

Michael Altman
Content Blindness: Inattention to Web Content When Mistaken for Advertisements
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Abstract

Web users are known to be efficient at scanning large amounts of information in order to satiate the user's goals for visiting the site. These goals rarely include attention to advertisements; which web users have learned to effectively avoid without the need for direct attention. It is clear that web users are able to easily separate these advertisements as they typically appear with a visual disconnect (both in styling and location) from relevant web content. In this study I attempted to validate that this type of inattention can manifest itself in actual web content that may contain the user's desired goal. I did this by asking participants to search a content rich website for a word while I manipulated the location and style of the target word in a way that would intuitively bring attention to the location of the word.

The results established that the styling of content with shading or a border has negative effects on a web user's visual search through a web page. Users process visual cues that are not consistent with a web site's visual treatment and purposely do not attend to these areas. Web users also use expectations for the location of non-relevant items in order to give priority to goal oriented content during visual search. By defining the avoidance of content in a visual search task in terms of banner-blindness, these findings demonstrated the existence of content-blindness.

Introduction

Overview

Researchers have found that experienced web users are incredibly efficient in scanning and searching a website for content without being caught up or distracted by advertisements. They are capable of adapting to different page layouts while applying a heuristic understanding of how best to approach the visual search for goal relevant content.

Often times usability engineers refer to the inattention of web advertisements as banner blindness. At times, web designers use extra formatting in order to bring special attention to featured or important content. These formatting changes to content can trigger cues in the web user causing an adverse effect of banner blindness type inattention. The phenomena of inattention to content will be referred to as content blindness.

Background

Banner advertisements on the web play a key part in e-marketing. This hasn't changed since the mid 90's. In 2004, Moira Burke et al. conducted research in order to disprove the previous theory of banner blindness. Banner blindness is the notion that as web users scan a website, they don't process advertisements. The reasoning behind this theory has a handful of different explanations. Moira Burke's paper disproves the theories of the existence of banner blindness by demonstrating that although eye tracking studies show that users don't explicitly look at advertisements, they process them. Their study showed that the existence of an advertisement on a page constantly hinders the performance of a visual search task on a site.

Though they were able to successfully disprove banner blindness to a degree, they didn't offer reasoning behind their findings. In order to identify variable that could contribute to the

mentioned phenomena we must examine reasons as to why the data showed what it did and how it is that users are able to identify banner advertisements without explicitly looking at them. (Going forward I will be making the assumption according to previous eye tracking research that most people don't look directly at banner advertisements).

Michael Bernard studied user expectations for web content location. His research showed that most users expect to see banner advertisements along the top and right side of a website. Could these expectations contribute to people not looking at certain areas of the page for wanted content? He speculated that this is the case as well as the inverse. He hypothesized that content in non-advertisement places gets priority in a serial search for content consistent with the goals of the user. According to Bernard, it is likely that the expectation of the placement of an advertisement allows users to effectively avoid advertisements. How would advertisement-like content placed in a 'content area' effect the visual search task of the user?

Laura Granka et al. help to expand on the questions that are raised by Bernard's study and help to explain why users appear to be blind to advertisements. They tested advertisement location and advertisement size against visual search tasks for users. They found that information density did not significantly contribute to attention onset. One reason for this in a practical real world website setting is that many of the large and "information dense" regions are typically isolated from the primary site content as advertisements. They claim that "Users are likely to 'visually disconnect' from these regions because the elements appear extraneous to both the goals of the site and the users own needs/motivations for accessing the site."

Perhaps the theory that best explains the phenomena of perceived banner blindness how users can identify advertisements and process them without looking at them is that of the famous paper proposing

a feature integration theory of attention by Anne M. Treisman and Garry Gelade. Parts of the theory that pertain to the questions at hand are the theories on visual search and texture segregation.

The Visual Search Theory states that simple, common features can be detected without focused attention. Therefore searching for something specific, in a group of distracters should not be effected by the number of distracters. This applies to common web advertisement characteristics such as lines, corners (borders), and colors.

The Texture Segregation Theory states that changes in texture and grouping of common features are processed before complete attention to a feature happens. Thus, it can explain that common visual features of advertisement (when unique compared to the context of the rest of the website) can allow for processing without attention. Once identified (in a pre-process) as a potential advertisement users chose to ignore the area and continue in their search task.

Treisman and Gelade also tested familiarity against their theory and found that “in a familiar context, likely objects can be predicted. Their presence can then be checked by matching their disjunctive features to those in the display, without also checking how they are spatially conjoined.” Thus, even pre-processing of a disjunctive boarder or color that stands out from the context of the page, users can make an assumption that the rest of the area is associated with an advertisement (or something not consistent with their goals of the visual search.

Current Study

These theories can be taken out of context of web advertising and applied to actual web design and content layout. Often web designers will format featured content differently from the rest of the content in attempt to draw the user's attention. This approach may have adverse effects similar to banner blindness. Rather than drawing attention, these areas may actually hinder attention by sending the user

cues, that the area is an advertisement and should be avoided during visual search. Web designers can learn from the effects of advertisements on the attention of web users in order to design for easy and efficient digestion of information. Users expect certain areas of a page to contain specific content. They also expect visual consistency throughout a website making the assumption, that visually jarring items may not coincide with their goal while visiting the site.

In the current study I will attempt to identify what attributes and page locations which are synonymous with advertisements may cause content blindness. By manipulating the location and the style of target search content and measuring the search times I hope to identify what contributes most to content blindness. A secondary goal of this research is to simply validate the existence of content blindness.

I hypothesize that content blindness occurs in content styled differently content that appears in the rest of a web page. Thus, search times will be longer in trials where the target search word appears in content that is styled with a border or with shading when compared to target search words that appear with no altered style. This is because these items will resemble an advertisement and therefore elicit the same attentional avoidance that would occur with an advertisement in the case of banner blindness. I also hypothesize that target search words that appear along the right side of the page will take longer than stimuli with target search words in the left, center, and bottom parts of the page. This is because users expect advertisements to appear along the right side of the page. This is consistent with the findings of Laura Granka et al about user expectations for website module location. Since users will expect to see advertisements in this area, they will not initially search this area for the target word. These two hypotheses imply a third prediction. That is, stimuli with target search words in the right location with styling will take the longest to identify of all the stimuli. This is because they will not only resemble advertisements because of styling, but they will also appear in a location typically expected to be reserved for advertisements.

It is possible that stimuli with target search terms that appear in the bottom of the page will have longer search times because the typical web user scans from top to bottom. However, I predict that the stimuli that will show traces of content-blindness will require multiple iterations of a top to bottom page search in order to identify the target. This being the case will show significantly longer search times when compared to the control condition for the stimulus located at the bottom of the page.

Participants

There were 12 participants in this study between the ages of 20 and 30. Of these participants, 7 were female and 5 were male. All of the participants were asked to volunteer for no compensation.

Materials

All tests were done on a Toshiba Satellite P250 running Ubuntu 9.10. The tests were run using Opera as a browser. 12 web pages were downloaded and saved on a local hard drive and organized using the Firefox add-on Scrapbook. The pages were all daily home page snapshots from The Onion website. No two pages were identical. Firebug was used to alter the content of the pages by inserting borders and shading. Light blue (#A0DDF0) was used for shading stimuli. Borders were 1 pixel wide and black (padding was used to keep style consistency in some cases). These 12 altered web pages were used as stimuli for the experiment. A stop watch was used to measure search times.

Design

There were two independent variables used in this study both of which were manipulated within subject. The first was the location on the page of the target word. There were four locations in which the stimulus would appear: left (L), center (C), right (R), and bottom (B). The second independent variable was the styling of the module in which the target word appeared. There were three values for this variable: control (C – no styling), shading (S – light blue shading), and border (B – black border). Such that LC is left-control, CC is center-control, and RS is right-shading etc.

There were a total of 12 trials, with 1 trials of every set location/style combination. The dependent variable was a measure of search time in seconds from the time the target word was presented until the participant identified that they had found the target word. Trials that reached three minutes were stopped and the maxim time was recorded. This was done in order to ensure a maximum time of 40 minutes for participation.

Procedure

Participants were given verbal instructions from the experimenter. Each participant was shown a non stimulus page from The Onion website in order to familiarize them with the layout of the pages. Participants were then instructed that they would be shown 12 pages similar to the one in front of them and asked to find a specific word on the page. They were told that this would be timed on each search task. They were also shown a boundary on the page where the target location would not appear below. Participants were instructed not to use the 'find word' feature of the browser. Participants were given the laptop and verbally instructed to find a target word on the page. The stopwatch was started by the experimenter at this point. Participants then used the mouse or arrow keys to navigate around the page while they scanned for the target word. Once they verbally confirmed identification of the word, the stopwatch was stopped by the experimenter. If the stopwatch reached three minutes before the participant was able to identify the word, the experimenter would stop the search task. The next page was loaded by the experimenter and the process repeated until all 12 stimuli were run as search tasks. Upon completion of the experiment, participants were debriefed on the purpose of the study. The average overall time to complete the experiment was about 20 minutes.

Results

Search times across all participants were collected. Time was capped at three minutes as a maximum allotted time.

I hypothesized that the results would show an effect of location and style of a target word on the search time required to find the target. Targets in the right area (RC, RB, and RS) would take longer to find than targets in other areas. I also hypothesized that targets with borders and shading would take longer to find than targets with no style attributions (LS, CS, RS, BS, LB, CB, RB, and BB would take longer than LC, CC, RC, and BC). Thus, search times would increase for targets with styling compared to the control and targets in the right content area would have longer search times when compared to those in the center, left, and bottom. Styled targets in the right content area would have the longest search times (RB and RS).

To measure our results, I use a repeated measures two-way ANOVA to compare the dependent variable across independent variables in such a way that I compared the mean search times of the style conditions and the location conditions in order to determine main effects. The mean times were across all participants. I then use the Scheffe method post-hoc test in order to identify significant interactions within the independent variables.

There was a main effect in style, where search times for the Control condition was significantly faster than the Shading condition and very close to significant in the Border condition with $F=2.357, p < .2$ (See Appendix I, Figure 1). There was also a main effect in the search times for the location variables. The search times for the Left conditions were significantly faster than those in the Bottom, Center, and

Right condition with $F=6.232$, $p<.2$ (See Appendix I, Figure 2). The ANOVA showed a significant interaction between location and style with $F=3.423$, $p<.2$ (See Appendix I, Figure 3).

To look at the interaction in more detail, I conducted four one-way repeated measures ANOVAs looking at effect of style on search time (separately for four different locations). There were no significant effects of style on location in left and right locations. Search time with conditions in the bottom and center locations showed significant differences in search times between style conditions with $F=4.963$, $p<.2$ for the bottom location and $F=6.095$, $p<.2$ for the center location. The Scheffe method showed that BS had significantly longer search times than BC and BB. The Scheffe method also showed that CB and CS had significantly longer search times than CC.

The hypothesis that targets in the right area would take longer to identify than other areas is rejected. All areas had significantly longer search times compared only to the left area. The hypothesis that styled targets (shaded and with borders) would have longer search times than the control is accepted. Styled targets took significantly longer to find than control targets. Because both hypotheses were not supported, my prediction that styled targets in the right area (RS and RB) would take the longest is not supported.

Discussion

Web users are known to be efficient at scanning large amounts of information in order to satiate the user's goals for visiting the site. These goals rarely include attention to advertisements; which web users have learned to effectively avoid without the need for direct attention. It is clear that web users are able to easily separate these advertisements as they typically appear with a visual disconnect (both in styling and location) from relevant web content. In this study I attempted to validate that this type of

inattention can manifest itself in actual web content that may contain the user's desired goal. I did this by asking participants to search a content rich website a word while I manipulated the location and style of the target word in a way that would intuitively bring attention to the location of the word. The location changes and style treatments were subtle enough to look like they fit in the context of the page, but different enough that they could look like an advertisement if not given enough attention. The idea was to replicate realistic situation where a web designer may attempt to bring attention to a specific section of content through location and style manipulation.

By comparing participant search times, I was able to determine that styling in this study did in fact have a significant effect on the speed it took to find a target word. When compared to the control conditions, target words that appeared in modules styled with either shading or a black border took significantly longer to find. Targets that appeared in the left, main content area were identified much faster than those that appeared in the center, right, and bottom of the page. The condition with the target word in the bottom with shading took significantly longer to find than the control and border conditions on the bottom of the page. Border and shading styling also showed significantly longer search times when compared to the control specifically when the target appeared in the center of the page.

These findings do not fit my predictions exactly. I predicted that targets in the right area would take longer than all others because this is where users typically expect to see advertisements. The results showed that overall, the right and center had very similar search times with the bottom being slightly faster and the left being significantly faster the three. Because of this, my prediction that styled items in the right area would have the longest search times was not supported. However, the results did show support that the use of alternate styling in content areas does have an effect on search times. This still shows support for content blindness.

These results are consistent with Treisman and Gelade's Visual Search Theory and Texture Segregation Theory. Though these results do not lend themselves to the exact cues in styling that cause the users to identify areas of a page that may be advertisements, it does show that users consistently ignore certain areas of the page in an initial visual search. The increased times may be due to users reaching the end of the page and not being able to find the target. Then going back and doing a serial (self-terminating) search through all content. This would include paying special attention to areas not attended to in the initial search.

Michael Bernard's theories that expected location for advertisements are not clear in the results; some inferences may still be made. It is clear that the left area had short search times, and therefore it can be assumed that initial searches started in this area before moving elsewhere on the page. The simple fact that items in the center and right areas did not get priority in the initial search may lend itself to user expectations that important content is usually in on left of a web page. Even though the bottom area did not show a significant difference in search time compared to the top center and right, does not mean that it did not get priority over those two areas. It was close enough to significance that with more participants, it may have shown to have faster search times than the center and right area. The fact that the search times are higher than the left may be due to the bottom content being rich in searchable material as well as requiring the participant to navigate further down on the page in order to see it. If it is the case that the bottom area is faster than the center and right area, we can then assume that the standard of reading from left to right, top to bottom does not apply in the scanning of web pages. The scanning technique would then be due to avoidance of expected advertisements.

The spikes in search time interactions may be due to user expectations for the types of advertisement

they expect to see based on location. Users would then be more likely to not attend to these items when presented in the scope of a visual search task. If these results are accurate, than one could conclude that users expect to see borders in the center and right side of the page to contain advertisements more so than if they were shaded. Shaded items would have the stronger correlation with the area being an advertisements in the left and bottom area when compared to borders. It would then be safe to make the recommendation to not style desired content in the left and bottom of the page with shading, and avoid using borders around desired content in the center and right parts of the page.

The fast search times in borders in the bottom and the left and the very long search times for borders in the center were, however unexpected. I think that this may have been due to the possibility that the styling for some targets resembled advertisements more closely than others. In the case of the border on the left, the type of content in the area used for the target, held sports information in each page used. Since the target words were sports related, participants may have already known where to start searching for the information. If this were the case, it would nullify the conclusions drawn previously that certain areas have specific expectations for the visual treatment of advertisements based on location.

This could be rectified in future experiments by doing a pilot study with the stimuli in order to make sure that the all styled targets have an equal visual likeness to advertisements. This can be done by creating a metric by which modules can be rated by how much they look like an advertisement. Future studies would also benefit from more participants. This would increase the statistical power and potentially show different results. The study could also have benefited from collecting more demographic information on the participants as well as asking (afterwards) they what type of search strategy they utilized during the study. There is a possibility that there are individual differences in the

way in which people process and attend to items on a web page. This type of information may help to identify the type of user that is effective at avoiding advertisement like items in a visual search, and ultimately make recommendations based on target audiences.

This study has shown that the styling of content with shading or a border has negative effects on a web user's visual search through a web page. Users' process visual cues that are not consistent with a web site's visual treatment and purposely do not attend to these areas. Web users also use expectations for the location of non-relevant items in order to give priority to goal oriented content during visual search. By defining the avoidance of content in a visual search task in terms of banner-blindness, these findings demonstrated the existence of content-blindness.

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Appendix I: Results

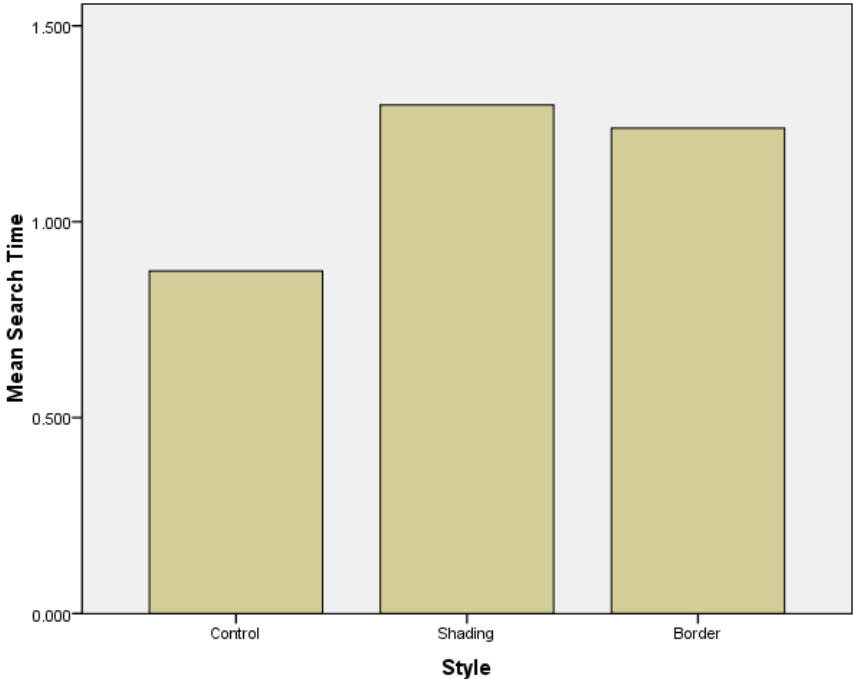


Figure 1: Main effect of style on mean search time (in minutes)

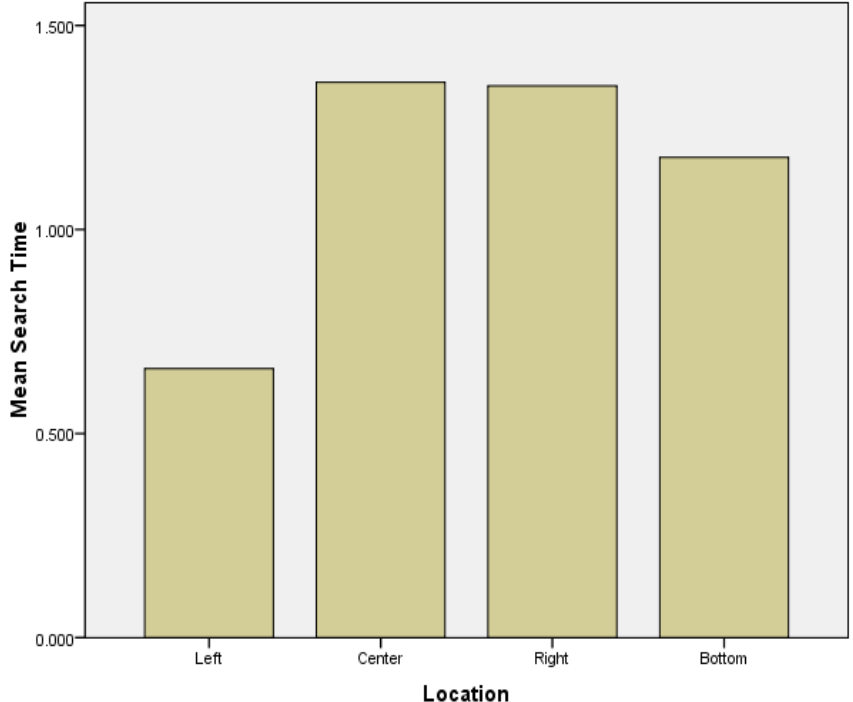


Figure 2: Main effect of location on mean search time (in minutes)

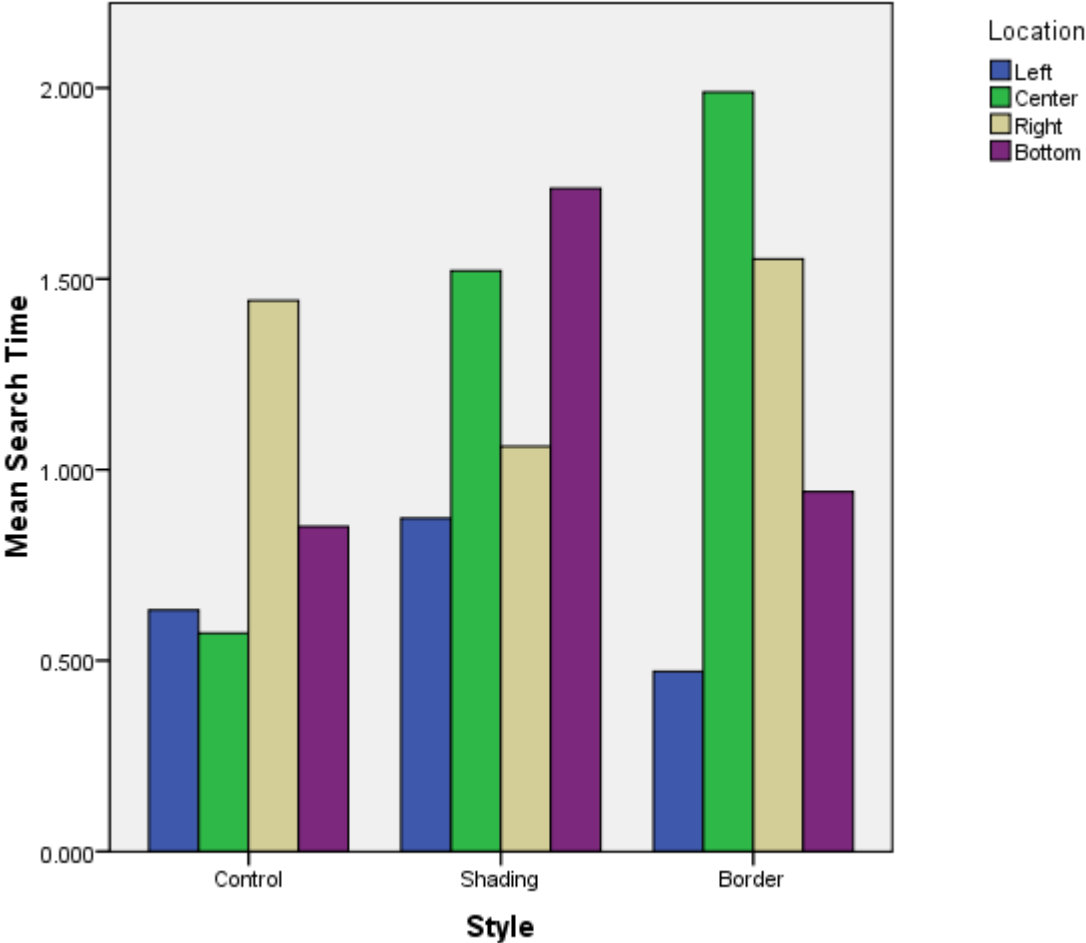


Figure 3: Interaction of location and style on mean search time (in minutes)