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São Paulo - Brazil

Rethinking Online Code Editors for Supporting Time-based Web Documents

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What are online code editors?

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- Authoring tools that allow developers to code and see the results promptly

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- Bret Victor: *Inventing on Principle and Learnable Programming* —> <http://vimeo.com/36579366>
- There are a number of Web playgrounds for prototyping HTML, CSS and JavaScript

w3schools.com



CODEPEN



JS Bin

In this work...

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In this work...

- We go a step further by giving special attention to the **temporal aspect** (e.g. preserving presentation state between code changes)
- Our proof of concept has been developed using many open source libraries, and currently it works in modern Web browsers (e.g., Safari, Firefox and Chrome)
- Main functionalities: immediate feedback, coding assistance, playback control and programmatic visualization

Demo Video

User Interface

User Interface

The image shows the AIBULANT Sketchbook interface. The left pane displays HTML code for creating an animated background with five clouds. The right pane shows a preview of the resulting animation, featuring five white clouds of varying sizes and positions against a light blue background. The interface includes a top navigation bar with tabs for HTML, CSS, JS, and Timesheet, and buttons for Save, Share, and Download. A video player interface is visible in the top right corner of the preview pane, showing a play button and a timestamp of 00:00:06.03. A Google+ logo is visible in the bottom right corner of the preview pane.

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2 So we will have an animated background with 5 clouds  
3 moving across the screen.  
4 Steps:  
5 1. create the clouds  
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8 -->  
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10 <div class="cloud x1"></div>  
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14 <div class="cloud x4"></div>  
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16 </div>  
17 <!-- That's the markup! -->  
18 <!-- That looks cool. We are done!! -->  
19 <!-- Disregard --><a style="position: fixed; bottom:  
20 10px; right: 10px;color:#CCC"  
href="https://plus.google.com  
/111052275277622928148?rel=me">Google+</a>
```

User Interface

The screenshot shows the AIBULANT Sketchbook interface. The left pane displays HTML code for creating an animated background with five clouds. The right pane shows a preview of the resulting animation, featuring five white clouds of varying sizes and colors (white, light blue, and medium blue) moving across a light blue background. The interface includes a top navigation bar with tabs for HTML, CSS, JS, and Timesheet, and buttons for Save, Share, and Download. A video player interface is visible in the top right of the preview pane, showing a play button and a timestamp of 00:00:06.03. A Google+ logo is visible in the bottom right corner of the preview pane.

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A

CodeMirror: text editor in JS

User Interface

The image shows a screenshot of the AIBULANT Sketchbook interface, which is designed to look like an open notebook. The left page (labeled 'A') contains a code editor with HTML and JavaScript code. The right page (labeled 'B') shows a preview of the code, featuring a light blue background with five white, stylized clouds. The interface includes a top navigation bar with tabs for 'HTML', 'CSS', 'JS', and 'Timesheet', and buttons for 'Save', 'Share', and 'Download'. A video player interface is visible in the top right corner of the preview area, showing a play button and a timestamp of 00:00:06.03. A small 'Google+' logo is visible in the bottom right corner of the preview area.

A
CodeMirror: text editor in JS

B
IFRAME

User Interface

1

The screenshot shows the AIBULANT Sketchbook interface. On the left is a code editor with a red box around the 'HTML' tab and a red '1' above it. The code in the editor is as follows:

```
1 <!--
2 So we will have an animated background with 5 clouds
3 moving across the screen.
4 Steps:
5 1. create the clouds
6 2. Animate them to move across the screen
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```

On the right is a preview window showing a light blue background with five white, stylized clouds. A video player interface is visible in the top right corner of the preview, showing a play button and a timer at 00:00:06.03. The text 'AIBULANT Sketchbook' is in the top right corner of the interface, and 'Google+' is in the bottom right corner of the preview area.

A
CodeMirror: text editor in JS

B
IFRAME

User Interface

The image shows a screenshot of the AIBULANT Sketchbook interface, which is designed to look like an open book. The left page (labeled 'A') is a code editor with a line number margin on the left. The right page (labeled 'B') is a preview window showing the rendered output of the code. The interface includes a top navigation bar with tabs for 'HTML', 'CSS', 'JS', and 'Timesheet', and buttons for 'Save', 'Share', and 'Download'. A red box labeled '1' highlights the tabs, and another red box labeled '2' highlights the 'Save', 'Share', and 'Download' buttons. The code in the editor includes comments and HTML/JS code for creating and animating five clouds. The preview shows a light blue background with five white, stylized clouds. A timer in the top right of the preview shows '00:00:06.03'. A 'Google+' link is visible in the bottom right of the preview.

1 HTML CSS JS Timesheet **2** Save Share Download

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1 <!--
2 So we will have an animated background with 5 clouds
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4 Steps:
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```

A
CodeMirror: text editor in JS

B
IFRAME

AIBULANT Sketchbook
00:00:06.03
Google+

User Interface

The image shows a two-page spread of a digital sketchbook. The left page is a code editor with a white background and a light blue sidebar on the left containing line numbers 1 through 20. The code is written in a monospaced font with syntax highlighting. The right page is a preview window with a light blue background, showing a white sky with five white clouds. In the top right corner of the preview, there is a play button icon and a timer showing 00:00:06.03. The top of the sketchbook has a navigation bar with several tabs and buttons. Three red boxes highlight specific areas: box 1 contains the 'HTML', 'CSS', 'JS', and 'Timesheet' tabs; box 2 contains a pencil icon and a question mark icon; box 3 contains 'Save', 'Share', and 'Download' buttons. The text 'AIBULANT Sketchbook' is in the top right corner. At the bottom of each page, there is a large red letter: 'A' on the left and 'B' on the right. Below these letters are the labels 'CodeMirror: text editor in JS' and 'IFRAME' respectively. A 'Google+' logo is visible in the bottom right corner of the preview area.

1 HTML CSS JS Timesheet

2 ?

3 Save Share Download

AIBULANT Sketchbook

00:00:06.03

A
CodeMirror: text editor in JS

B
IFRAME

Google+

User Interface

The image shows a two-page spread of a digital sketchbook interface. The left page (A) is a code editor with a white background and a light blue sidebar on the left containing line numbers 1 through 20. The code is written in a monospaced font with syntax highlighting. The right page (B) is a preview window with a light blue background, displaying five white, stylized clouds of varying sizes and positions. The interface is titled 'AIBULANT Sketchbook' in the top right corner. Four red boxes with numbers 1 through 4 highlight specific UI elements: 1. A tab bar with 'HTML', 'CSS', 'JS', and 'Timesheet' tabs. 2. A toolbar with a pencil icon and a question mark icon. 3. A toolbar with 'Save', 'Share', and 'Download' buttons. 4. A playback control bar with a play button, a stop button, and a timer showing '00:00:06.03'. Below the code editor, the letter 'A' is written in large red font, and below the preview window, the letter 'B' is written in large red font. At the bottom of the left page, the text 'CodeMirror: text editor in JS' is written in red. At the bottom of the right page, the text 'IFRAME' is written in red. A small 'Google+' logo is visible in the bottom right corner of the preview window.

1 HTML CSS JS Timesheet

2 ?

3 Save Share Download

4 00:00:06.03

A
CodeMirror: text editor in JS

B
IFRAME

Infrastructure

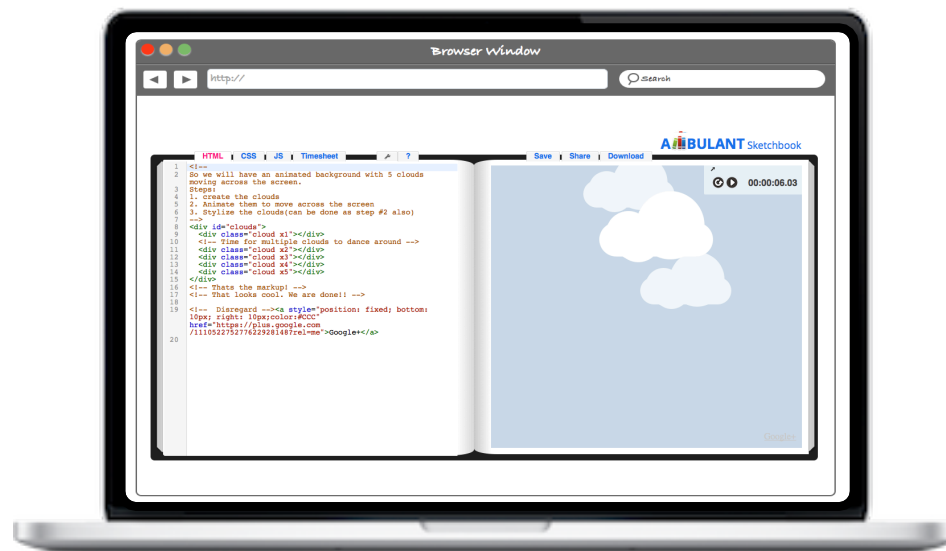
The screenshot displays the AIBULANT Sketchbook interface. The left pane shows the following HTML code:

```
1 <!--  
2 So we will have an animated background with 5 clouds  
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```

The right pane shows a preview of the animation. It features a light blue background with five white, stylized clouds of varying sizes and positions. A playback control bar at the top right of the preview area shows a play button and a timer at 00:00:06.03. The AIBULANT Sketchbook logo is visible in the top right corner of the interface, and a Google+ logo is in the bottom right corner of the preview area.

Infrastructure

code editor



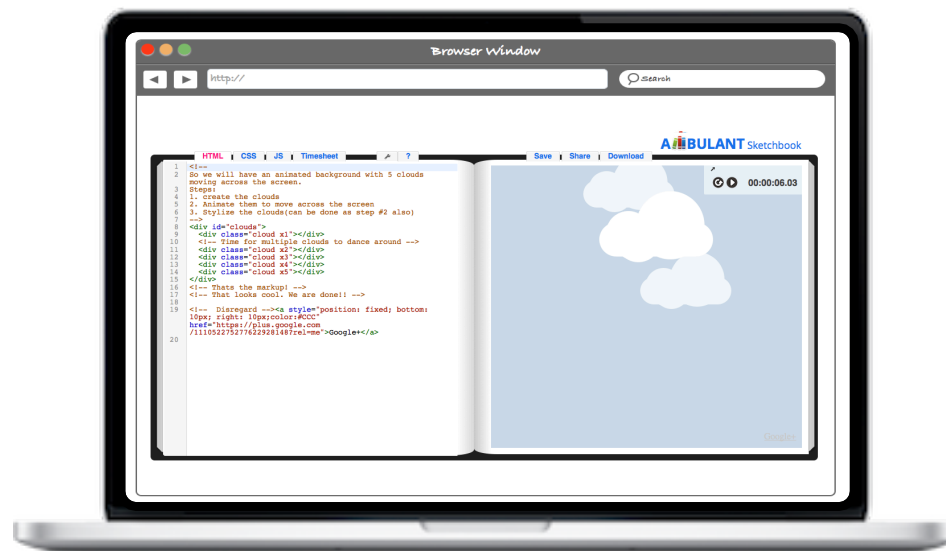
code previewer (local)

Infrastructure

web server



code editor



code previewer (local)

Infrastructure

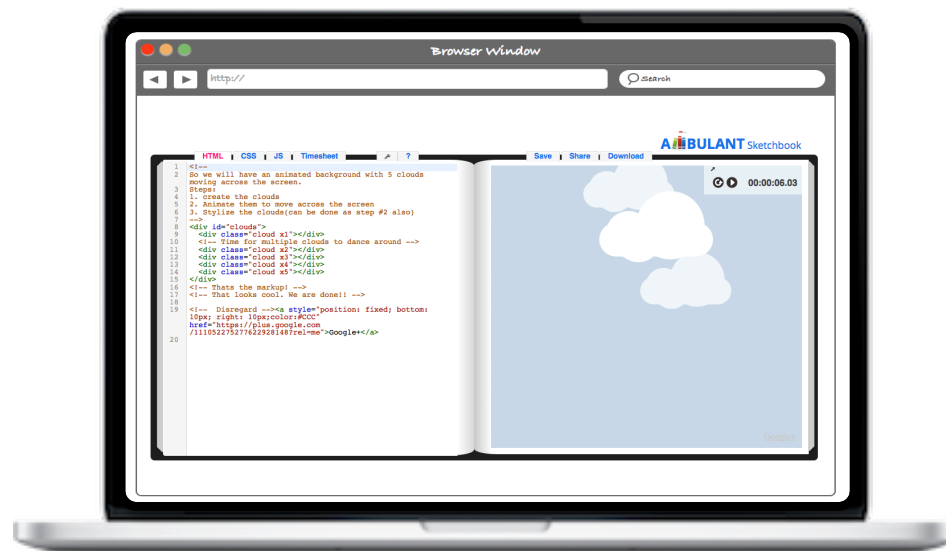
web server



changes and
event updates

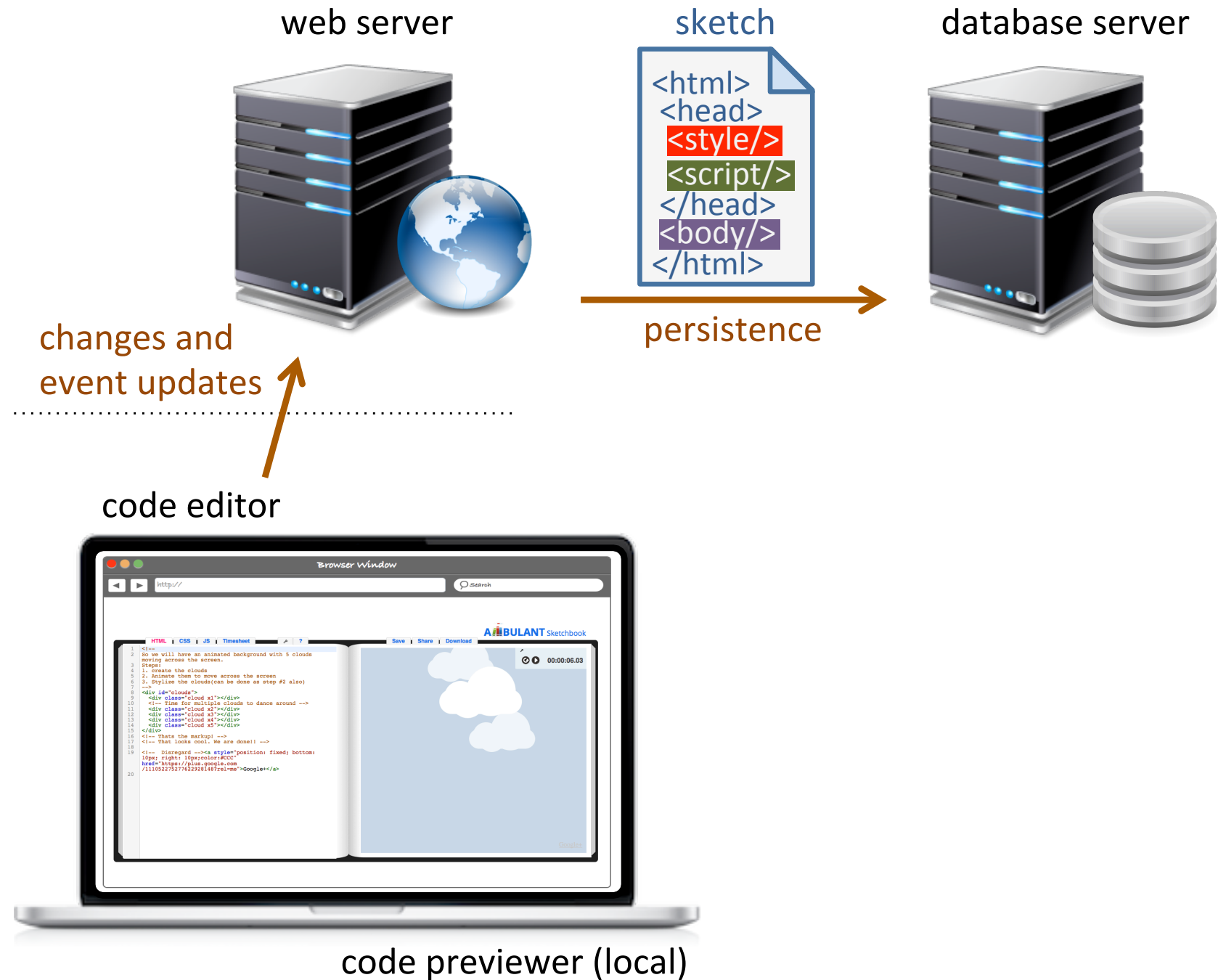


code editor

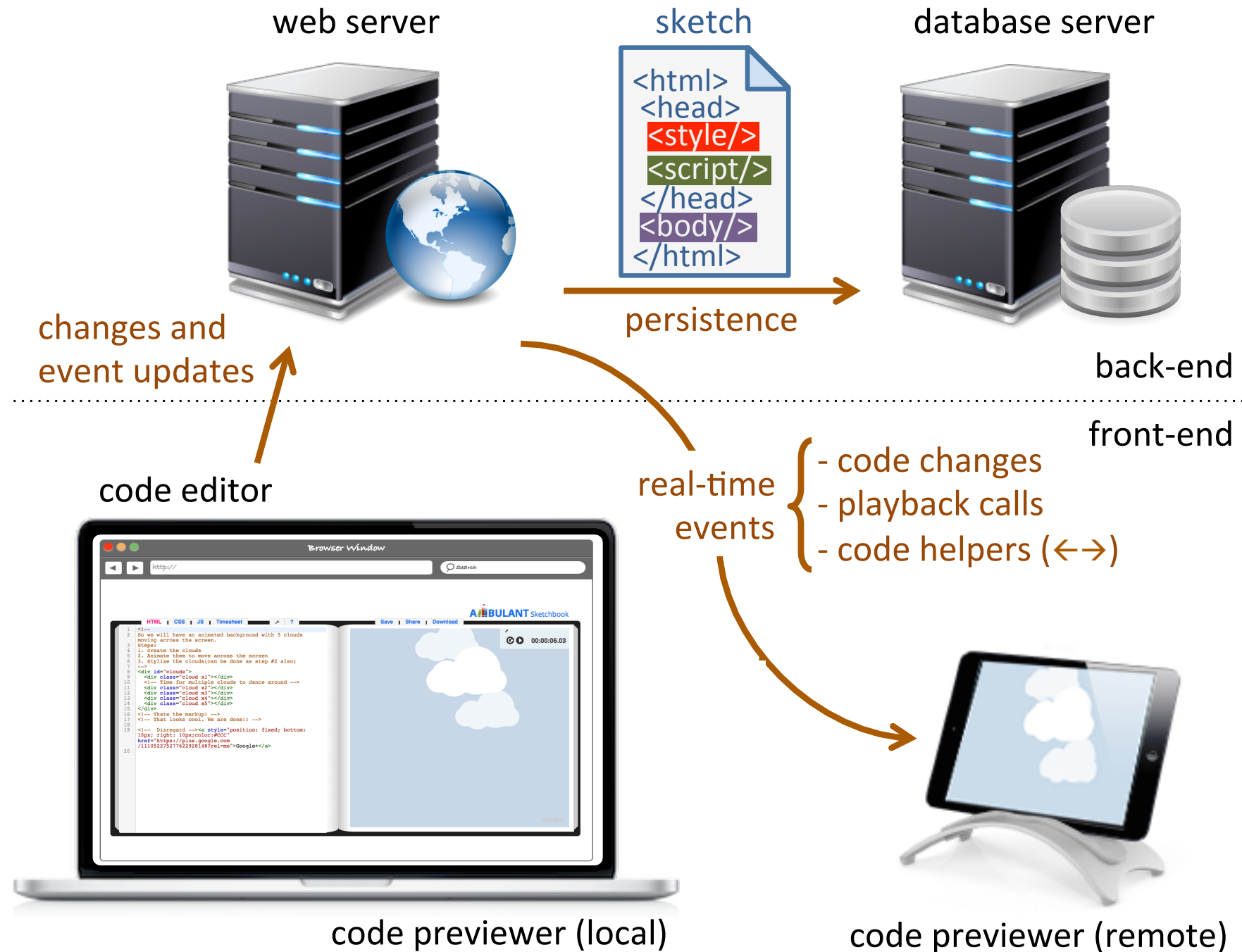


code previewer (local)

Infrastructure



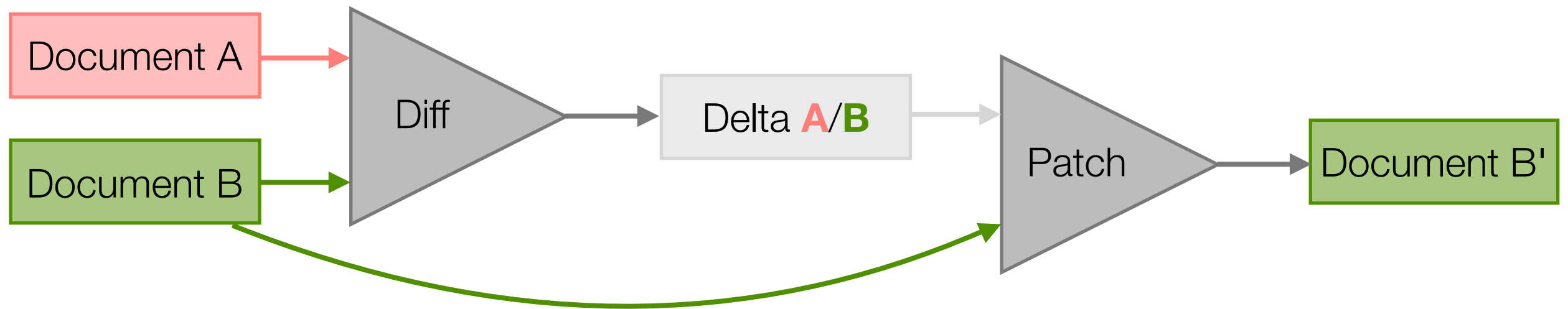
Infrastructure



Implementation: Code Changes

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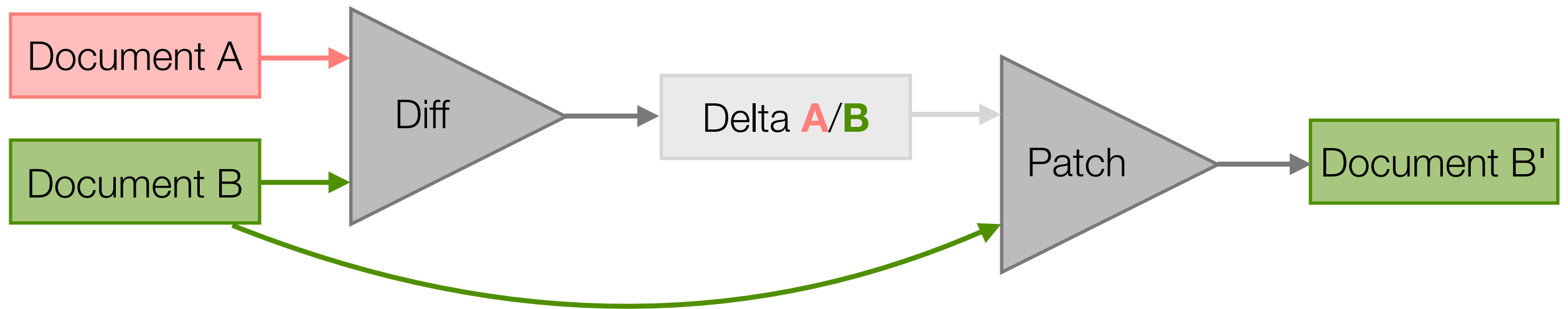
- HTML



Implementation: Code Changes

- HTML

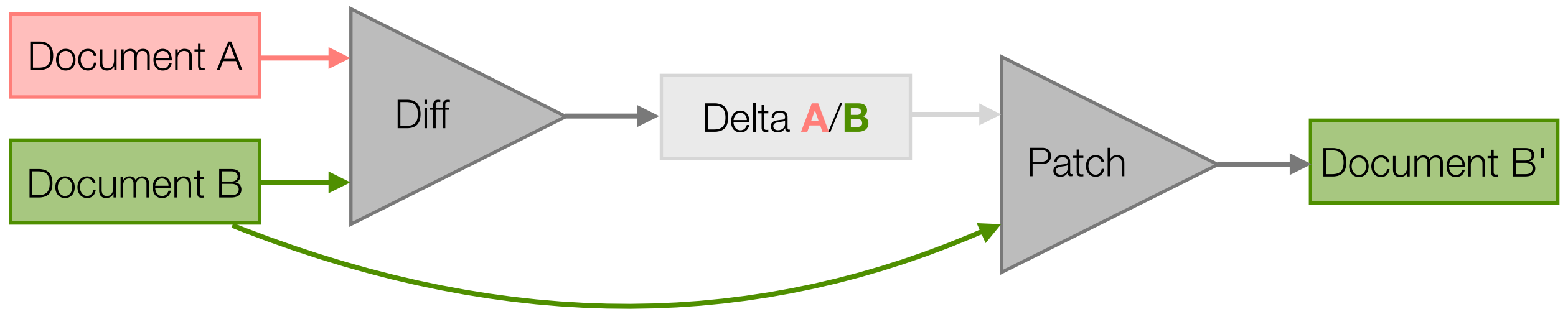
diffDOM: A JavaScript diffing algorithm for DOM elements



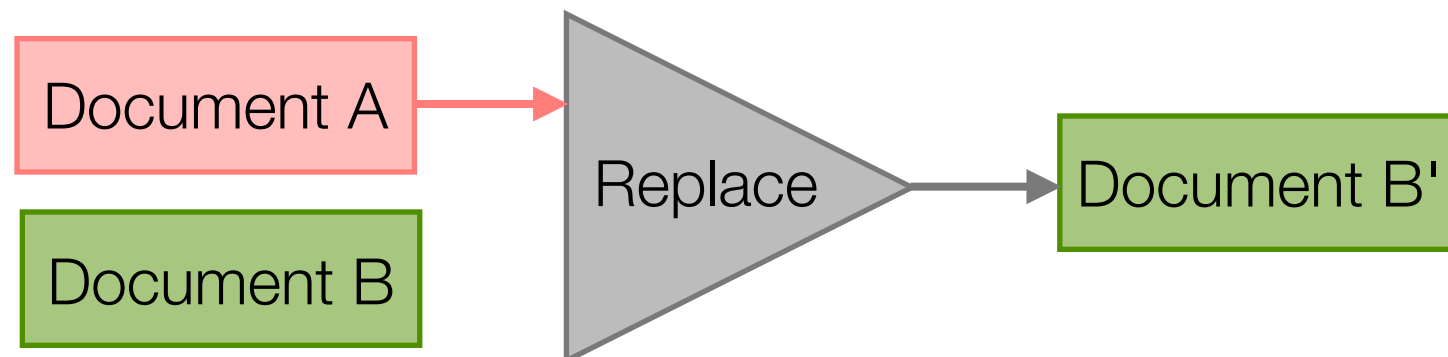
Implementation: Code Changes

- HTML

diffDOM: A JavaScript diffing algorithm for DOM elements



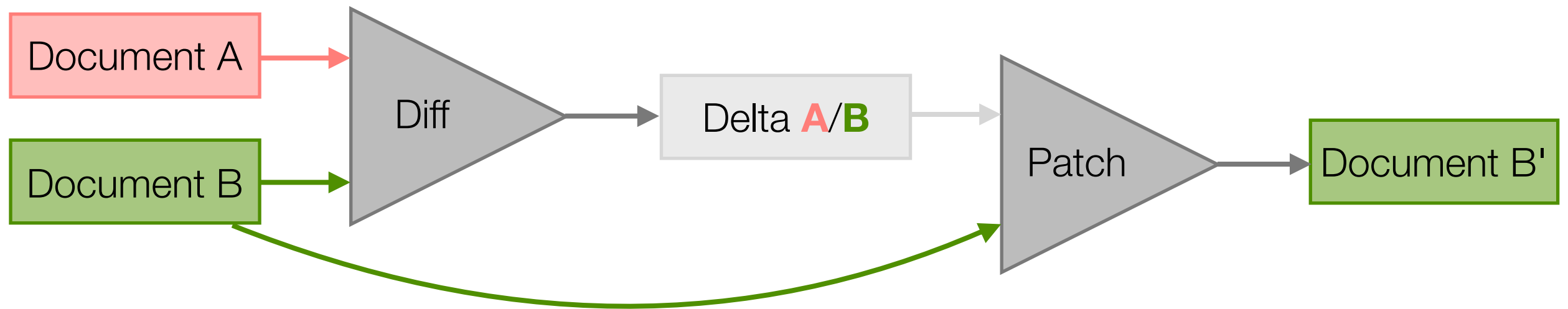
- CSS



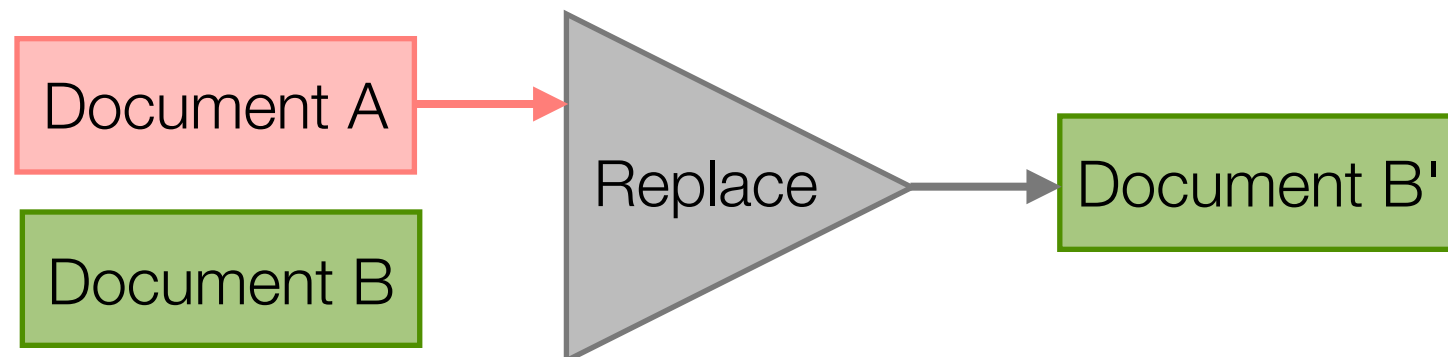
Implementation: Code Changes

- HTML

diffDOM: A JavaScript diffing algorithm for DOM elements



- CSS



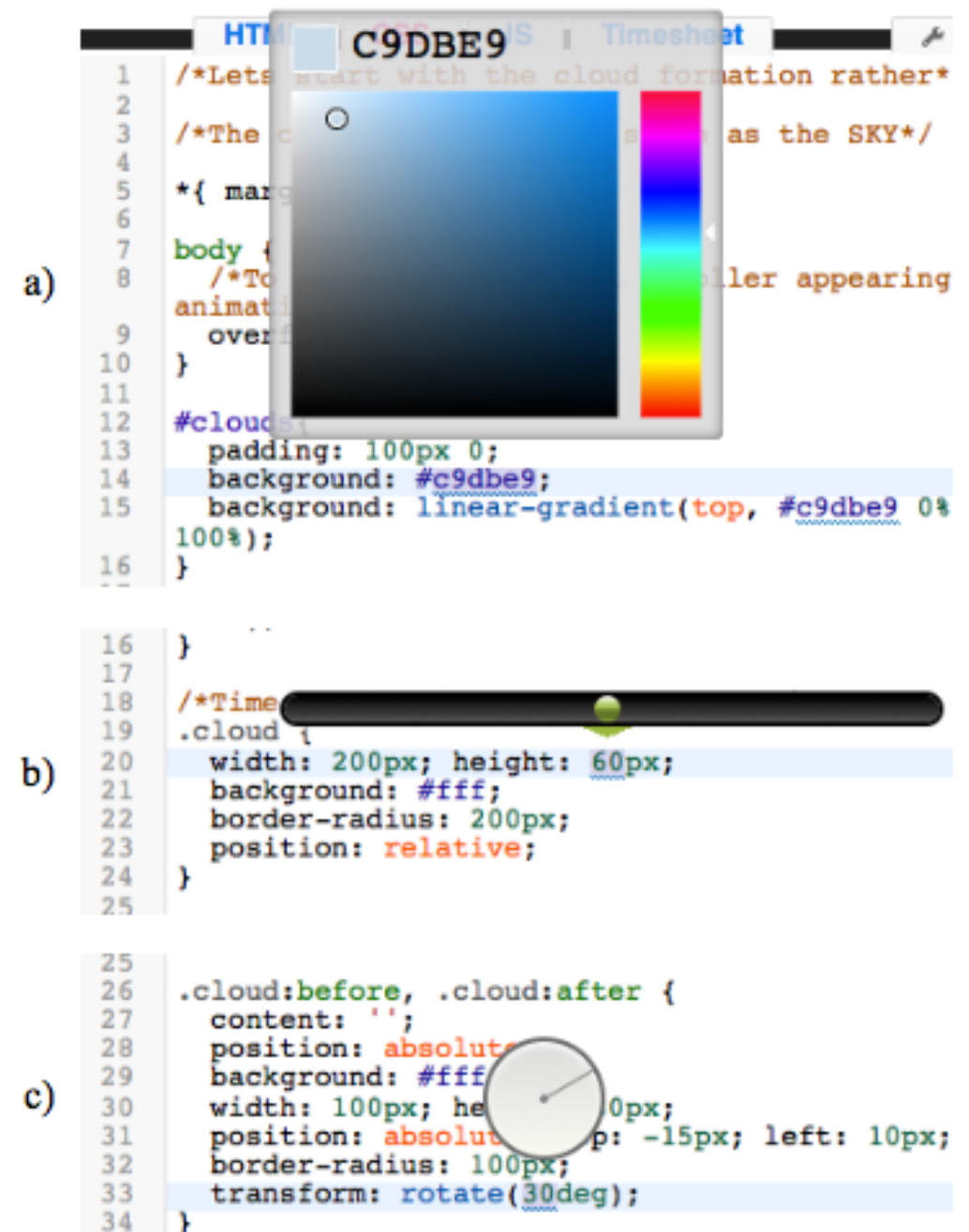
- JavaScript —> still to be done! (very hard)

Implementation: Helpers

Implementation: Helpers

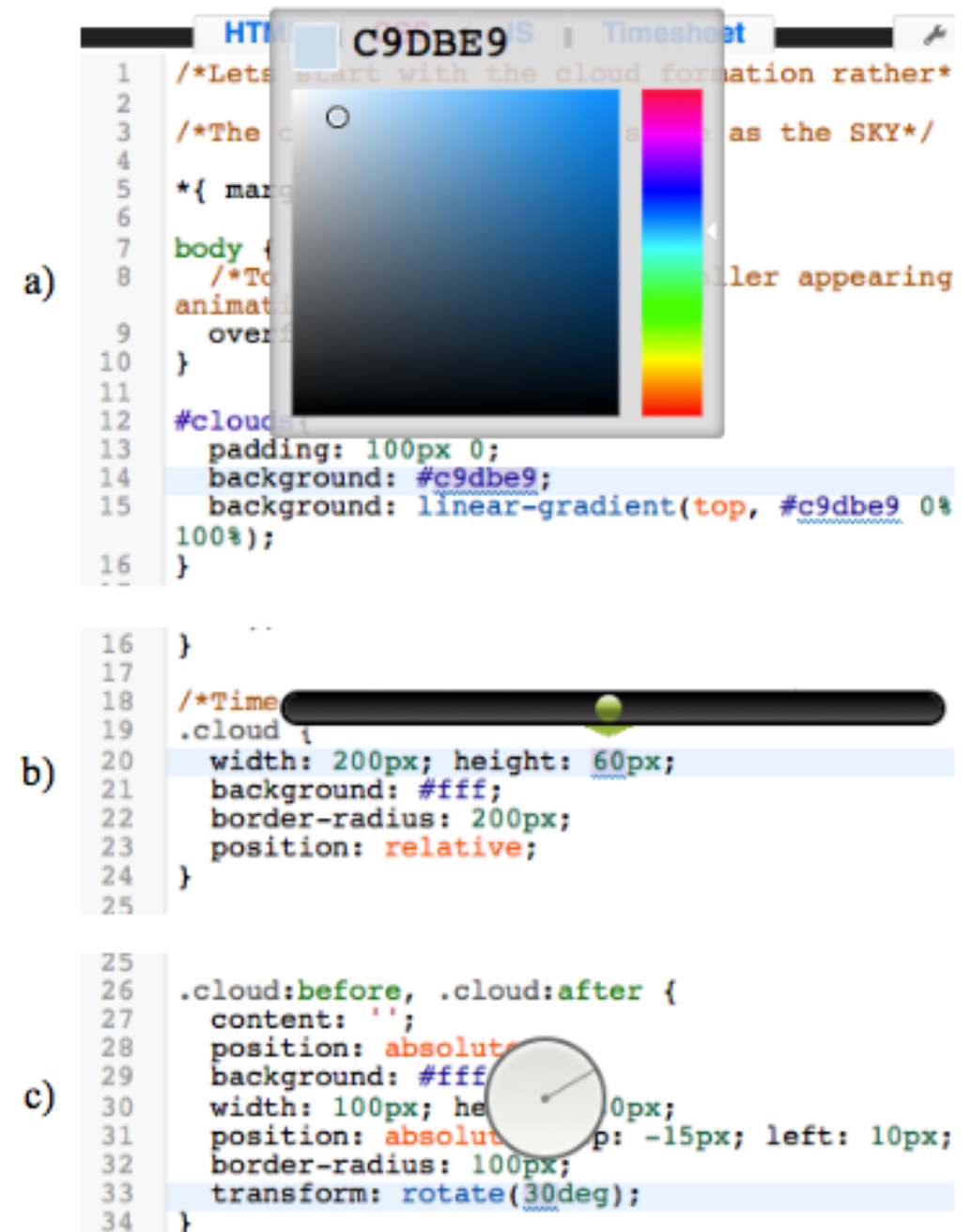
- Contextual helpers can facilitate the authoring process:

- color picker
- slider and
- angle picker



Implementation: Helpers

- Contextual helpers can facilitate the authoring process:
 - color picker
 - slider and
 - angle picker
- Inlet: JavaScript plugin for CodeMirror



User Evaluation

User Evaluation

- 22 post-secondary students over 2 weeks (IFES)



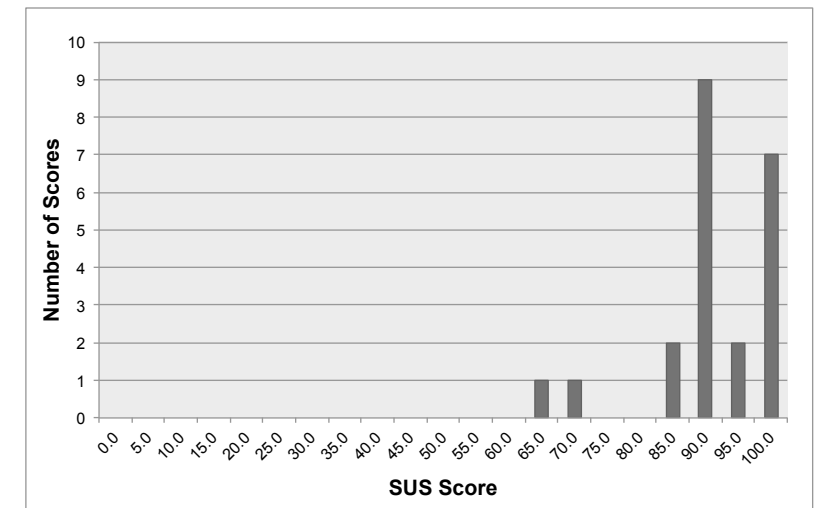
User Evaluation

- 22 post-secondary students over 2 weeks (IFES)
- Exercises on how to use SVG graphics on the Web



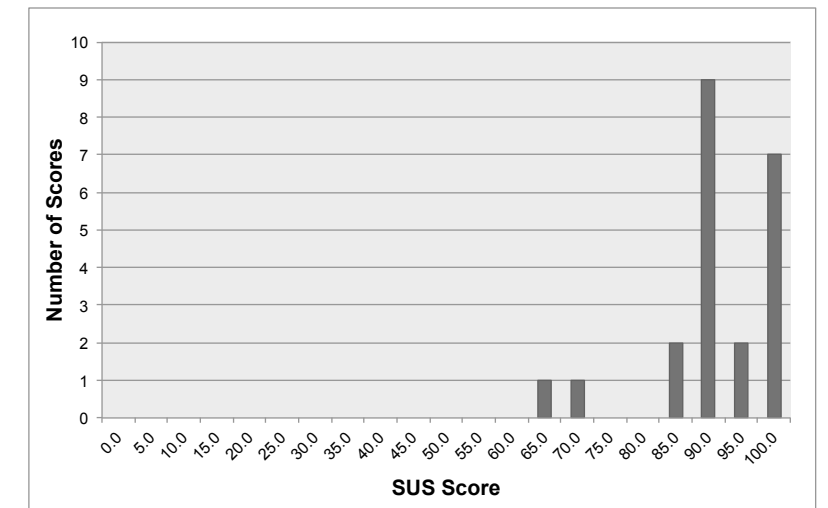
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- Results based on SUS framework and open-ended questions



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Mean SUS score = 90.0 / Learnability score = 84.7

Final Remarks

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- Next steps: improve current implementation based on user evaluation
- Add support code snippets in SMIL Timesheets and *Time Style Sheets* (TSS)

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- Valuable tool to teach concepts of time on Web documents using the *Problem-Based Learning* (PBL) methodology
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- We need a fresh new look into the standardization of time-based APIs on the Web

Final Remarks

- Valuable tool to teach concepts of time on Web documents using the *Problem-Based Learning* (PBL) methodology
- Next steps: improve current implementation based on user evaluation
- Add support code snippets in SMIL Timesheets and *Time Style Sheets* (TSS)
- We need a fresh new look into the standardization of time-based APIs on the Web
- Offer mechanisms to control and simulate the behavior of elements over time (e.g. temporal visualization)

AIBULANT Sketchbook

sketchbook.laiola.com.br

Thanks!

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