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Added value of an autostereoscopic multiview 3-D display for advertising in a public environment

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ABSTRACT

The rapid development of new media has made it increasingly possible to present people with ever richer experiences. The two experiments in this paper examine the mediating role of presence in a 3-D display as compared to a 2-D display with respect to commercials in a public environment. The results show that an autostereoscopic multiview 3-D display enhances the feelings of presence and produces a more positive brand attitude. Hence, autostereoscopic 3-D displays outperform 2-D displays for eye-catching outdoor advertising.

1. Introduction

In our society we are continuously exposed to advertising. As a consequence, all companies need to use more eye-catching ways of advertising in order to compete for the consumer's attention. One of the latest trends in promoting products and services is making use of 3-D visualization, which enables the consumer to interactively rotate the product, and to virtually study it from all sides, in order to simulate a natural shopping experience. This form of advertising is being applied on the Internet for the last few years now, and clearly adds considerable media-richness to the more traditionally used banners. Li et al. [1] demonstrated that advertising via 3-D visualization provides the consumer more product knowledge, and generates a more positive brand attitude. Both of these aspects are mediated by enhanced feelings of presence, i.e., enhanced feelings of being involved in the displayed environment.

A whole new dimension of 3-dimensionality can be experienced on stereoscopic displays, hereafter shortly indicated as 3-D displays. In these displays the left eye gets a slightly different perspective than the right eye, just as in real-life viewing. The brain then extracts depth information from the difference between the left- and right-eye images [2]. Scientists have studied 3-D displays and their use since the nineties (e.g., [3,4]). Since then several techniques are developed that enable stereoscopic vision.

This paper evaluates the added value of advertising by means of a specific type of 3-D display, i.e., an autostereoscopic multiview display. Autostereoscopic refers to the ability to perceive stereoscopic depth without optical aids, such as glasses. In general, stereoscopic displays have two views, i.e., one for the left and one for the right eye. The disadvantage of autostereoscopic two-view displays, however, is that viewers are obliged to remain at a fixed position in front of the display screen. Especially for the application of advertising in public environments, this is an unacceptable limitation. A multiview display, for example one that uses a lenticular sheet in front of a LCD as shown in Fig. 1, generates a repetition of multiple views. In this way, a viewer continuously perceives stereoscopic depth when horizontally moving in front of the display. More details on this technology are provided in [5].

It is shown in literature (e.g., [6]) that 3-D displays applied in an entertainment context evoke more pronounced feelings of presence than the traditional 2-D displays. More recently, it is also stated that immersive virtual environments (usually based on 3-D head-mounted devices) provide viewers with a higher level of presence, as a consequence of which they process information more implicitly. In an advertising context, this leads to less recall of the commercial content, but also to a more positive brand

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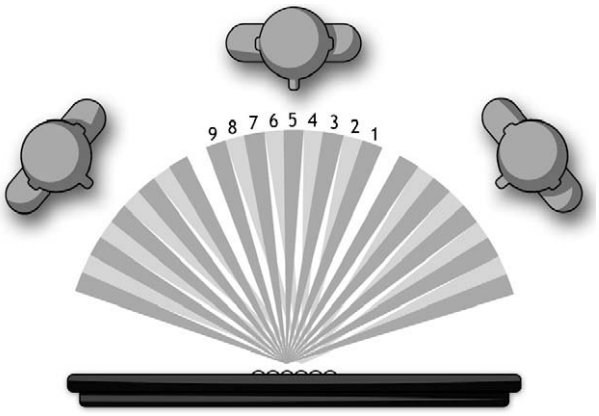

Fig. 1. Basic principle of autostereoscopic multi-view 3-D display.

attitude and purchase intention [7]. With respect to the enhanced feelings of presence and the positive brand attitude as a consequence of 3-D visualization or 3-D rendering, the studies of Li et al. [1] and of Grigorovici [7] are in line with each other. Their conclusions, however, seem contradictory on the effect of 3-D on product knowledge and/or recall of commercial content. Based on these findings, it is expected that also an autostereoscopic 3-D display in an advertising context enhances the feelings of presence, and as such mediates a more positive brand attitude, and possibly also a higher level of product knowledge as compared to a 2-D display. In this paper, these hypotheses are evaluated based on two studies, in which the effect of a 3-D display is investigated measuring participants' feelings of presence, their memory of and brand attitude towards displayed commercials. Additionally, the mediating role of presence to the advertising effect is analyzed.

2. Role of presence in 3-D advertising

The studies described in this paper for evaluating the added value of an autostereoscopic 3-D display in advertising, are based on the research done by Li et al. [1]. They examined the effect of commercial type, being a graphical 3-D visualization and a banner ad, on consumers. The effectiveness of the commercial was measured along feelings of presence, product knowledge and brand attitude. It was found that when watching a graphical 3-D visualization, participants experienced stronger feelings of presence than when watching a 2-D view. Participants also remembered more of the displayed products when presented in the interactive 3-D visualization way. Furthermore, they felt better informed about the product, were more willing to actually pursue it, and indicated to be able to make a better quality decision. Advertising by means of 3-D visualization thus appeared to be very valuable when it came to the effectiveness of a commercial.

Li et al. [1] also found presence to be a mediator between commercial type on one hand, and memory and brand attitude on the other. Participants who experienced strong feelings of presence when seeing a commercial based on a graphical 3-D visualization remembered more of the commercial content and were more positive towards the brands displayed. Hence, it was concluded that the feelings of presence played a powerful role in increasing the advertising effectiveness.

The term presence has not been unambiguously used in literature. The concept of presence was introduced by Minsky in 1980 and was named telepresence. It concerns the feeling of "being there" in a mediated environment (e.g., television). Presence is stated to consist of "physical" and "social" presence [8,9]. Social presence is the sense of "being there" in a social environment, in which there is contact with other social entities. Physical presence is the sense of "being there" in a physical environment. In the present study, presence refers to physical presence.

A frequently used instrument to measure presence is the ITC-Sense of Presence Inventory (ITC-SOPI), developed and revised by Lessiter et al. [10]. They distinguish four components of presence: physical space; engagement; naturalness; negative effects. In their revision [11], they recommend to exclude the last component and to only add up the scores of the first three components, assuming that when measuring presence the share of negative effects is small. Following this recommendation, the present study distinguishes physical space, engagement, and naturalness as main components of physical presence.

3. Added value of a 3-D display in advertising

For evaluating the effectiveness of a 3-D display for advertising purposes, we formulate hypotheses on feelings of presence, product memory and brand attitude in line with the study reported in [1].

3.1. Presence

Research on 3-D advertising showed that a 3-D visualization of the displayed products, in which these products could be interactively rotated in a 3-D environment, but are presented on a standard 2-D computer monitor, evoked feelings of presence [1].

Far more research was done on induced feelings of presence in an entertainment application, such as television. Lombard et al. [12] investigated the potential effect of the television's display size on presence. Their results revealed an increase in presence experience with display size. Bracken [13] evaluated the effect of display quality on presence varying the spatial resolution of the television source signal between SD (standard definition) and HD (high definition). She showed that watching HDTV content resulted in stronger feelings of presence than SDTV content.

The relationship between feelings of presence and stereoscopic depth has been investigated since the last decennium. IJsselsteijn et al. [14] studied the effect of a stereoscopic display on feelings of presence and found that larger depth ranges increased the viewers' experienced level of presence. In an additional study [15] they found that moving stereoscopic image content evoked stronger feelings of presence than still content. Freeman and Avons [6] used focus groups to study the difference between experts and non-experts in the language they used to express their presence feelings about stereoscopic image material. Both groups confirmed increased feelings of presence with 3-D (versus 2-D) image material. Moreover, there was a strong consensus between both groups about the type of image content that best suited high-presence TV broadcasting.

In summary, 3-D visualization for advertisement as well as 3-D displays for entertainment proved to induce stronger feelings of presence than 2-D displays. In line with these results, the following hypothesis is formulated for the effect of display dimensionality for showing commercials on the experienced level of presence:

Hypothesis 1. A 3-D display results in stronger feelings of presence than a 2-D display.

3.2. Memory

Li et al. [1] demonstrated that consumers felt more knowledgeable of the commercial and of the product displayed, when having the possibility to interact with a graphical 3-D visualization than when seeing only a 2-D view. However, from this study it is not clear whether the dimensional perspective, the interaction, or the

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