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Hyper Source
Bridging the Gap between Web Browser and IDE
Like Two Ships in the Night...

Developers spend significant time outside their code editor and inside their Web browser.

19% of programming time is spent on the web (Brandt, CHI’10)

Editors and browsers remain largely unaware of each other.
Bridging the Gap

**Research idea:** Track web history directly inside source documents.

**Hypothesis:** Saving web pages visited while editing code can (1) help developers re-retrieve relevant pages and (2) facilitate code understanding.
background(0);
stroke(255);
// perform a forward FFT on the sound
fft.forward(jingle.mix);
for(int i = 0; i < fft.specSize();
// draw the line for each frequency bin
line(i, height, i, height - fft.
}
```javascript
background(0);
stroke(255);
// perform a forward FFT on the signal
fft.forward(jingle.mix);
for(int i = 0; i < fft.specSize();
    // draw the line for frequency bin
    line(i, height, i, height - fft.
        // fill for visualization
        fill(255,63);
```

**Properties of Fourier Transform**

- The properties of the Fourier Transform are as follows:
  - Linearity: $F(a * x + b * y) = a * F(x) + b * F(y)$
  - Time-Shifting: $F(x(t - T)) = e^{-j2\pi ft}F(f)$
  - Frequency-Shifting: $F(x(t) * e^{j2\pi ft}) = F(x(t))$
public static List<Object> parse(NodeList list, int type) {
    List<Object> returnVals = new ArrayList<Object>();

    for (int i = 0; i < list.getLength(); i++) {
        Element elem = (Element) list.item(i);
        Object currentVals = new Object();
        if (elem.hasAttribute("id")) {
            elem.getAttribute("id");
        }
        NodeList elemKids = elem.getChildNodes();
        if (elem.getNodeName().equals("genre") || elem.getNodeName().equals("style")) {
            // Then we're dealing with <genre> or <style> parsing
            if (elem.getTextContent().contains("&")) {
                System.out.println(elem.getTextContent());
            }
            else {
                int numKidsFound = 0;
                for (int j = 0; j < elemKids.getLength(); j++) {
                    if (numKidsFound == getNodeCount(type)) {
                        break;
                    }
                }
            }
        }
    }
    return returnVals;

    return returnVals;
}
Editor Extension

Code Editor

Processing & jEdit

Disk

Browser Plug-In

Web Browser

Google Chrome

IPC
Browse: Add visited page to queue

Edit: Assign queue to text

Browse: clear queue; add visited page

Edit: Assign Queue to text
BROWSING:
Browse: Add visited page to queue

PROXIMATE EDITING:
Browse: re-initialize queue w/ visited page
Edit: Assign queue to new text
First n-1 edits: Assign queue to new text
n-th edit: no assign

DISTANT EDITING:
Start with empty queue
Edit

Browse: re-initialize queue w/ visited page
Maintaining annotations through edits

Insert(2,"y+")

Code

```
r = f(x);
```

Pages

**URL Set 1**

- http://google.com/..
- http://forum.xyz.co

**URL Set 1**

- http://google.com/..
- http://forum.xyz.co
Recording Too Much Data?

I. Page filtering
   1. Domain blacklists
   2. “Clear Queue”
   3. Delete individual items
Recording Too Much Data?

1. Page filtering
   1. Domain blacklists
   2. “Clear Queue”
   3. Delete individual items

2. Relevance heuristics
   1. Copy & paste
   2. Final page before editing
   3. Explicit mark
User Experiences
How much code gets annotated?

2 hours programming competition with HyperSource (n=4):

<table>
<thead>
<tr>
<th></th>
<th>mean</th>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web Pages visited</td>
<td>37</td>
<td>26</td>
<td>49</td>
</tr>
<tr>
<td>Code lines annotated</td>
<td>7/141</td>
<td>5/102</td>
<td>9/177</td>
</tr>
</tbody>
</table>
How useful are annotations?

Review source files with and without annotations, then answer a series of questions about code (n=4).

Survey feedback:

- Helped understand unfamiliar code:
  “It was much easier to answer the questions with the annotated URLs”

- Web pages were used as starting points
Can this approach apply to other authoring tasks?

International reaction to the US election of Barack Obama to the office of President in 2008 could be characterized as cautiously optimistic. Longtime US allies like Australia and Germany were enthusiastic, if not ecstatic, while countries like Iran and Israel - at the center of heated worldwide debate - were more circumspect, waiting to see if Obama's rhetoric would translate into meaningful policy changes.

Barack Obama told supporters that "change has come to America" as he claimed victory in a historic presidential election.
HyperSource

Collects visited web pages and associate them with lines of code that developers subsequently write.

Tracks and shows associations within each source file.
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