Telescope

Fine-Tuned Discovery of Interactive Web UI Feature Implementation
Why learn from professional web UI’s?
Why learn from professional web UI’s?

Start Here: Learn CSS Layout
Now that you’ve learned the essentials of typography in the previous “Start Here” course, you’re ready to move on to the next fundamental element of web...

Get Started With Laravel 5
Laravel is a PHP framework for modern web apps. Recently upgraded to version 5, Laravel is a mature system that continues to win support due to its elegance...

6 Flexbox Projects for Web Designers
The CSS Flexbox model is starting to see more widespread use and is now supported in all major browsers. In this course, Craig Campbell will build upon...
How do I do that?

Feb. 17, 2012 02:15 a.m.

A large storm produced 32 inches of snow at Stevens Pass in the three days before the avalanche.

The new snow put an increasing load on a fragile crust.
Learning Gap: Self-starter to Professional
Self-Starter to Professional Learning Gap

Build a Professional Website

CONTINUE

What you will learn

Build the Airbnb home page and learn the fundamentals of web development in the process.

Find a place to stay.

Find a place to stay.
Inspection Burden

28,238 Lines of JavaScript!
Last Year: Unravel

A large storm produced 32 inches of snow at Stevens Pass in the three days before the avalanche.

This new snow put an increasing load on a fragile crust.

.nextSibling

/slide.js:9:32 (user.setInteractive)
/slide.js:15:1 (completeLoad)
/ll.slide.js:58:2 (clickMap)
Last Year: Unravel

THE FELLOWSHIP OF THE RING
BOOK ONE

I A Long-expected Party
II The Shadow of the Past
III Three is Company
IV A Short Cut to Mushrooms
V A Conspiracy Unmasked
VI The Old Forest
VII In the House of Tom Bombadil
VIII Fog on the Barrow-downs
IX At the Sign of The Prancing Pony
X Strider
XI A Knife in the Dark
XII Flight to the Ford
Last Year: Unravel

M1: Key Source 1
M2: Key Source 2
M3: “Ah-ha” moment
Human-Centered Prototyping

Prototype 1: Extract Feature Code
Feedback: Show us relevant code

Prototype 2: Activity Highlighting
Feedback: Show us live activity

Prototype 3: Live Traces
Feedback: Slow it down, play
Human-Centered Design Findings

User Needs

Variable amounts of JavaScript

Personalized views (play, inspect)

Visual connections

*Feature reduction
In addition, ever since Bilbo came back to the Shire with the ring—which he has kept secret from nearly everyone—he has not seemed to age at all. In fact, he reaches his 111th birthday virtually unchanged.

When Bilbo announces that he is throwing a grand party for his "eleventy-first" birthday, everyone in the Shire takes interest. After extensive and elaborate preparation, the day of Bilbo’s birthday finally arrives. All of Hobbiton has a fine time eating, drinking, and watching the spectacular fireworks provided by Gandalf.

As dinner winds down, Bilbo rises and asks to speak to the assembled guests. The speech is short. Just as Bilbo is starting to lose his audience’s attention, he announces that he is leaving, and he suddenly disappears in a flash of light. The party guests are not amused, and they return, muttering, to their eating and drinking.

Bilbo, having used his ring to become invisible, walks back to Bag End, takes off the ring and begins packing for a
Telescope Approach

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```javascript
function h(t,n){var i,r,o,s,a,u,c filter:function(t,e){return null==t.which&&!(t.wi
,contents:{script:/(?:java|ecma)script/},convert for(var e in t){var i=t[e];if(n.isFunction(i)||
.t.fn.scrollspy.noConflict=function(){return t.fn
this.i&&(3<=this.a[gt]?(this.X=this.a[1],this.W="}
```

$("#map").click(function(e){
  scrollTop();
  animateWeather();
});
Live Demo!
Technical Challenges

Fully trace all front end JavaScript
On any public website
Regardless of state or HTTPS

- Unravel
- Scry
- Theseus
- Telescope
Technical Blockers

JavaScript debug API’s are not cumulative.

Browser policies block script alteration/instrumentation.
Technique: Sleight of Hand

```html
<html>
  <head>
    <script(/foo)
  <body>
    <h1>hello!</h1>
</html>
```
Technique: Sleight of Hand

```html
<html>
  <head>
    <script(/foo)
  <body>
    <h1>hello!</h1>
</html>
```

Agent
Technique: Sleight of Hand

```
3

head
script(/foo)
body
h1 hello!
```
Technique: Sleight of Hand

head
  script(/foo)
body
  h1 hello!

head
  script(inline)
  fondueTracer()
  script(/fondue/foo)
body
  h1 hello!
Technique: Sleight of Hand

```
<html
   ----
   --------
   ----
   -- ----

<head
   script(inline)
   fonduetracer()
   script(/fondu/foo)
</head
  body
  h1 hello!
```
Technique: Sleight of Hand

```html
<html>
  <head>
    <script(inline) fonduetracer()></script>
    <script(fondue/foo)></script>
  </head>
  <body>
    <h1>hello!</h1>
  </body>
</html>
```
JavaScript Detail Levels

L1: DOM JS, Non-Library
L2: Active JS, Non-Library
L3: Active JS
L4: All JS, Non-Library
L5: All JS

- site-view.js
  - update
  - show
  - $("div").show
  - view.js:67
  - view.js:96
  - view.js:129

- site-model.js
  - getJSON
  - model.js:13

- jQuery-Library.js
  - $.fn
  - $.fn.show
  - jQuery.js:214
  - jQuery.js:386

- Angular-Library.js
Case Study

Telescope Reduction

● 7 Popular Websites
● 10,000+ LOC each
● 6 Sites
  ○ <150 LOC Features
● 7th Site
  ○ <1K LOC of 30K
Snapshot

NYT Snowfall: 41K LOC
Dot Game: 12K LOC

```
c = function (e, t, n, r) {
  if (e > 0) {
    $('#game').addClass('active');
    $('#progress').addClass('active');
    $('#game').addClass('bg' + e).addClass('active');
    $('.dot').remove();
    $('.number').remove();
    for (var i = 0; i < n.length; i++) {
      n[i].controls.remove();
      n[i].curve.remove();
    }
  }
  if (!r) {
    $('#retry').css({
      display: 'none'
    });
  }
```
Exploratory User Study

Self-Starter Discovery

- Class-based toggling
- Simple animation

Student Web Dev Discovery

- Event-driven design
- MVC Patterns
Limitations

● Preventative Web Architecture Techniques
  ○ HTML/CSS Minification
  ○ Content Security Policies

● Performance
  ○ Non-cached instrumentation Delay (5-180 seconds)
  ○ Memory limits for large runtimes

● User Class
  ○ Novices without sufficient HTML and JS knowledge
Future Work: Social Snapshot Learning

This is really similar to the Amazon product carousel and Flickr picture viewer.

Jake Archibald has a great tutorial on how to build an app cache like the one here.
Telescope
Fine-Tuned Discovery of Interactive Web UI Feature Implementation

Joshua Hibschman
Haoqi Zhang
Architecture: Sleight of Hand

Artificial State Restoration
Artificial Script Loading
Architecture: Website Instrument Swap and Trace

Swapped Source Requests → Instrumented Sources

Website

Extension

Fondue API

Source Cache

Initial HTML Source Swap

Trace Bridge

Website / Telescope Handshake

Fondue Traces, Sources, Remote Commands
Approach

1. Connect code to observable output
2. Help users reconstruct execution flow
3. Provide interactions to fully navigate code
4. Help users use poorly constructed code

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L3: Active JS
L4: All JS, Non-Library
L5: All JS

site-view.js
update
show
view.js:67
view.js:96

view.js:129

site-model.js
getJSON
model.js:13

jQuery-Library.js
$.fn
$.fn.show
jQuery.js:214
jQuery.js:386

Angular-Library.js