Loom: One Web Development Tool for Everyone

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Motivation

Existing web development tools either provide easy-to-use interfaces intended for novice users, sacrificing expressiveness, or advanced interfaces intended for developers who already know web technologies, but inaccessible by ordinary users.

Loom aims to **bridge the gap** between these categories, giving novice users the full power of front-end web technologies such as HTML and CSS without the need to write code, while also giving developers a powerful tool for rapid prototyping.

In addition, Loom aims to impart the basics of HTML and CSS to users as they work with the tool, **teaching valuable concepts** about these technologies that can be carried over to other web development tools.

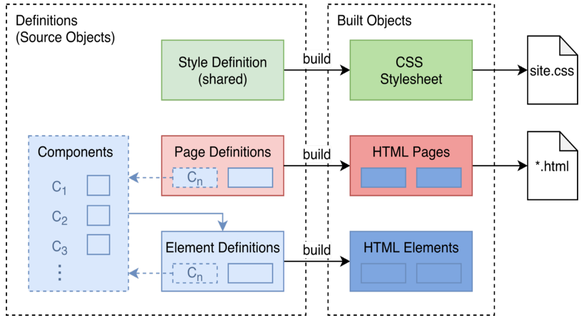
Solution Design

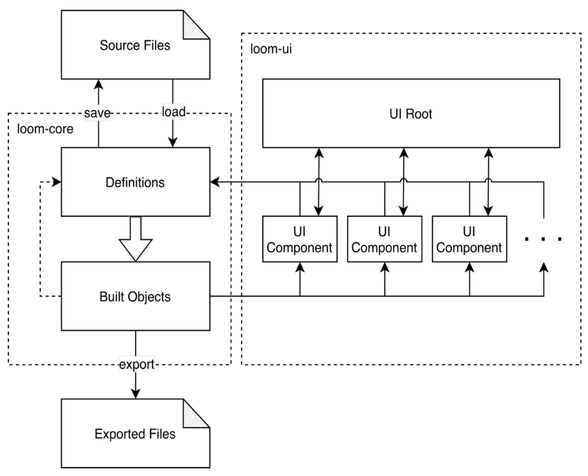
Working directly with web technologies can be frustrating, even for developers. Loom provides a handful of **simple, but useful, abstractions** over these technologies to make working with them easier.

Components are an example abstraction defined by Loom. Components enable reuse of HTML elements across several pages, such as a site header and footer. This is not possible in standard HTML.

To support these abstractions, Loom differentiates between Definitions and Built Objects. Definitions contain the data which users directly modify. Built Objects result from building Definitions, and correspond directly to **standard HTML and CSS**.

A **Project** in Loom can consist of several pages and one stylesheet which contains styling information for the entire project.





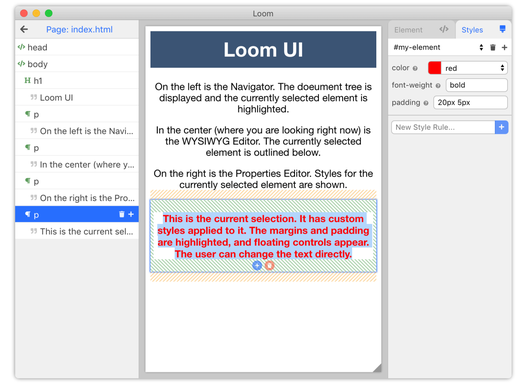
The build process to transform Definitions into Built Objects is **reactive**. That is, if any value within a Definition changes, any associated Built Objects will update appropriately as well. The Built Objects will also themselves emit events in order to trigger additional actions such as UI updates. This process enables **immediate feedback** to user actions.

Loom makes heavy use of event-driven programming. A collection of event-driven data structures has been created specifically for Loom, enabling a high level of code reuse. These data structures include key-value dictionaries, lists, and wrappers around single values, as well as several helper classes for performing reactive operations such as mapping, filtering, key lookup, and more.

Interface Design

The UI of Loom **scales with the user**. As an example, for some properties, novice users can take advantage of dropdown selections with curated choices, while developers can enter any value they choose. Similarly, many technical terms have nearby “help” controls to assist novice users.

- The **Navigator** (left) allows the user to select a page or component to edit, and then a data item (such as an HTML Element or text) within.
- The **WYSIWYG Editor** (center) shows the user a live preview of the page and selected data, and allows them to edit the page contents via direct text entry, keyboard shortcuts, and floating controls.
- The **Properties Editor** (right) gives the user fine control over properties of the selected data, such as HTML attributes and styles.



Results

To evaluate Loom, we evaluate how well it meets the needs of target users: Novices, Developers, and Designers.

Novices	Developers	Designers
✓ Create / Delete Pages	✓ Set Custom HTML Attributes	✓ Create Content Quickly
✓ Create / Delete Elements	✓ View Element Properties	✓ Live View of Output
✓ Associate Visuals with HTML	✓ View Element Styles	○ Layout Content Quickly
✓ Save Project as Static Files	○ Set Custom CSS Properties	○ Modify Font Styles
○ Bold / Italic / Underline Text	○ Create Custom CSS Rules	✗ Copy and Tweak Pages
✗ Create Images / Links	✗ Create and Edit Scripts	✗ Standard Color Palette

There is clearly room for improvement even among this small subset of use cases. Nonetheless, this demonstrates the potential for Loom to accommodate a wide variety of users with different needs.

Future Work

UI Improvements

- Drag-and-drop to create and move content
- Additional controls within WYSIWYG Editor
- Improved interface for editing style properties
- Additional context clues, help text
- More…

Additional Features

- Parameterized components
- Support for media files, scripts
- Import existing websites
- Post-processing of output content
- More…