The Effect of Presentation in Online Advertising on Perceived Intrusiveness and Annoyance in Different Emotional States

Kaveh Bakhtiyari[1,2(✉)], Jürgen Ziegler[1], and Hafizah Husain[2]

[1] Interactive Systems, Department of Computer and Cognitive Science,
Faculty of Engineering, University of Duisburg-Essen, 47057 Duisburg, Germany
{kaveh.bakhtiyari,juergen.ziegler}@uni-due.de
[2] Department of Electrical, Electronics, and System Engineering, Universiti Kebangsaan
Malaysia (The National University of Malaysia), 43600 Bangi, Selangor Darul Ehsan, Malaysia
hafizahh@ukm.edu.my

Abstract. Online advertising is a rapidly growing area with high commercial relevance. This paper investigates the effect of different types of ad presentation, varying in frame size, position and animation level on visual intrusiveness and annoyance as perceived by users. Furthermore, we investigate the influence of users' emotional states on perceived intrusiveness and annoyance. This research has been carried out through a survey study. The analysis of the data shows a linear correlation between the visual attention of the ads and its features. Also, a positive influence of emotion has been found on various types of ad presentations. In addition, the participants with emotions of positive valence and low arousal showed more tolerance to the same ad as the users with a different emotional state. This research proposes a new aspect in computational advertising to adapt the recommendations based on the user's emotional state and the parameters of the online advertisements.

Keywords: Online advertising · Visual salience · Annoyance · Emotional influence · Computational advertising · Visual intrusiveness

1 Introduction

Online advertising is an important source of revenue for internet companies. There are many forms of online ads; S. Rodgers and Thorson [1] identified few types of online advertisements: banners, interstitials, pop-ups, pop-unders, sponsorships, hypertext links and websites. Among them, banners seem to be more prevalent [2], so that they are making 16% of the revenues in online-businesses, and about 54% on mobile devices. In 2015, Search Engine Marketing (SEM) [3] was the most profitable form of internet advertising. Yet, there are many open questions in this business, such as: What are the dependent factors of profitable ads? How can an effective form of ad be recognized and presented?

There are two aspects on delivering an effective (more profitable) ad. The first aspect is about "content", which is not in the scope of this paper, and the second aspect is about

"form of presentation" that is our target. Each form of the presentation is different in intrusiveness and visual saliency. Some ads force the users to watch, however, some other ads may not be even recognized.

This research studies the effect of emotion on visual saliency and the user's perception on different types of ad presentations. It aims to deliver a more appropriate form of ad's presentation to the users in order to increase the user's satisfaction and to improve the user's experience in online advertising. To the best of our knowledge, there is no much empirical study about the intrusiveness and its correlation with the emotions on various types of advertisements [4, 5].

At the end, this study would help the computational advertising systems to recommend more tolerance-friendly advertisements to the users to prevent or decrease the annoyance attitudes. This research contributes by answering the following research questions:

- RQ1: How do the different types of ad's presentation attract the visual attention?
- RQ2: What is the extent of perceived annoyance for different types of ad's presentations?
- RQ3: Is there any significant difference between male and female users' perceived attention and annoyance against the ads?
- RQ4: Do the emotions effect the user's attention and perception on online advertisements?

This paper is organized as follows: a short background is provided in Sect. 2. Then the research methodology is elaborated. At the end, the collected data is analyzed and every research question is answered and discussed.

2   Background

Advertisement effectiveness depends on many factors such as the ad's features, and user's cognitive and emotional state. The ad's features such as logo design, content, presentation, color and images affect the brand awareness and branding memory [6, 7]. Also the user's cognitive and emotional state affect the user's perception and tolerance. Based on a well-established literature [8, 9], there is a dual mode process Elaboration Likelihood Model of information processing. This model proposes two processes based on the user's levels of involvement. High involvement situations follow a "central route" processing. It means that they take a cognitive effort to evaluate statements. In this process, nonessential stimuli, such as color and/or sound are "secondary" elements and they are not being considered heavily. On the other hand, in the low-involvement situations, users use "peripheral route" processing. In this process, the user's subconscious is more involved, and affective elements are ruling the process, and they are highly affected through peripheral cues such as music and visual components.

From the marketing perspective, ad content and design can be classified into two groups of cognitive and affective. In cognitive contents, the users are more likely to click on an ad which offers an incentive for action [10], such as promotional offers or discounts. A research in 1999 [11] showed that 66% of users read and look at the banners

to find a free offer before they click to another page. In an affective advertisement, the content gains the user's attention by using an emotional appeal [12]. This mode of content expects to attract more attention. In general, most of the consumer level advertisements are more effective and less factual [13].

The role of emotion in marketing and consumer satisfaction has been investigated and evaluated by many researchers. Emotion is an influencing factor in information processing and responding to persuasive appeals. From a marketing point of view, the key is to develop an advertising concept that speaks to the target consumers directly. This can be achieved by taking into account the emotions that the target consumers are likely to be feeling at this point. The visual and textual content of the advertisement should work together to initiate a message in line with the emotional appeal the marketer hopes to make [7]. Also the ad's content itself can have an influence on human emotions, for more details we refer the readers to [14].

Users perceived feelings toward an ad may lead to their judgment about its provider credibility. Based on the literature on online advertisements, more visually intrusive ads are more disturbing [15] and annoying [16]. A website with annoying ads can easily jeopardize the reputation of the service provider and the promoted brand [17]. Therefore, it is very important to deliver an advertisement with a balance of visual saliency and annoyance in order to gain more profit without losing the reputation and the users' attention. Visual saliency is the perceptual quality or state which makes an item stands out from the neighbors and it can attract the visual attention immediately. But the visual saliency and annoyance of a single form of presentation may not be the same all the time. Users may experience different states of visual attention and tolerance on different types of presentations during a course of a time.

3   Methodology

This study was carried out by analyzing and considering the ad's features, user's emotions and their level of visual attention and annoyance for each form of ads throughout a survey. Figure 1 shows the whole concept of this research.
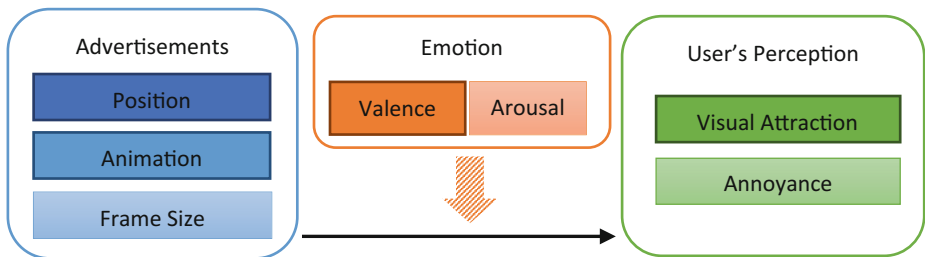

Fig. 1. The research concept and the role of emotion on advertisements' presentation

To investigate the answers of the research questions, various types of presenting online advertisements have been explored. Online ads brokers are offering different specific forms of ads presentation, and most of them are common among many brokers.

These brokers have issued some rules and regulations for the host clients to provide ethical experience of online advertisements for the users. We have judged the ethical and unethical types of advertisements based on the rules published by Google Inc., and unethical types of ads such as pop-up and pop-under windows are ignored [4, 16, 18].

3.1 Advertisements

Twelve forms of common and ethical online advertisements have been selected in this survey that cover the majority of ads' styles. Each form has three main presentation features including position, frame size [3] and animation [19]. The position of an ad can be inline or outline based on the location of the main content of the web page and the advertisement. The animation level can be considered as low or high. The last feature is the frame size, which is either small or big. These features are defined as binomial parameters due to the complexity of the analysis. The different forms of ads and their characteristics are listed in Table 1, and each one is assigned a specific case number. The model of skyscraper is called to those vertical ads which are usually located at the left or right sides of the page.

Table 1. List of 12 types of selected online advertisements

Type	In/Out-line	Position	Animation	Size	Case
Horizontal	Outline	Top – Bottom	Low	Small	1
	Outline	Top	Low	Big	5
	Outline	Bottom (fixed)	Low	Small	6
Vertical (Skyscraper)	Outline	Right – Left	Low	Big	3
	Outline	Right – Left	Med. (fly-in)	Big	8
	Outline	Right – Left	High (fly-in)	Big	9
Square	Outline	Right – Left	Low	Big	2
	Inline	Middle of text	Low	Small	4
	Inline	Middle of text	High – Muted	Small	10
	Inline	Middle of text	High – Sound	Small	12
Half/Full	Outline	Middle/Center	Low	Half	7
Screen	Inline	Interstitial	Low/Medium	Full	11

In this survey, 45 banners were selected with a variety of animation levels and sizes. These are selected from 16 different categories (e.g. computer, shopping, charity, etc.) targeting mostly both females and males. These cases are presented in a random order for each participant.

3.2 Emotions

To capture the user's current emotional state, the participant is asked to report his/her own emotion and its strength at two stages: Firstly, at the beginning, and secondly, at the end of the questionnaire. Self-reporting at two stages helps us to detect inaccuracies and anomalies in self-reported emotions. This survey and its contents are designed to

be emotionally neutral in order to prevent any emotional moderation. Therefore, if the first and the last reported emotions are statistically and psychologically different, the reported record is considered as unreliable and removed from further analysis.

Emotion reporting is presented based on the Pick-A-Mood (PAM) model on 9 emotions [20]. These emotions are also presented in a mannequin-like style introduced in the PAM model with separately designed icons for male and female for each emotion. PAM model eases the selection of user's current emotional state [20]. PAM has clustered eight emotions (except Neutral) from the two dimensions of Valence – Arousal [20]. The valence dimension represents an emotion, either positive (attractiveness) or negative (aversiveness). The arousal dimension defines the energy of an emotion. The neutral emotion is separately categorized as EG0. These clustering and the assigned abbreviations are shown in Table 2.

Table 2. Emotional clustering measured by PAM

	Pleasant	Unpleasant
Energized	*EG1*	*EG4*
	Excited – Lively	Tense – Nervous
	Cheerful – Happy	Irritated – Annoyed
Calm	*EG2*	*EG3*
	Calm – Serene	Sad – Gloomy
	Relaxed – Carefree	Bored – Weary

To report the strength of the selected emotion, a scale of 1 to 5 is provided to be chosen [21, 22]. The participant has to choose a pair of emotion and its strength to report how strong they feel the selected emotion.

3.3 Questions

After selecting the emotions, the 12 cases were being presented in a random order. Each case was followed by 4 questions to cover RQ1 and RQ2. The two questions of VI1 and VI2 were presented to cover RQ1 about visual saliency (attraction), and the questions of AN1 and AN2 were presented to cover RQ2 about the user's perception and annoyance on each form of advertisement. These four questions are provided below:

- (VI1) How much does the presented advertisement attract your attention?
- (AN1) How much does the presented type of advertisement annoy you?
- (VI2) How much does the presented type of advertisement distract your concentration (focus) on the main content?
- (AN2) If this type of advertisement is being shown frequently, how much does it make a **__negative__** perception/attitude towards the product/service/brand?

For each question, the participant has to provide an answer in scale of 1 to 5 interpreting 1: Very low; 3: Medium; and 5: Very high.

4   Results

The survey was carried out online by 180 participants (90 Males – 90 Females) from various countries to ensure comprehensiveness of culture as it may effects on emotions [23]. After the initial analysis, 20 records (8 Males – 12 Females) were considered as outlier, and were removed due to the significantly different emotional states reported at the beginning and the end of the survey. The participants were from different geographical regions with mostly 48% from Europe and 23% from the Asia and Australia.

The reported emotions of Tense, Irritated and Sad, which are all negative emotions have the lowest number of entries in the collected data. We left EG4 out from analysis, because they were only few cases (only 5 records). The other emotional groups of EG0 to EG3 have 27, 31, 72 and 25 participants respectively.

The overall average of the answers given to the four questions on 12 cases are shown in Fig. 2. This figure shows that the cases 1 and 12 are respectively the worst and the best in user's visual attention; and the cases 1 and 5 has the least and the cases 11, 12 and 10 have the most annoyance, in the same order.
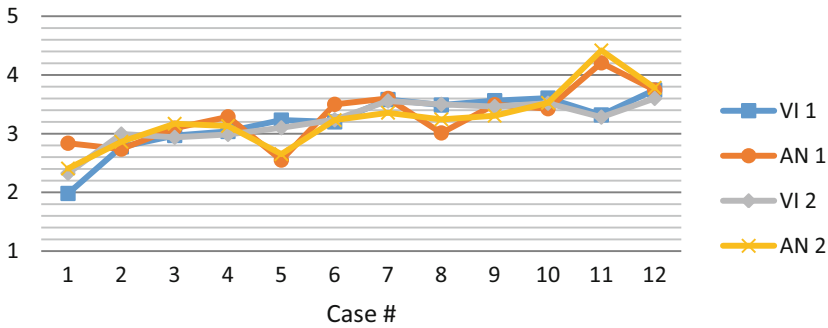

Fig. 2.   The overall average answers of the four questions

As it was planned, the similar questions (Questions 1, 3: VI1, VI2; and Questions 2, 4: AN1, AN2) haves the highest correlations as expected (as shown in Table 3). Also, this table provides evidence that the participants could understand the questions, and answers were not given randomly. Therefore, VI2 and AN2 can also be ignored, because they are highly correlated with the VI1 and AN1. In the rest of research VI1 and AN1 are called VI and AN respectively.

Table 3.   The correlation of the answers among four questions

	VI1	AN1	VI2	AN2
VI1	1			
AN1	0.533025	1		
VI2	0.979866	0.53969	1	
AN2	0.652699	0.91148	0.650396	1

To answer RQ3, about the possibility of significant difference between the male and female users, mean and variance values are calculated. The t-Test results between male and female responses with the alpha value of 0.05 (VI: t(17) = 1.027, p = 0.321; AN: t(22) = 0.069, p = 0.945) show that there is no significant difference between the genders, even though the mean values of the male group shows a higher attraction to the online advertisements.

4.1 The Effects of the Ads Features

The mean values, standard deviation (SD), and the effect of various emotions on each case have been studied. Figure 3 presents the mean and error values of ad's features of the experiment.
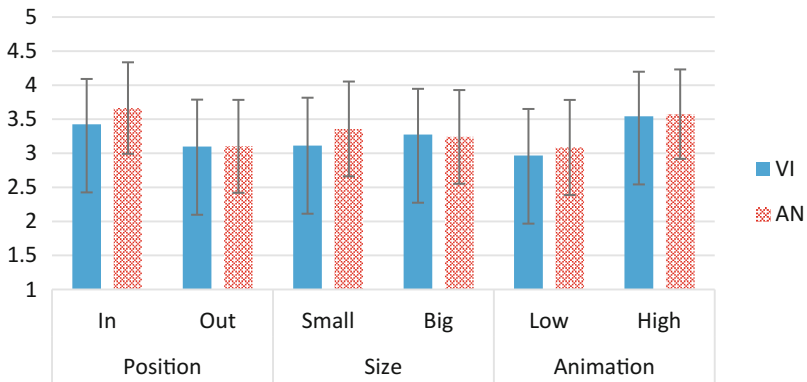

Fig. 3. The means and error bars of the ad's features

The effect of each feature on intrusiveness (VI) and annoyance (AN) is investigated by ANOVA. The results of ANOVA is tabulated in Table 4 with F(1,1918) and their Eta-squared values. Based on the reported results for VI and AN, regardless of the user's emotions, a ANOVA analysis and Eta-squared values show the significant effect and effect size of the ads features for visual attention and annoyance.

Table 4. ANOVA with Eta-squared analysis on the effects of features on VI and AN

	VI			AN		
	F	p	Eta-squared	F	p	Eta-squared
Position	24.6102	< 0.00	0.0126	73.1269	< 0.00	0.0368
Frame Size	6.4398	0.011	0.0033	60.2119	0.0483	0.0057
Animation	85.5155	< 0.00	0.0428	3.9068	< 0.00	0.0302

* df (Between groups): 1; df (Within groups): 1918; F-crit: 3.8463

The results also show that the animation level of the ad plays a more important role in visual saliency and intrusiveness, and position has more effect on the user's

annoyance. For both VI and AN, frame size has less effect than the other features. These results are limited to the participants in this survey, and it can be extended by being tested in practical and laboratory experiments.

4.2 Emotional Analysis

In this section, Mean, SD and ANOVA results with Eta-squared values have been presented. The ANOVA analysis with Bonferroni correction for each case separately will not be reported in this paper due to the space limit. Table 5 shows that there is a difference among the different emotional groups for both VI and AN. To measure the significance of this difference, ANOVA test has been employed among these groups with the alpha value of 0.05.

Table 5. The mean and standard deviation values of VI and AN

	VI	Mean	SD	AN	Mean	SD
EG0		1.37037	0.629294		2.703704	1.409168
EG1		2.032258	0.948116		2.774194	1.453953
EG2		2.180556	1.039046		2.930556	1.356532
EG3		2.08	0.862168		2.88	1.129897
EG4		1.6	0.894427		2.4	1.516575

The ANOVA test on emotional groups (Table 6) shows that emotion has a significant effect on VI and AN. Also, the emotional groups were compared using a post-hoc analysis of Bonferroni correction, and it showed significant differences among themselves.

Table 6. ANOVA with Eta-squared values on the emotions for VI and AN

	VI			AN		
	F	p	Eta-squared	F	p	Eta-squared
Emotion	10.30881	< 0.00	0.021	11.91755	< 0.00	0.0242

* df (Between groups): 4; df (Within groups): 1915; F-crit: 2.376574

5   Discussion and Conclusion

The analysis of the collected data showed that those advertisements with highly animated content, and animated position are, in average, more annoying and distracting the user's focus. This study also took the users' gender into the account. Although men showed slightly more attracted to the advertisements, the level of annoyance was similar in both genders. Also the result showed that despite a slight difference in attraction, there is no significant difference between the attraction and tolerance of male and female users. Previously, a research showed that there is a significant difference in the positive attitudes on online ads [24].

Also, ANOVA analysis shows a significant effect of the discussed ad's features on visual saliency, intrusiveness and annoyance. Among the features, animation and position have more effect on visual saliency and annoyance respectively.

The ANOVA results showed a significant effect of emotion on the participants' perception on different advertisement presentations, also the post-hoc analysis showed that the users' emotions with positive valence and/or low arousal are more attracted and tolerant for intrusive advertisements (Table 7). Therefore, it is recommended to only show less intrusive ads to the users with EG2, otherwise they get annoyed easily, and do not focus on the ad.

Table 7. Intrusiveness recommendation based on the emotional dimensions

Dimensions	Intrusive ads recommended	Non-intrusive ads recommended
Valence	Positive (+)	Negative (−)
Arousal	Low ↓	High ↑

6   Future Work

In the next step, we would like to check and detect the user's attention and tolerance by measuring the interaction features such as the keyboard keystroke dynamics, mouse movements and eye movements. It is expected to find a model between these features. Therefore, the user's perception and emotion can be predicted while he/she is interacting with a PC without being explicitly questioned [25, 26].

The results of this research can be integrated as a Decision Support System (DSS) into the computational advertising systems to recommend the online ads in more effective forms of presentation. Ad's features and user's affective states are the independent variables of this research, in order to provide a balance between the ad's intrusiveness and user's annoyance and tolerance toward an ad.

References

1. Rodgers, S., Thorson, E.: The interactive advertising model: how users perceive and process online ads. J. Interact. Advert. **1**, 41–60 (2000)
2. Hoffman, D., Novak, T.: Advertising pricing models for the World Wide Web. In: Hurley, D., Kahn, B., Varian, H., Cambridge, E. (eds.) Internet Publishing and Beyond: The Economics of Digital Information and Intellectual Property, p. 2. MIT Press, Cambridge (2000)
3. Agarwal, A., Hosanagar, K., Smith, M.D.: Location, location, location: an analysis of profitability of position in online advertising markets. J. Market. Res. **48**, 1057–1073 (2011)

4. McCoy, S., Everard, A., Polak, P., Galletta, D.F.: An experimental study of antecedents and consequences of online ad intrusiveness. Int. J. Hum. Comput. Interact. **24**, 672–699 (2008)
5. Lin, Y.-L., Chen, Y.-W.: Effects of ad types, positions, animation lengths, and exposure times on the click-through rate of animated online advertisings. Comput. Ind. Eng. **57**, 580–591 (2009)
6. Lohtia, R., Donthu, N., Hershberger, E.K.: The impact of content and design elements on banner advertising click-through rates. J. Advert. Res. **43**, 410–418 (2003)
7. Petrovici, I.: Aspects of symbolic communications in online advertising. Proc. Soc. Behav. Sci. **149**, 719–723 (2014)
8. Meyers-Levy, J., Malaviya, P.: Consumers' processing of persuasive advertisements: an integrative framework of persuasion theories. J. Market. **63**, 45–60 (1999)
9. Petty, R.E., Cacioppo, J.T.: Communication and Persuasion: Central and Peripheral Routes to Attitude Change. Springer, New York (1986)
10. Krishnamurthy, S.: Deciphering the internet advertising puzzle. Market. Manage. **9**, 35–39 (2000)
11. Mullaney, T.J.: Online Marketing is Clicking. Business Week, New York (1999)
12. Holbrook, M.B., Batra, R.: Assessing the role of emotions as mediators of consumer responses to advertising. J. Consum. Res. **14**, 404–420 (1987)
13. Lambert, D.R., Morris, M.H., Pitt, L.F.: Has industrial advertising become consumerized? a longitudinal perspective from the USA. Int. J. Advert. **14**, 349–364 (1995)
14. Brown, S.P., Stayman, D.M.: Antecedents and consequences of attitude toward the ad, a meta-analysis. J. Consum. Res. **19**, 34–51 (1992)
15. Reed, M.: Going beyond the banner ad. Marketing **29**, 25–26 (1999)
16. McCoy, S., Everard, A., Polak, P., Galletta, D.F.: The effects of online advertising. Commun. ACM **50**, 84–88 (2007)
17. Danaher, P.J., Mullarkey, G.W.: Factors affecting online advertising recall: a study of students. J. Advert. Res. **43**, 252–267 (2003)
18. Rettie, R.: An exploration of flow during Internet use. Internet Res. Electron. Netw. Appl. Policy **11**, 103–113 (2001)
19. Kuisma, J., Simola, J., Uusitalo, L., Öörni, A.: The effects of animation and format on the perception and memory of online advertising. J. Interact. Mark. **24**, 269–282 (2010)
20. Desmet, P., Vastenburg, M., Van Bel, D., Romero Herrera, N.: Pick-A-Mood; development and application of a pictorial mood-reporting instrument. In: Out of Control: Proceedings of the 8th International Conference on Design and Emotion, London, UK, 11–14 September 2012 (2012)
21. Hartel, C.E.J., Ashkanasy, N.M., Zerbe, W.J.: Functionality, Intentionality and Morality. Elsevier, New York (2007)
22. Watson, D., Clark, L.A., Tellegen, A.: Development and validation of brief measures of positive and negative affect: the PANAS scales. J. Person. Soc. Psychol. **54**, 1063–1070 (1988)
23. Bakhtiyari, K., Husain, H.: Fuzzy model of dominance emotions in affective computing. J. Neural Comput. Appl. **25**, 1467–1477 (2014)
24. Wolin, L.D., Korgaonkar, P.: Web advertising: gender differences in beliefs, attitudes and behavior. Internet Res. **13**, 375–385 (2003)
25. Bakhtiyari, K., Taghavi, M., Husain, H.: Hybrid affective computing—keyboard, mouse and touch screen: from review to experiment. J. Neural Comput. Appl. **26**, 1277–1296 (2015)
26. Bakhtiyari, K., Taghavi, M., Husain, H.: Implementation of Emotional-Aware Computer Systems Using Typical Input Devices. In: Nguyen, N.T., Attachoo, B., Trawiński, B., Somboonviwat, K. (eds.) ACIIDS 2014. LNCS (LNAI), vol. 8397, pp. 364–374. Springer, Heidelberg (2014). doi:10.1007/978-3-319-05476-6_37