

Two-Level Artificial-Landmark Scrollbars to Improve Revisitation in Long Documents

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Introduction

Though scrollbars of document viewers provide a spatial representation of the document and allow effective navigation and revisitation, they become inefficient for long documents. We investigate the use of artificial landmarks in two-level scrollbars to improve the revisitation support in long documents – inspired by visual enhancements seen in real-life books (e.g., indent cuts).



Landmark:

Landmarks are visual features that help a user to remember locations [1,2]. Landmarks are an important part of real-world navigation.

Problem Overview

Revisitation in documents is a common task, but the scrollbars provide very little support when users need to go back to places in a document that they have visited before.

Two main existing approaches to support revisitation in long documents:

- **Search:** requires that the user recall exact text from the desired location.
- **Explicit bookmarks:** require manual interventions from users to manage and view all the bookmarks.

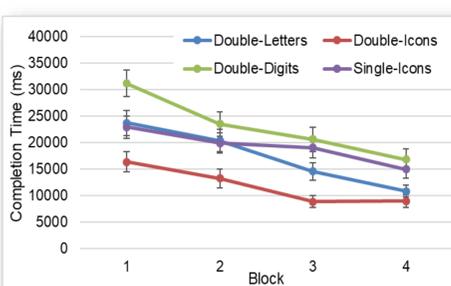
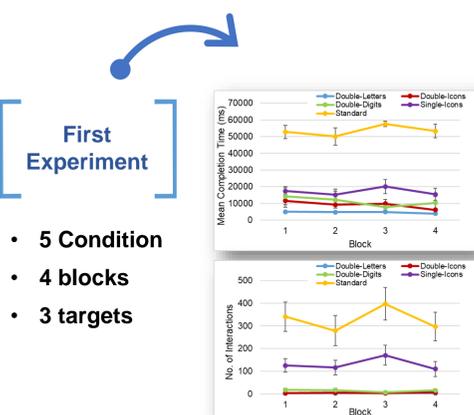
Study Interfaces

We designed five custom document viewer interfaces, and four of them were augmented with artificial landmarks inspired by landmarks augmented linear controller design [3].

- **Standard:** a single scrollbar with no scrollbar embellishment
- **Single-Icon:** a single scrollbar with one column of icon landmarks
- **Double -Icons, -Letters, -Digits:** three designs with two-level scrollbars and two columns of landmarks (icons, letters and digits)



Five study interfaces used in the experiments



Trial Completion Time:

Showed that Double-Icons is significantly faster than Single-Icons.

Number of Interactions:

All of the Double-Scrollbar conditions required significantly less number of interactions.

Subjective Responses:

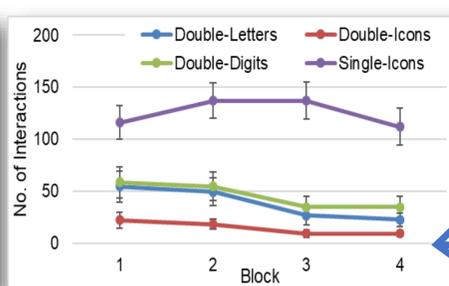
Double-Icons outperformed other interfaces and was more preferred by the participants.

Trial Completion Time:

Trial completion time for standard interface was significantly worse compared to landmark-augmented interfaces.

Number of Interactions:

Standard interface and Single-Icons requires significantly more number of interactions.



Second Experiment

- **4 Condition**
- **4 blocks**
- **6 targets**

Experiment Design

The study involved visit and revisit of pages selected from a long document using the customized interfaces. Participants used a mouse to click, drag or scroll on the custom scrollbars to locate and revisit stimuli pages.



Spatial Memory:

Spatial memory is the part of memory responsible for recording information about one's environment and spatial orientation.

What Next?

We plan to use dynamic landmarks based on the content of the documents.

We also plan to test our landmarked scrollbars in small devices e.g., smartphones.

Conclusions

We present two-level artificial landmarks augmented scrollbars and tested with three different landmarks in hundreds of pages long document.

Our studies show that artificial landmarks can be a promising way to form strong spatial memory of long documents – and can improve revisitation performance. Also, Icon landmarks outperformed Letters and Digits.

References

1. Kevin Lynch. 1960. The image of the city. MIT Press.
2. Joey Scarr, Andy Cockburn, Carl Gutwin, and Andrea Bunt. 2012. Improving command selection with CommandMaps.
3. Md. Sami Uddin, Carl Gutwin, and Alix Goguy. 2017. Using Artificial Landmarks to Improve Revisitation Performance and Spatial Learning in Linear Control Widgets

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