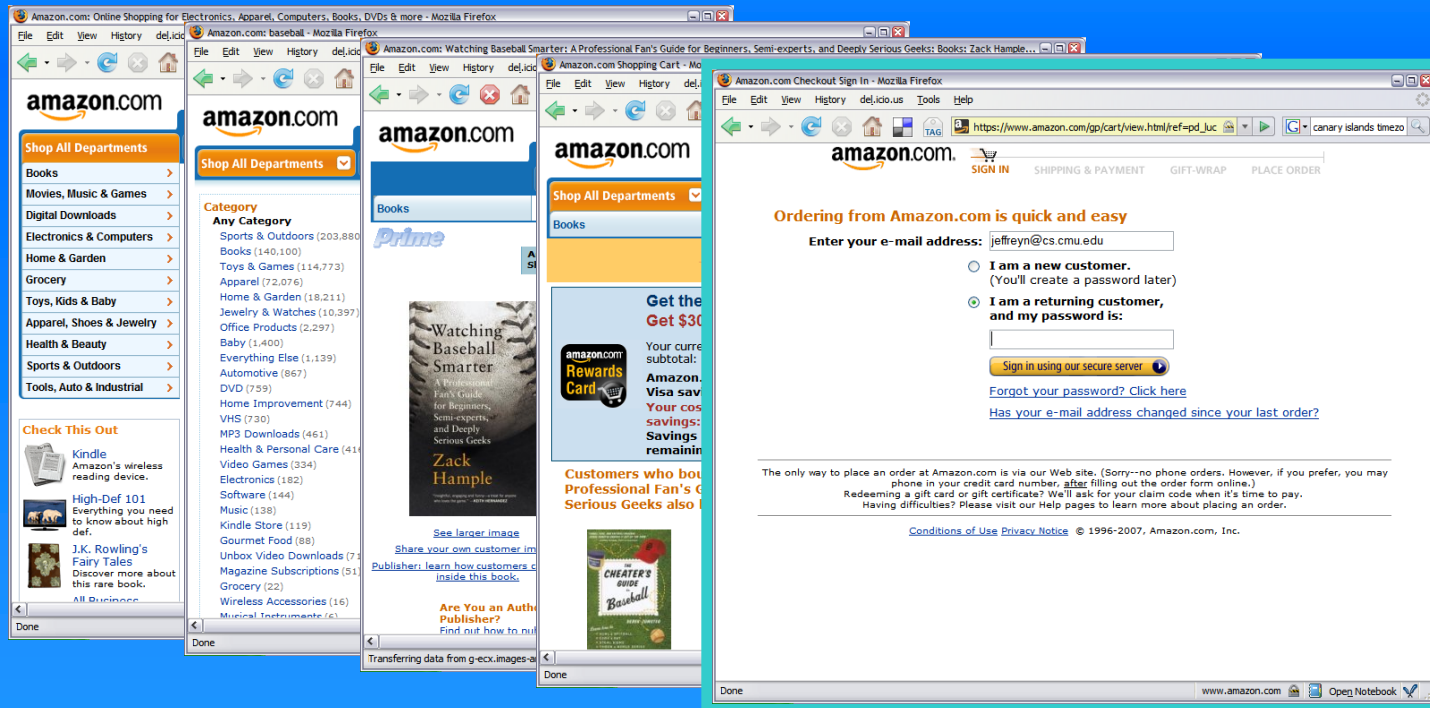
Enter your e-mail address:

I am a returning customer.

Sign in using our secure server

Items:	\$11.16
Shipping & Handling:	\$3.99
Total Before Tax:	\$15.15
Estimated Tax:	\$0.00
Order Total: \$15.15	
Estimated ship date for this item: October 2, 2007	
Place your order	

amazon.com – Buy one item



Search
Amazon.com
Search
New Search
GO

Books › "baseball"

Related Searches: baseball history, football, sports.

Showing 1 - 12 of 124,856 Results

- Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks by Zack Hamble (Author)
Buy new: \$13.95 \$11.16 50 U
Get it by Tuesday, Oct 2 if you order by 11:59 PM
Eligible for FREE Super Saver Shipping
- Sports Illustrated: The Baseball Book (2006)
Buy new: \$29.95 \$19.77 73 U
Get it by Tuesday, Oct 2 if you order by 11:59 PM
Eligible for FREE Super Saver Shipping
- The Boy Who Saved Baseball by R. J. Palacio
Buy new: \$6.99 83 Used & new
Get it by Tuesday, Oct 2 if you order by 11:59 PM

SEARCH RESULTS

Watching Baseball Smarter: A Professional Fan's Guide for Beginners, Semi-experts, and Deeply Serious Geeks (Paperback) by Zack Hamble (Author)

List Price: \$13.95

Price: \$11.16 & eligible for FREE Super Saver Shipping on orders over \$25. Details

You Save: \$2.79 (20%)

Quantity: 1

Add to Shopping Cart

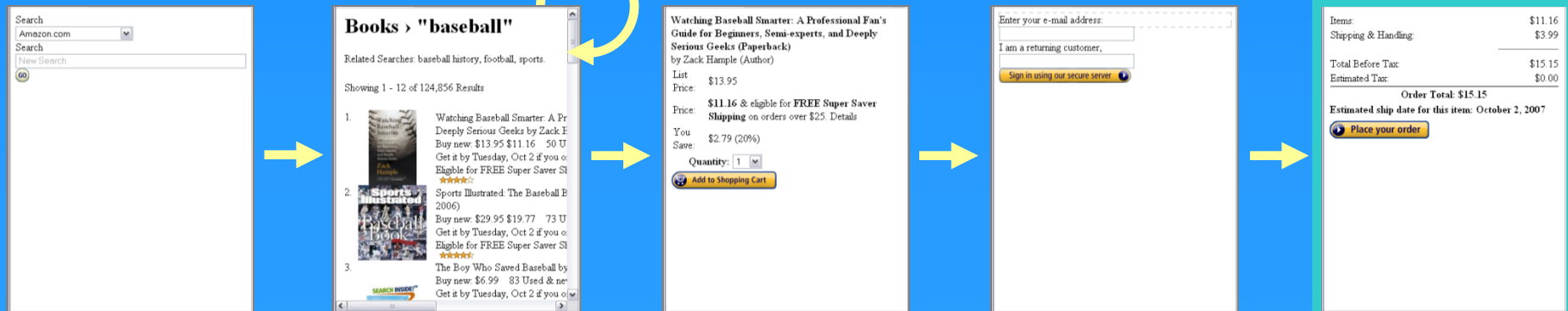
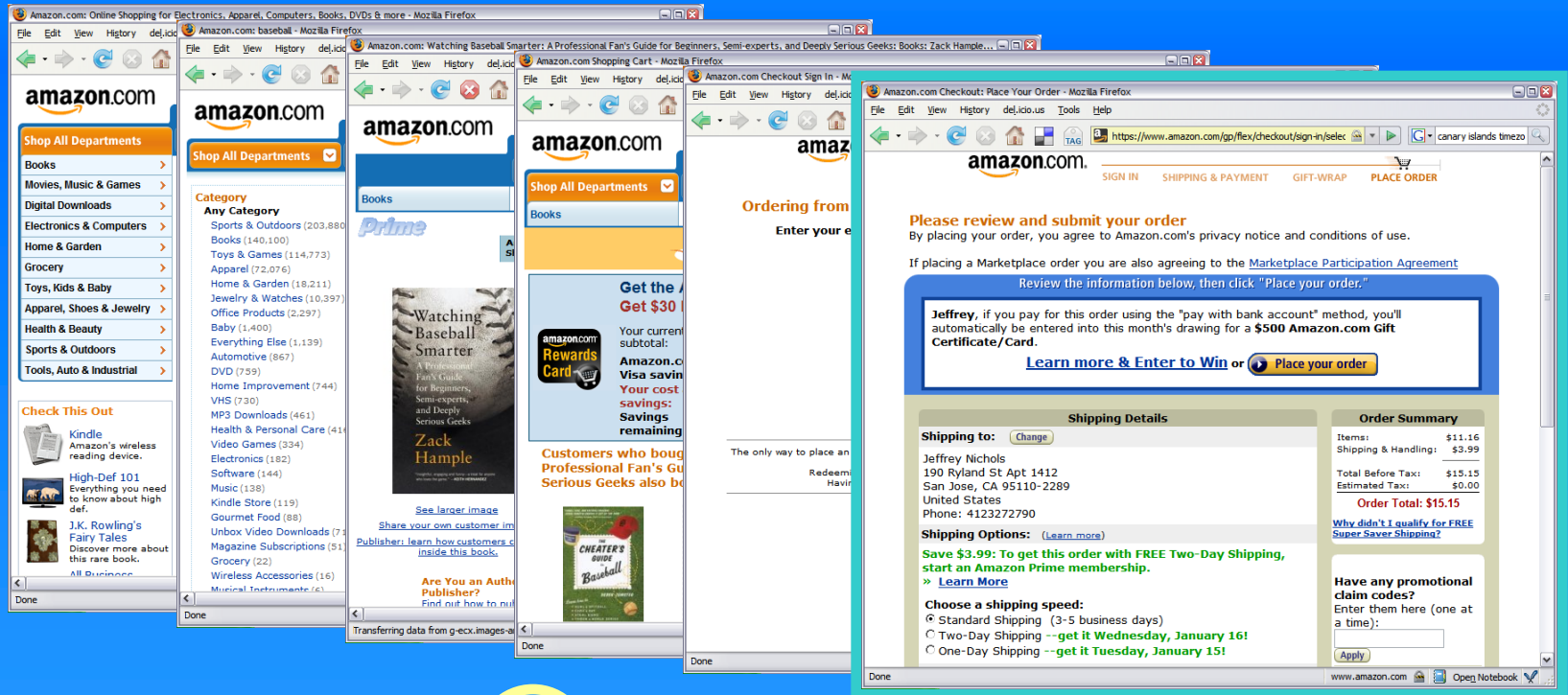
Enter your e-mail address:

I am a returning customer,

Sign in using our secure server

Items:	\$11.16
Shipping & Handling:	\$3.99
Total Before Tax:	\$15.15
Estimated Tax:	\$0.00
Order Total: \$15.15	
Estimated ship date for this item: October 2, 2007	
Place your order	

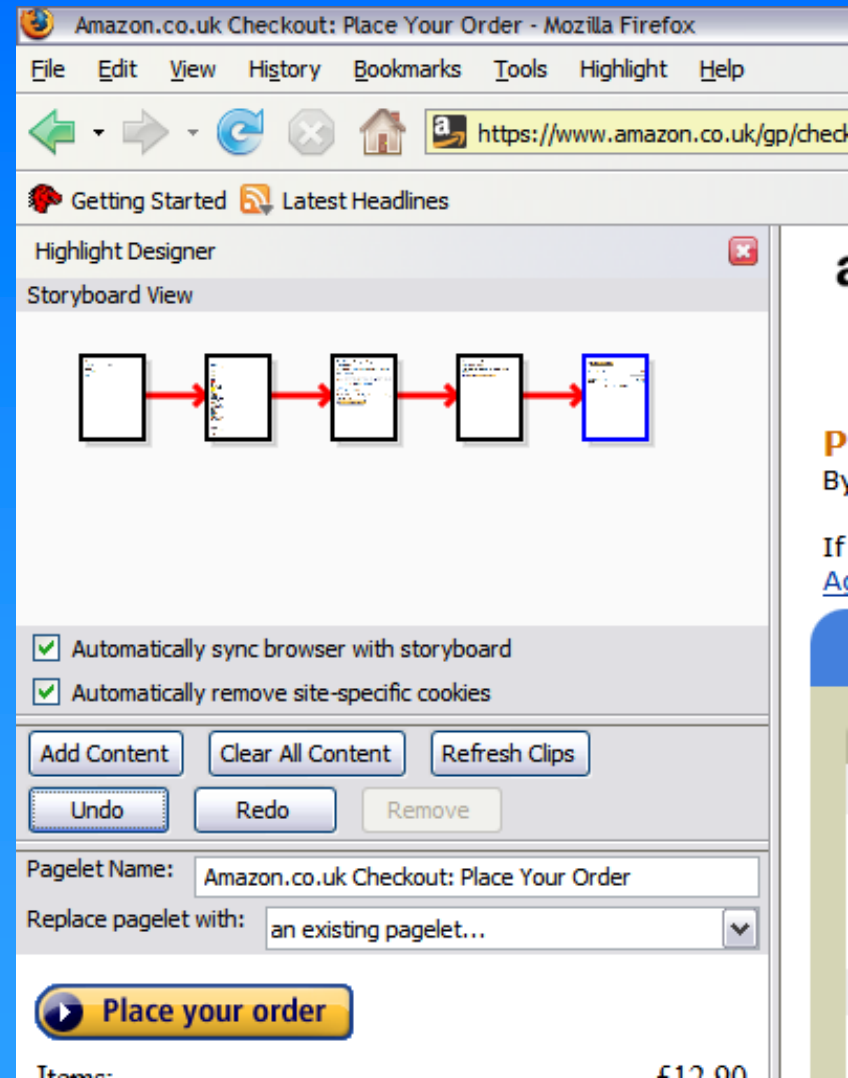
amazon.com – Buy one item



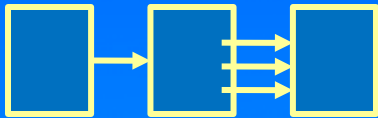
Creating complex structures

Additional traces allow for:

- Branching
- Looping
- Generalization



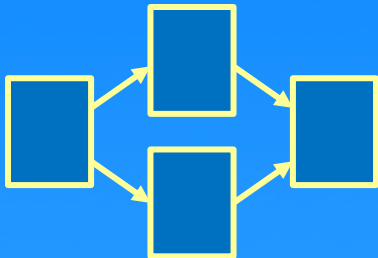
Some Supported Page Structures



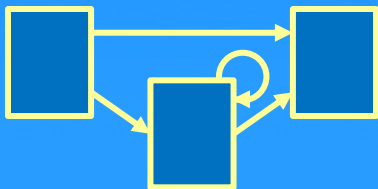
Query/results/detail



Multiple result pages



Diverge/converge



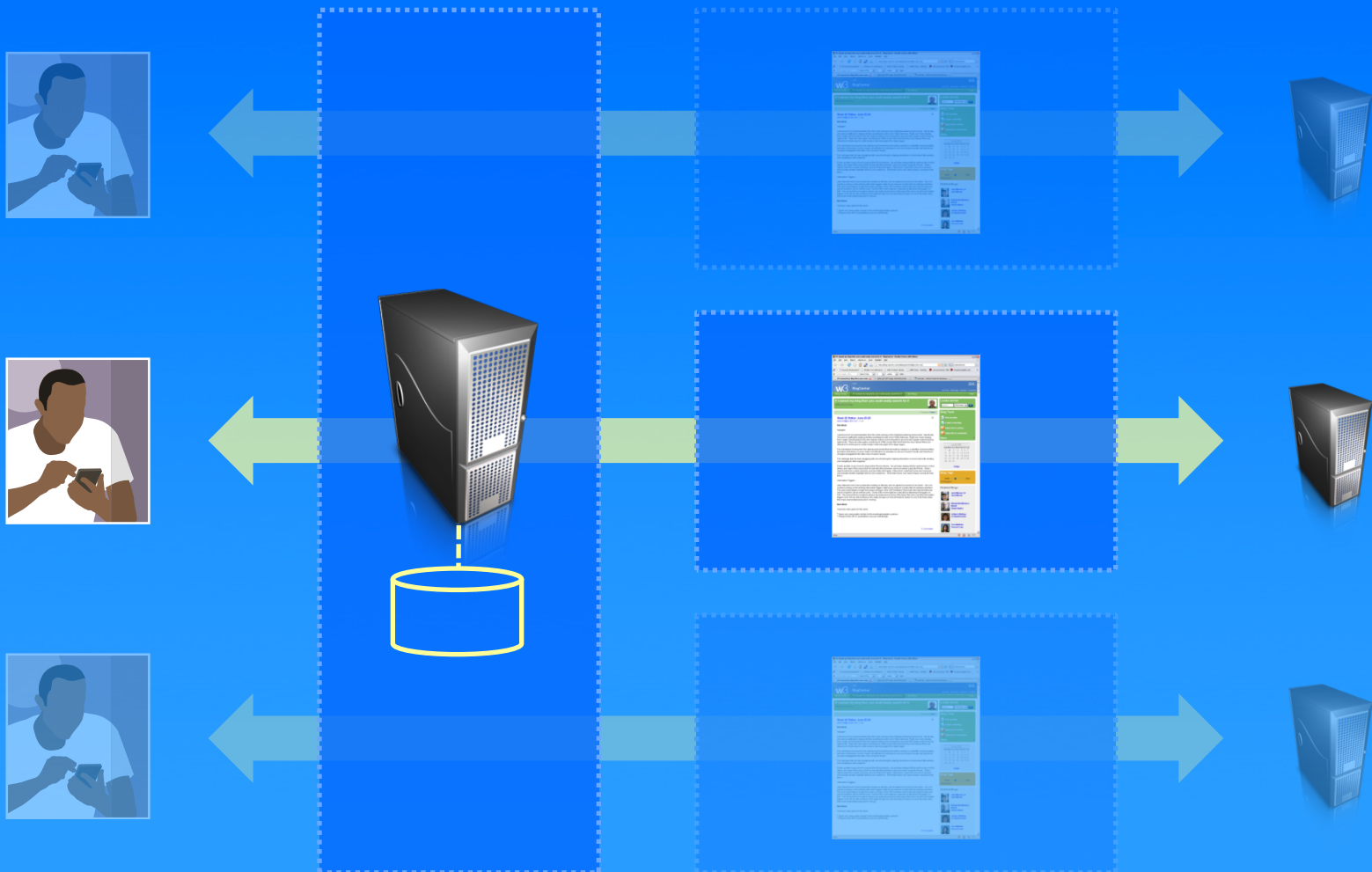
Query/error/result

Implementation

mobile users

proxy server

web servers



Why use this architecture?

Allows re-authoring of sites with dynamic JavaScript and Ajax

Re-authoring can be done in terms of UI design

- Easier to inspect than code, Web Service descriptions

Structured JavaScript Format

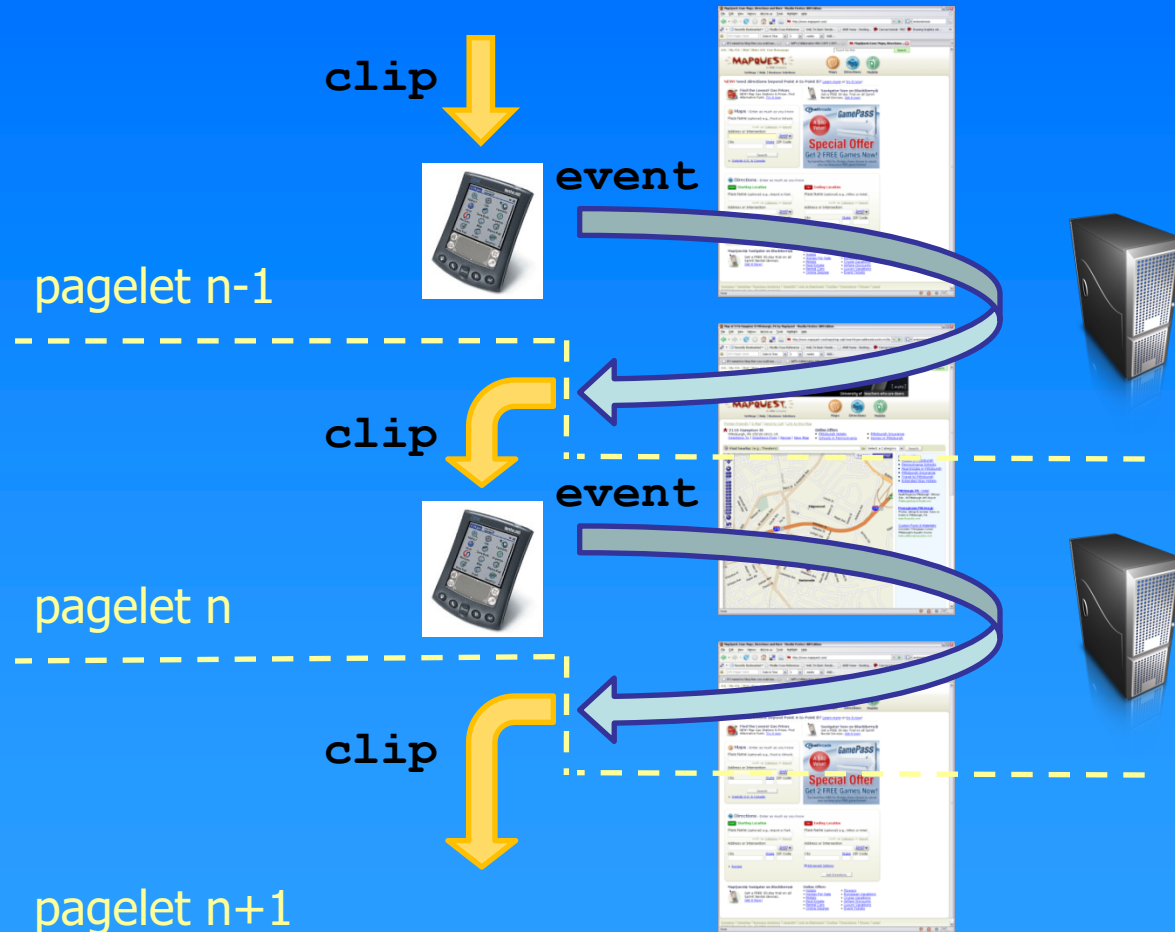
Based on Storyboard concept

Code divided into chunks corresponding to mobile page (pagelet)

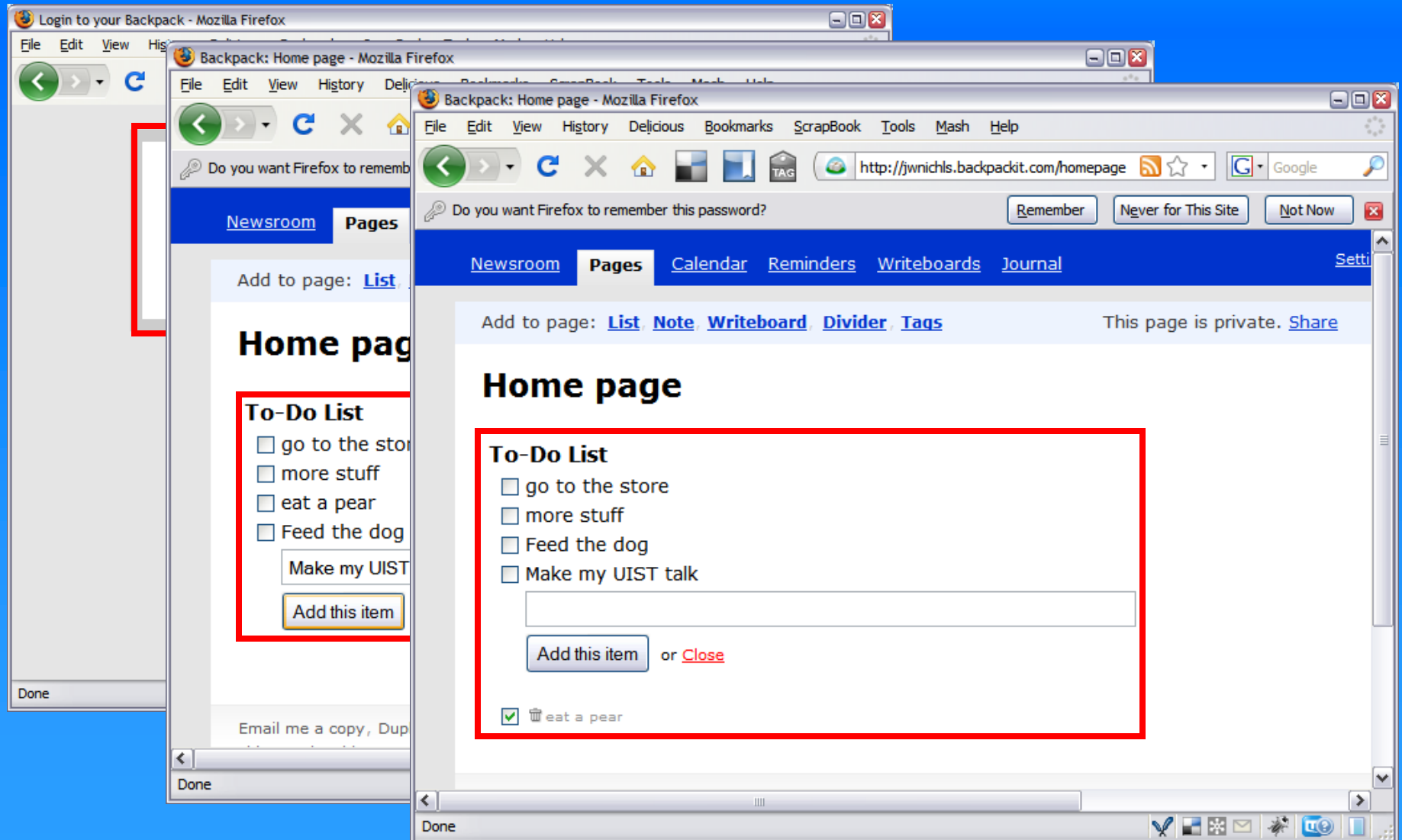
Each pagelet has two methods

- Clip method – selects content from page to clip
- Event method – navigates to next content based on mobile interaction

Application Descriptions




BackpackIt.com – To Do List



BackpackIt.com – To Do List

Internet Explorer 9:56
http://192.168.1.99:9080/proxy-se



Username:

Password:

[\(forgot password?\)](#)

View Tools



Internet Explorer 3:38
http://192.168.1.99:9080/proxy-se

[<<Go back](#)

Password has been emailed

View Tools

Internet Explorer 3:25
http://192.168.1.99:9080/proxy-se

[<<Go back](#)

To-Do List

☐ Feed the dog

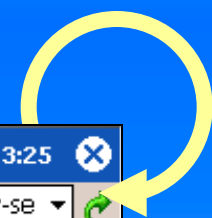
☒ go to the store

☐ eat a pear

☐ walk the dog

or [Close](#)

View Tools



Deployment Conclusions

- Proxy browser/remote control metaphor powerful for authoring and deployment
- Allows for modification of sites using AJAX or dynamic JavaScript
- Scalability of the server architecture needs to be tested

Empirical study of apps

Compared the Highlight applications with their existing web sites in terms of:

- Number of interactive elements (links, form elements, etc.)
- Size of total pages downloaded (kB)

Benefits – Interactive Elements

Description	Interactive Elements	
	Original	Highlight
Check status of AA flight	736	3
Update Facebook status	217	5
Find nearby Wi-fi hotspot	74	18
Get weather in my area	486	6
Sprint cellphone usage	175	6
Log today's exercise	128	4
Update Fitday food diary	169	38
Get calories for food	88	16
Real estate in my area	274	35
Show trip itineraries	77	17
Find Amazon book price	823	4

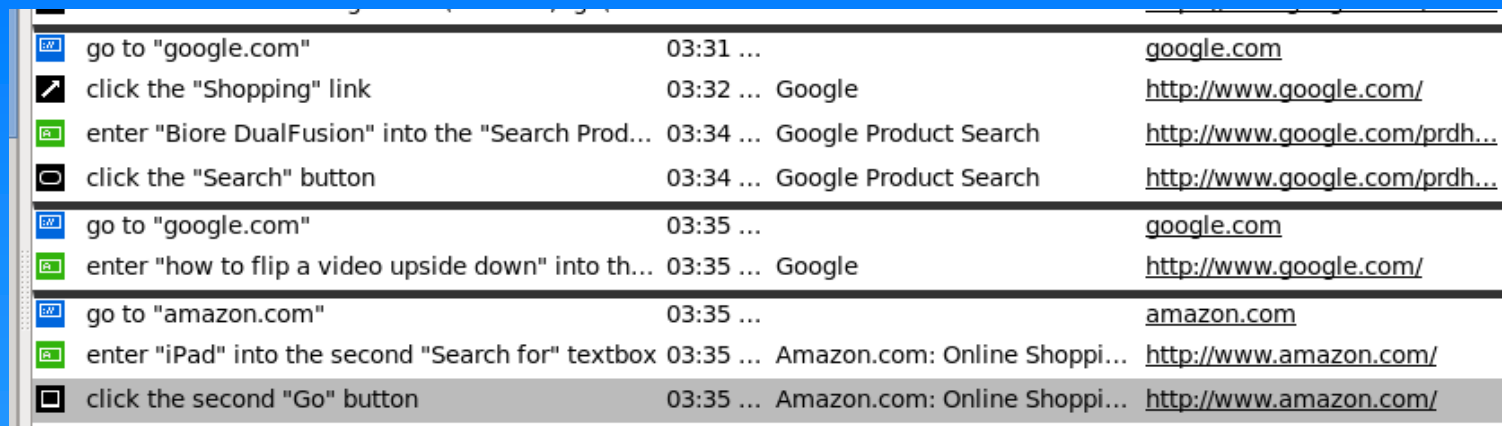
Benefits – Transmission Size










Description	Size (kB)		Percent Size
	Original	Highlight	
Check status of AA flight	711	3.6	0.5%
Update Facebook status	296	0.5	0.2%
Find nearby Wi-fi hotspot	1072	2.8	0.3%
Get weather in my area	1079	7	0.6%
Sprint cellphone usage	739	4.6	0.6%
Log today's exercise	393	0.9	0.2%
Update Fitday food diary	145	12.7	8.8%
Get calories for food	63	11.5	18.3%
Real estate in my area	1036	194.1	18.7%
Show trip itineraries	726	42.7	5.9%
Find Amazon book price	844	4.1	0.5%

CoCo Backup

Mining web history logs

- Leverage a recorded history of everything a user has done on the web via ActionShot/CRH



	go to "google.com"	03:31 ...	google.com
	click the "Shopping" link	03:32 ... Google	http://www.google.com/
	enter "Biore DualFusion" into the "Search Prod..."	03:34 ... Google Product Search	http://www.google.com/prdh...
	click the "Search" button	03:34 ... Google Product Search	http://www.google.com/prdh...
	go to "google.com"	03:35 ...	google.com
	enter "how to flip a video upside down" into th...	03:35 ... Google	http://www.google.com/
	go to "amazon.com"	03:35 ...	amazon.com
	enter "iPad" into the second "Search for" textbox	03:35 ... Amazon.com: Online Shoppi...	http://www.amazon.com/
	click the second "Go" button	03:35 ... Amazon.com: Online Shoppi...	http://www.amazon.com/

- Segment stream based on:
 - Time between actions (5 mins)
 - Switching websites
- Generate a set of segments, one for each task

Finding the right script

- CoCo searches CoScripter scripts and ActionShot segments to find one that satisfies the query
- Search uses vector-space model and TF/IDF to rank possible scripts
- Interact with user to supply missing parameters
- Confirm that this script is the one the user wants

Generating a response

- How does CoCo decide what information to return to the user?
- Manual: user provides explicit `clip` command
 - User has full control over which content is returned
 - Enables authoring of complete CoCo experience
- Automatic: system guesses which portion of web page to clip and return
 - Requires no additional authoring, e.g. for ActionShot scripts
 - Relies on heuristics to select a page region for clipping

Automatic clipping

- Given a web page, which region best represents the result of the script?
- Use geometric heuristics¹ to identify candidate regions on the page
- Use word overlap to rank regions relative to the user's query
- Return highest-ranked region



¹[Mahmud et al, CSurf: A Context-Driven Non-Visual Web Browser, WWW 2007]

User study: will users trust automation?

- Would users trust a system such as CoCo to automate their web tasks?
 - Compare to existing automation systems: iMacros, Automation Anywhere, CoScripter
- Designed experiment to compare understandability of textual (script) vs visual (screenshot) feedback
 - 1219 Mechanical Turkers completed study
- Hypothesis: the reduced information in the textual representation does not hamper user understanding of automation effects

Example task

Goal

Check the status of
American Airlines
Flight 279

Users saw one or more
of these three visualizations

They were asked whether
the visualization(s) they
saw accomplished the goal

We computed how many
people answered the
question correctly for
each condition

1.

Step 1 of 4

The screenshot shows the American Airlines website homepage. At the top, there's a navigation bar with links for Login, My Account, Worldwide Sites, Contact AA, and FAQ. Below this is the American Airlines logo and a search bar. The main content area is divided into several sections. On the left, there's a sidebar with links for Reservations, Travel Information, Fare Sales & Special Offers, AAdvantage, Products & Gifts, Business Programs & Agency Reference, and About Us. The main content area features a large banner for 'CARIBBEAN & MEXICO SALE' with a 'BOOK TODAY' button. Below the banner, there's a 'Fare Sale Alerts' section listing various destinations and fares. To the right of the banner, there's a 'Book Flights' section with a form for selecting flight details (Round-Trip, One-Way, Multi-City, etc.), departure and return dates, times, and a 'GO' button. Below the 'Book Flights' section, there's a 'Gates & Times' section with a form for selecting flight details (From, To, Flight Number, etc.) and a 'GO' button. At the bottom, there's a 'My Account' section with a form for logging in (AAdvantage #, Password) and a 'GO' button. The footer includes a 'Become a fan of American Airlines on facebook' link and a 'FEEDBACK' link.

2.

Static screenshots (like video, no
animation)

3.

- * go to "aa.com"
- * enter "279" into the "Flight Number:"
textbox
- * click the fifth "GO" button

User study results

	Video	ScreenShots	Script	Success Rate
7.	Y	Y	Y	77.2%
6.	Y	Y	N	74.4%
5.	Y	N	Y	77.2%
4.	Y	N	N	85.1%
3.	N	Y	Y	75.9%
2.	N	Y	N	75.1%
1.	N	N	Y	76.0%

- Except for condition #4, all conditions had similar success rates
- Conclusion: text-only (#1) is comparable to existing automation approaches with visual feedback

Summary

- We present CoCo, an intelligent conversational assistant for the web
- CoCo performs tasks for users thru a simple textual interface
- An automatic clipping algorithm guesses what response to return to the user as a result of execution
- A user study shows that users understand CoCo automation as well as traditional visual automation

Future work

- Teach CoCo how to do a new task that it hasn't seen before in scripts or web history
- Design an authoring environment specifically to teach CoCo how to do tasks on the web
- Improve the clipping algorithm by leveraging more implicit user feedback such as mouse hovering
- Model user preferences and become more personalized over time