Modeling Sub-Document Attention Using Viewport Time

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(with support from Nir Grinberg)
A Superior Chicken Soup

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Chicken soup is one of the most painless and pleasing things to make in a home kitchen. But do modern cooks know that?

During America’s inexorable march toward processed food, chicken soup became something to buy, not something to make — Campbell’s alone produces more than 50 varieties — and many cooks simply don’t know how satisfying a project it is.

“So what comes first, the chicken or the soup?” Ashley Aguilar, a radiology technician in San Jose, Calif., asked after spotting an online photo of my homemade chicken soup.
Current understanding of user engagement on the Web is limited mostly to the document level.

- bounce rate
- page views
- time-on-page

**OVERALL GOAL**

Understand how users interact with documents online.

**IN THIS WORK**

Validate our sub-document attention model on large-scale Web data using a known user behavior metric.

1.2 million reading sessions on a popular news site.

Cross-language reading rate.
Eye tracking to measure attention

- Fine-grained measurement of attention
- Great for understanding engagement patterns
  - Expensive, dedicated hardware
  - Calibration and lab setting
  - Does not scale to millions of web users

Our approach: measure attention using only **standard browser data**.
Uniform attention

- Divide total user attention uniformly across the page, based on page element size.

- Does not take into account viewport information.

- What can we learn about attention from lab studies?
Viewport attention distribution is very predictable!

(Sharmin et al., 2013)

(Buscher et al., 2010)
Gaussian viewport attention

- Uses the user’s viewport and attention distribution to assign attention to page elements.

+ *Empirically motivated:* Builds on prior research in attention.

- How do we validate it?
User engagement dataset
- 1.2 million reading sessions across a popular new website collected by Chartbeat, Inc.
- Each session consists of second-to-second viewport time data.

Cross-language reading rate
- Readers have predictable and measurable rates across nine languages.
  (Susanne Trauzettel-Klosinski and Klaus Dietz, 2012)

Validation Approach: Reading rates estimated by the attention model should correspond with known reading rates for each language.

- 5 sec. → 240 WPM
- 12 sec. → 220 WPM
- 8 sec. → 100 WPM
Applying our model

What about images? Which article topics use the **most engaging** images?

- Group articles by topic.

- Apply our viewport-based sub-document attention model to each session.
Understanding language
- Write automatic summaries using sub-document attention distributions.

Understanding engagement
- Help identify and aid struggling readers.
- Better understand user preferences.

Attention measurement at scale
- We can reliably measure sub-document attention within the browser.
- Especially useful tool at scale.
- Such as measuring attention of millions of users to thousands of images.

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