New scrolling method promises accelerated skim reading and data recall

April 13 2016

The explosion of digital content and data that we take in from screens each day through documents, email chains, web pages and social media flows is enormous and consequently, the rapid comprehension of complex information has become an essential aspect of modern life. The continuous scrolling technique typically used to browse this data is, however, far from perfect. In conventional scrolling, a number of objects are moving in the viewer window, which is problematic for visual attention. First, motion blur makes it impossible to focus on an object. Second, the user is not able to direct their attention for long enough to comprehend the content before it scrolls out of the window.

The EU COMPUTED project has created the Spotlights software to address many of the shortcomings of conventional scrolling. The naming

of the new software is based on the spotlight metaphor of human visual attention. According to existing research, visual attention needs about half a second to focus, which is longer than the average amount of time that a sentence or picture remains on the screen when using the normal scrolling technique.

Spotlights works by locating on each webpage (whether it is a document, PDF, video, or web document) the visually important elements, and presents them using a transparent layer that appears on top of the text. These elements can take a number of forms, ranging from pictures, tables, graphs, headlines or sub-headings. In essence, the software chooses what the user should focus on and allows them enough time to be able to do so.

Testing Spotlights

The project team conducted three separate studies to test the new software. The first study tested user recall and was informed by empirical research on skim reading, emphasising the influence of time pressure, complex documents and a focus on comprehension. Users were asked to recall keywords and figures, also numerically rating their comprehension. To directly test whether Spotlights improved users' ability to attend to objects during scrolling, the researchers also collected data on gaze and scrolling behaviour. User recall was greatly improved with scrolling rates being 60 % faster. Users were also more confident with their comprehension of long documents when using Spotlights as a result.

The second study focused on overall comprehension and compared Spotlights to normal scrolling in a questionnaire-based test accompanied by standard workload metrics. The project team learnt from the recall study that participants employed more backward tracking, and to help this behaviour, the project turned on Spotlights' 'Click-and-Go' feature.

When an object is highlighted, the user can specifically select it by clicking on it with the cursor, warping the user to that object in the document and removes any other highlighted objects from view. The user was also able to return to potentially important and/or interesting objects within the document. Overall, the team concluded that Spotlights helped users to orient themselves better to unfamiliar content, particularly by helping them to quickly understand the high-level structure of a book.

Finally, the third study considered skim reading done for lookup and filtering purposes. A target was given and the user had to locate it in the document. For this, the researchers expected that scroll speed would be higher than in the second study, as the participants were searching for a specific object in the document, and not attempting overall understanding. The results were highly promising, showing that participants were twice as successful in localising targets as they were in normal scrolling when using Spotlights.

Next steps

The project team sees many opportunities to develop Spotlights further, with their research being the first attempt to maximise the amount of the information on the screen for human visual attention. They acknowledge that it is presently a prototype and will need further development but have already considered numerous avenues of further research and testing.

These include adjusting exposure parameters for individual personalisation that would in theory lead to better performance rates. Some users developed strategies to counteract Spotlights by focussing on the middle of the screen instead of trying to find the best upcoming spotlight, so new techniques to automatically guide attention to the next object should be considered. Finally, there needs to be more

consideration of how the complexity or unpredictability of an object affects visual processing requirements, with one possibility being to pre-process objects for complexity and modulate exposure time accordingly.

More information: For more information see the project page: cordis.europa.eu/project/rcn/193547_en.html

Provided by CORDIS