

Notes - Design - Processing Visual Information

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A brief intro to processing visual information relative to application and interface design.

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Intro How do our users actually process a page or screen within our application? As designers and developers we have long been interested in working out how to guide a user, and their focal point of vision and interest, across a page or screen.

For example, graphical artists use emphasis and positioning to draw attention to a headline in a poster. Similarly, cartoonists carefully compose and sketch out cartoons so that viewers notice the characters and, hence, read the all-important speech bubbles in the required order. Without such logical hierarchy, a joke may simply not make sense.

As designers, we can lay out our visual page elements in certain ways that influence the order in which users will notice these elements and, indeed, how long they will spend looking at them.

By knowing common patterns for user viewing, we can design our application's pages to accommodate such usage patterns, thereby putting relevant information in the places where people are likely to actually look.

How do users read a page? So, how do users read a textual page?

Traditionally, we've always considered that western readers, at least, will start by looking at the first word in the top left corner of a page, then scan across the line from left to right, naturally reading the words, and then skip to the beginning of the next line.

Our reader will again scan from left to right to read the required line, skip to the next one, and continue this reading pattern until they reach the bottom of the page.

As our reader's eyes scan across the line of text, it is not actually a smooth action, as one might naturally expect.

So, instead of a smooth action, the focus of a user's eyes instead jumps rapidly between given spots on the page, which are known as *fixation points*. These jumps from point to point are known as *saccades*. The brain itself does not receive any visual information during such *saccades*, but it is capable of combining the images received at each *fixation point*, which the brain effectively *sees in a line*.

In human vision, our focal point is reliant upon the *fovea*. This area of vision is very limited, although we can still perceive vision, if a bit lacking in focus, with our peripheral vision.

Perceiving more complicated pages If we consider page layouts with a more complex design and pattern than simply blocks of text, it becomes slightly harder to discern exactly how a user's eyes will move across the page, and it will also tend to differ for each reader.

However, there are some generalisations we can consider and transfer from example to example.

Traditionally, graphic designers have believed that users get an initial impression of a page or document, such as a newspaper, by scanning the page in a Z-shaped pattern. Again, they start in the upper left corner, read the title of the newspaper across the top, and then continue scanning the page from the upper right corner.

This skimming continues diagonally to the lower left, skimming the page to the right, ending in the lower right corner. Our reader will then return their focal point to those areas of interest within the page.

One of the uncertainties in this pattern is how flashy, loud images will influence this z-shaped scan of the page. It has been observed that such images will tend to break this pattern, or at least slightly interrupt its flow.

We also know that a user searching a page for something specific will often follow a different pattern.

Studies In an attempt to better understand how user's perceive and experience visual information, researchers have conducted eye-tracking studies using specialised cameras and software. This setup is able to identify where and what a user is viewing on a screen at any given time.

This software can then replay the *scanpath*, which is simply a series of *fixations* and *saccades*. This replay tells us the areas of the screen a user has looked at, and for how long they spent observing each fixation point.

Whilst such *scanpaths* can naturally vary from user to user, we can obviously combine these results to achieve an aggregated *heatmap* diagram, which shows predominant areas of interest to our users.

Eyetracking web usability One of the best, and also well-known, studies of eye-tracking was conducted by Nielsen and Pernice, and published in 2009.

For example, they made the following interesting observations.

Websites present a different pattern for users compared to newspapers, for example. A user will tend to follow a pattern roughly equivalent to an *F*. They will read across the top, and then continue down the page, and read lines, or at least partial lines, of text from left to right. However, users tend to be more likely to read complete paragraphs or lines nearer the top of the screen, and then lose interest and simply scan the text near the bottom of the screen.

When a user reaches the bottom of the screen, they will often make an additional quick scan down the left side of the screen or page, in particular if there is a sidebar with links.

It's interesting to note that the screen's upper left corner receives the most attention, whilst the lower right corner received the least amount of interest.

Images and graphics naturally attract a user's attention. However, this tends to only be a strong response and reaction when they are a relevant and integral part of the content.

Users appear to be able to quickly discern relevant imagery from decorative stock photos. The latter are quickly overlooked and ignored beyond this first, superficial glance.

The vast majority of users now simply ignore banner ads on websites, and when such ads were placed specifically across the top of the screen, users simply ignored them and started their *F* shaped pattern beneath the position of the adverts. Effectively, they simply chose to begin their perusal of the screen where the content began at the top of the screen.

What was also interesting is that users tend to ignore elements that are repeated on multiple pages. If they've seen a logo or navigation bar at the top of a site's page, they normally do not look again unless they specifically need to.

Resources

- Card, S.K., Moran, T.P. and Newell, A. *The psychology of human-computer interaction*. Lawrence Erlbaum Associates. 1983.
- Nielsen, J. and Pernice, K. *Eyetracking web usability*. New Riders. 2009.