

# A Study on the Application of Synesthesia in Web banner Advertising design

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**Abstract:** The purpose of this study is to find out effectiveness of synesthesia(consists of sense of sight, sense of hearing, sense of touch, sense of taste and sense of smell) in banner advertising of commercial Web sites. Through experiments, we actually investigated effectiveness of synesthesia-causing advertisements. Then eventually, we suggested design guideline for banner advertising stimulating advertisement receiver's synesthesia because synesthesia in advertisement causes advertisement receiver's affirmative and active attitude for the web site. For this we performed literature review in order to suggest possibility of effectiveness of synesthetic experience on advertisement. Then we made two stimulus categories, one is for banner advertising stimulating single sense of receivers and the other one for banners stimulating multiple sense(synesthesia) of receivers. Then we compared consumer's attitude, preference, involvement and purchase intension between synesthesia-causing advertisement and single sense-causing advertisements through ANOVA test. The results of this study show that synesthetic experience of advertisements in commercial web sites causes more interests, higher preference, higher involvement and higher purchase intension than common web sites. It means that synesthetic advertisements induce higher advertisement performance and are very effective in persuading consumers. Therefore, it is suggested that synesthesia in advertisements of commercial web sites should be importantly considered for higher receiver persuasion. The synethetia effectiveness model suggested in this study is regarded as new design approach model for the development or design of more effective advertisement in commercial web sites. And also this study has an practical implication that the results of this study can be a background for the future researches on synthesisia in direction and method.

**Key words:** *Web banner Advertising design, Synesthesia,*

## 1. Preface

Internet advertisement easily attracts attention from people, as they are accustomed to a great number of advertisements that move rapidly with colorful images. To have a strong effect as an advertisement, it should be perceived by web users. This study, centering on web banner advertisement, examined models that interpret synesthetic perception characteristics by analyzing the brain mechanisms occurring in the process of perception by people who receive sense information from web. Based on what was examined, this study presents synesthetic effect models. It also aims at finding a method to feel transition of senses through visual information under a virtual environment in which senses cannot be felt directly in web advertisement. It aimed at improving perceptive efficiency for more effective web advertisement by re-designing web banner advertisement in which synesthesia is applied for comparative advertisement. Finally, under the assumption that if banner advertisement, in which synesthesia is applied, is produced to induce perception in web banner design its efficiency will be very high. It

will illustrate synesthetic perceptive reaction through experimental results and, based on the results, present a new web-advertisement design guideline.

## 2. Theoretical Background

### 2.1 Problems of Existing Web Banner Advertisement and Some Solutions

In existing banner advertisement, messages have a physical limit in several design factors, which reduces their effectiveness. As most domestic web advertisement present commercial messages and images offering premiums, there is no distinction between advertisements and viewer curiosity is low. This study chose design and senses elements that promote synesthesia, not just advertisements produced to rely on existing views, and studied possibility and effect of web advertisement in which synesthesia is used to maximize medium effect of banner advertisement.

### 2.2 Concept and Type Classification of Synesthesia

Synesthesia is defined as a subjective sensation or image of a sense (for example color) other than the one being stimulated (for example sound). Naturally as people age this degenerates. So, it means a very rare ability that is hard to be experienced by normal people such as seeing sound, touching music or tasting colors. Also, it is believed that normal people have senses with different aspects and mutual influence under special experimental conditions. This mutual influence is called intermodale Erscheinung. Present knowledge of synesthesia can be summarized as follows. It runs in families in a pattern consistent with X-linked dominant transmission. Female synesthetic predominate by a ratio of at least 3:1. Synesthetic are preponderantly non-right-handed and have additional features consistent with anomalous cerebral dominance. They are mentally balanced and normal-indeed bright-in the conventional sense, and possess excellent memories. Individuals have different senses. If something detected by one sense is transferred to another sense, can it be said that it is a synesthetic experience? If synesthesia is completely separated in types or styles, there is a doubt that it really exists. To test the validity of synesthesia, it is important to examine synesthesia in terms of its characteristics, types, similar styles and classification. Table 1 presents several types of actual synesthetic experience.

**Table 1. Types of Synesthesia (N = 365)**

Colored graphemes	66.8%
Colored time units	19.2%
Colored musical sounds	14.5%
Colored general sounds	12.1%
Colored phonemes	9.6%
Colored musical notes	10.4%
Colored personalities	4.4%
Colored tastes	6.3%
Colored pain	4.4%
Colored odors	5.8%
Colored temperature	2.2%
Colored touch	1.9%
Sound → touch	2.7%
Sound → taste	2.7%
Sound → smell	1.1%
Sound → temperature	0.5%

Taste -> hearing	0.3%
Taste -> touch	1.1%
Touch -> taste	0.5%
Touch -> smell	0.3%
Touch -> hearing	0.5%
Vision -> taste	1.9%
Vision -> hearing	1.1%
Vision -> smell	1.1%
Vision -> touch	0.8%
smell -> sound	0.3%
smell -> touch	1.1%

Note: About 40% of individuals have multiple synesthesia. From 365 cases compiled by sean A. Day, ph.d., moderator of The Synesthesia List, 2001 (available at <http://www.user.muohio.edu/daysa/>), with permission.

### 2.3 Synesthesia Delivering Model

Synesthesia was defined as different senses through one sense. However, similar phenomena to synesthesia have been observed and examined though they are not absolute synesthesia. A great variety of theories about synesthetic mechanism have been reported. Figure.1 presents a union theory of various styles that is one of the connection theories.

When a section of the brain that processes sensory perception was examined, only one sensory area is not separated, but if one sense is stimulated, adjacent sensory areas, such as sight, hearing, smell and touch, also can be expanded.

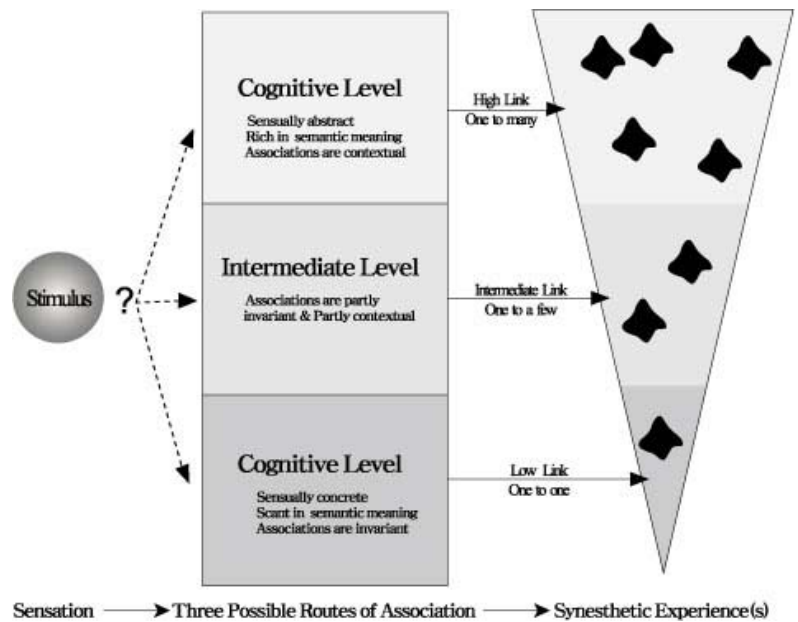


Figure 1. Possible routes of association in synesthesia (From Cytowic [1993].)

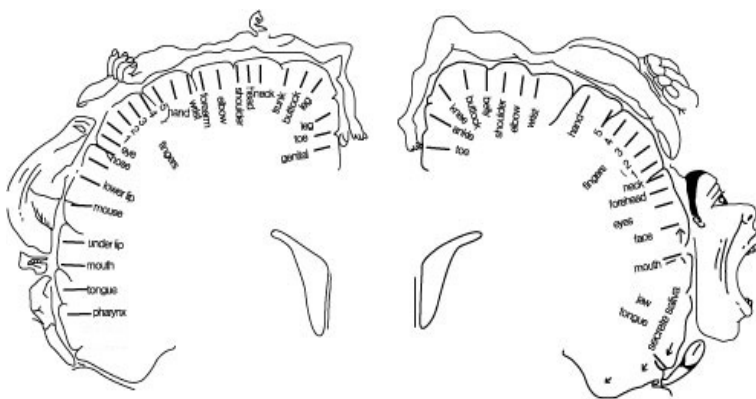
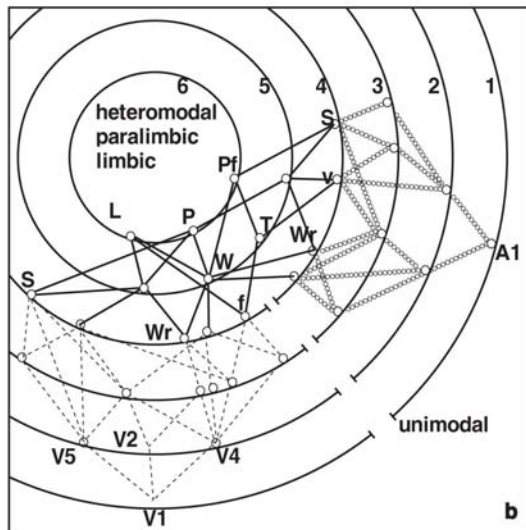


Figure 2. Sectional View of Brain Area of Each Sense

In the multiplex model, sensory information undergoes extensive associative elaboration and intentional modulation as it becomes incorporated into the texture of cognition (Mesulam 1998). Connections from one topological zone to another are reciprocal and allow the convergence of afferents and the divergence of efferents.

The resulting synaptic organization supports parallel as well as serial processing, and

permits each sensory event to initiate multiple cognitive outcomes. Upstream unimodal sectors encode basic features of sensation such as color, motion, form, and pitch. More complex derivatives such as



**Figure 3. Synesthesia Delivering Modelmultiplex**

objects, spatial locations, and sound sequences become encoded within downstream unimodal sectors by groups of coarsely-tuned neurons. Each mode is encoded with when(time), where(space), what(identity), and why(emotional salience to the organism) (DeGelder 2000). In such context, this study recognized characteristics and concepts of synesthesia as a means of effective transition of web banner advertisement design. They are related to expressive elements of sensory information and cognitive approach, not only to sensational or ornamental elements. Therefore in this study, synesthesia was applied to web banner advertising design and analysed through sensational expressive elements.

Note: Sense-Specific (unimodal) Association Cortices : Highly concerned with external world

Multi-Sensory (heteromodal) Association Cortices : each sense projecting to multiple & different association areas

Para-Limbic Areas : (portions of temporal and frontal lobes) Behavioral relevance now more important than the physical aspects of a stimulus

Limbic Areas : Memory, learning, modulation of drive, emotional, coloring of experience, higher control of hormonal & autonomic tone

Hypothalamus : (Head Ganglion of internal Milieu) Immune regulation, circadian rhythms, sexuality, temperature, metabolism, electrolyte balance, drives and instincts for species- and self-preservation

### 3. Design Approach of Synesthesia

#### 3.1 Design Expressive Elements in Web Banner Advertisement

Synesthesia was classified into emotional elements, a psychological state felt by people, and design elements, physical properties of subjects in order to identify constituents of synesthesia. About 500 adjectives were first collected from a Korean dictionary, and among them, the ones identical to expressive elements were considered as constituents. This study examined existing web banner advertisement that led to synesthetic experience and analyzed sensory expressive elements among constituents of the advertisement for a comparative experiment. It was designed to demonstrate whether union types of each sense for web banner advertisement lead to a synesthetic experience.

#### 3.2 Possibility of Web Banner Advertisement using Synesthesia

This study performed the first preliminary examination to increase positive use of synesthesia in Internet advertisement. For this, with an assumption that a basic principle of synesthesia is applicable to web banner advertisement design, design approaches were assessed. Case studies of foreign and domestic sites in which transition of senses is made through vision in a virtual environment in which no other sense is used, except hearing, were performed. This study identified expressive elements of each sense that promote synesthetic experience so as to examine promoters of synesthesia through which eyesight is transferred to other sensory organs. As a result, it was demonstrated that a correlation between synesthesia and web ads was significant. If so, of general characteristics of advertisement and synesthetic banner advertisement, which advertisement will be more effective? This study selected sites and subjects to be tested to demonstrate that effect of synesthetic banner

advertisement in which applied synesthesia is better. To identify synesthetic constituents, this study reconstructed emotional and design elements in four styles of advertisement.

**Table 2. union types of each sense for synesthetic web banner advertisement**

Advertisement type	Union Composition of five Sense					content
A type (sight+ hearing)	← Music	Rhythm	Sound	→		sight Make hearing
B type (sight+ touch)	← Color	Moving pic	image	Movement	→ copy	sight Make touch
C type (sight+ smell)	← Color	Moving	image	Movement	→ copy	sight Make smell
D type (sight+ taste)	← Standard	consistency	figuratively	→		sight Make taste

### 3.3 Synesthetic Effect Model

This study summed up sensory advertisement information about visual expressive elements of banner advertisement design based on what was examined in this study and united constituents of different senses. And in terms of psychological and nerve-biological characteristics of synesthesia, it presented the following synesthetic effect model, which promotes users through visual expressive elements in web banner advertisement. Collected synesthetic promoting elements were divided into design and emotional elements, which worked indirectly for identification of synesthetic characteristics of web banner advertisements. In the synesthetic effect model, expressive elements of each sense were classified by synesthetic constituents and it is believed that a comparative experiment may help lead synesthetic experience.

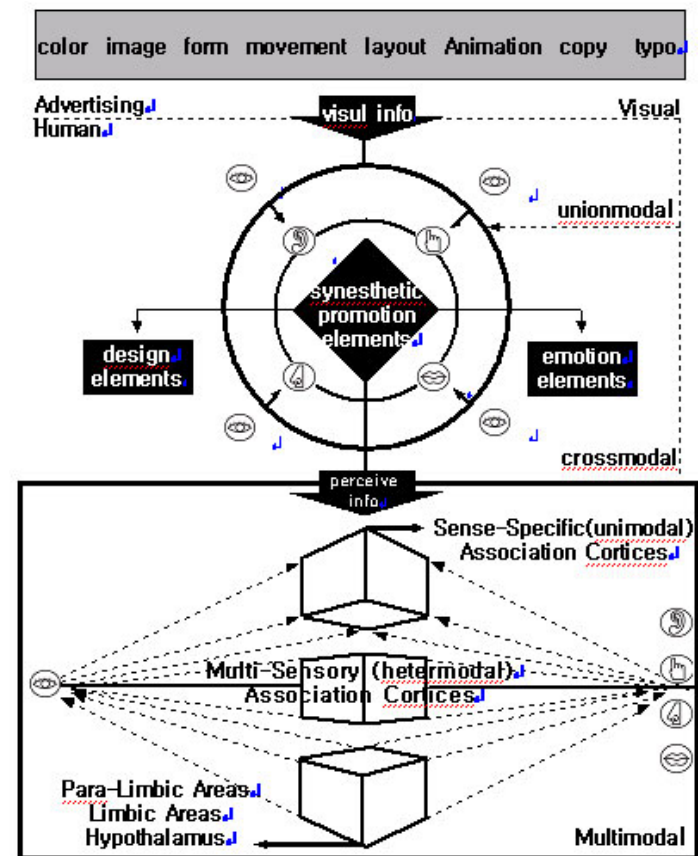


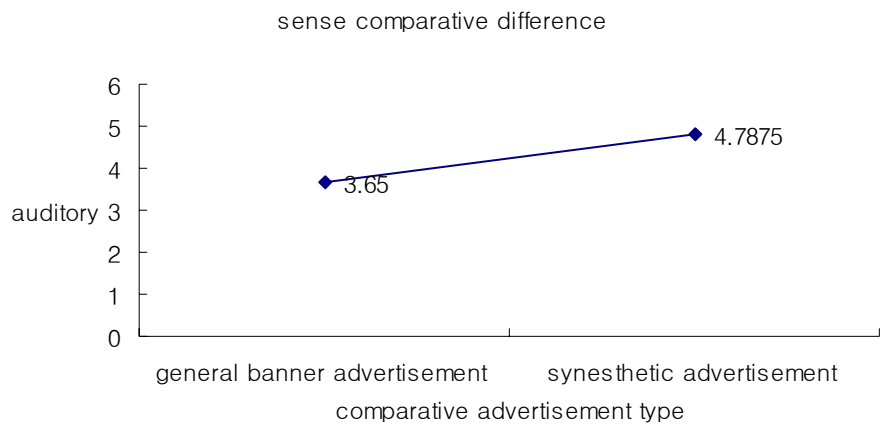
Figure 4 . Synesthetic Effect Model

## 4. Positive Investigational Research

### 4.1 Preliminary Investigation (Synesthetic Analysis)

Data of each type of advertisement as the first pilot study are designed to ascertain whether copies of advertisement are well made according to each sense, and the ANOVA test was performed to demonstrate this. As

a result, it was determined that copies of each advertisement were well made and the test confirmed synesthetic comparative experiments are significantly effective. A type of advertisement by union constituents of synesthesia is displayed in same size and

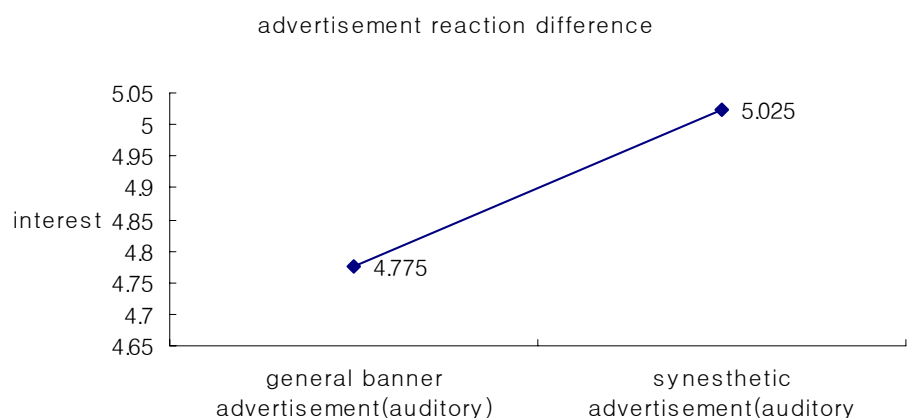


**Figure 5. comparative advertisement type**

address for a comparative advertisement with existing banner advertisement within main pages of existing search sites. According to the type of advertisement, for synesthetic web banner advertisement that re-constructed an existing banner advertisement through web banner advertisement of existing search sites and synesthetically united constituents, eight advertisement experiment stimuli were constructed by a  $2 \times 4$  matrix comparative advertisement type (general banner advertisement (a), synesthetic advertisement (B)  $\times$  advertisement types of each sense). For the search, types of advertisement prepared in personal local computers within time limit are connected to hyperlink in the PT monitor and a comparative search was carried. And then a questionnaire was carried out. After subjects used a web search method, for data collection, they were shown a comparative advertisement of each type in order and then they were interviewed. The period of the research was two days from November 20 to 21, 2002 and 80 university students were targeted for the interview. As a result of synesthetic analysis, it was demonstrated that for synesthetic banner, there is an auditory difference of 4.78 and for general banner, there is an auditory difference of 3.65. Statistically, there was a significant difference of 0.5 between auditory senses of synesthetic banner and general banner ( $F(1, 158)=26.760, p< 0.05$ )

#### 4.2 Main Examination (questionnaire)

Like the preliminary examination, this main examination unified search styles of subjects to obtain relatively concrete data in analyzing synesthesia. In this examination, eight banner advertisements for which an experiment was performed through PT



**Figure 6. advertisement reaction difference**

prepared for comparative advertisement experiments were presented in order to obtain reaction of subjects to advertisements. At the same time, 80 subjects were interviewed using questionnaire containing four items about advertisement reaction. The four items were: very low in interest/ very high in interest, very unfavorable/ very favorable, very uninteresting/ very interesting, and not deserving to purchase/ deserving to purchase. The items were analyzed using seven-point Likert measurement (1= never agree, 7= agree a lot). The analysis was made

through the ANOVA test about providing types of banner advertisement and reaction to advertisement types of four different senses. As assumed in this study, it can be said that advertisement that induces synesthetic experience has a better effect than advertisement that does not. Although the degree of interest is relatively low compared to the other items, it was shown that the result was significant compared with existing advertisement reaction.

## 5. Conclusions

The first cognitive characteristic to be identified by this study has to do with the fact that the information processing model is caused by unconsciousness, passive attitude, not by positive attitude to given visual information. The second characteristic to be identified through synesthesia application experiment is a union composition of visual information expressive elements with expressive elements of each sense that are transferred through the visual information. This study classified methods to induce synesthesia from normal people as experimental results through various unions into two: the one is a positive method for synesthetic experience and the other is through various unions with other sensory expressive elements based on the same visual expressive elements as presented by this study. As it is passive, in general, information was looked for from a given environment to users of the web. For information or advertisement in which strong interaction is found, active or passive actions of users were required. When the results were summed up, in realizing synesthetic web banner advertisement design, expressive elements of five senses with high connection with visual information expressive elements were identified. And receivers who processed recognized information given and showed emotional reaction to the information were identified and an assumption that an effect of banner advertisement constructed through synesthetic promoting design elements is high was definitely demonstrated. It is believed that this is a step to discuss whether the advertisement provided synesthetic phenomenon and experience, apart from the debate of whether the advertisement is synesthetic or not. The synesthetic experience exists in every individual whether he or she is a newborn baby or an elderly person, however it declines partly when he or she is grown. So, when design and emotional synesthetic promoting elements were found and used, enough experience is very likely to revive. In the future, it is believed that more studies on design potential and design possibility of synesthesia should be performed.

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