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CONSOLIDATED MODEL OF VISUAL AESTHETICS ATTRIBUTES FOR SENSE-BASED USER EXPERIENCE

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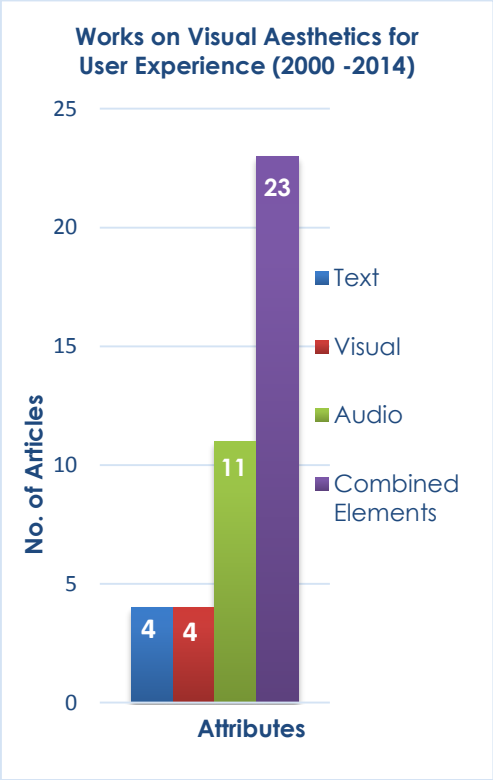
Graphical abstract



Abstract

The purpose of this study is to determine visual aesthetic attributes for user experience. As interactive digital media and their associated content have diversified, there are difficulties in finding universal visual aesthetic guidelines. While previous studies look into each unique user experience, there is little focusing on meta-analysis of visual aesthetics in providing user experience. Thus, by means of content analysis, this study attempts to determine visual aesthetics attributes for sense-based user experience. As a result, a consolidated model which comprises of visual aesthetics attributes and its inter-connections with regard to human senses is developed. This model offers guidance for creative industry practitioners in designing and developing aesthetic interactive digital media and creative content.

Keywords: Visual aesthetics, user experience, interactive products, creative content

Abstrak

Kajian ini adalah bertujuan untuk menentukan sifat-sifat estetik visual bagi pengalaman pengguna. Oleh kerana digital media interaktif serta yang berkaitan dengannya sudahpun semakin dipelbagaikan, terdapat kesukaran untuk mencari garis panduan estetik visual yang universal. Sedang kajian-kajian lepas banyak meihat kepada pengalaman pengguna yang unik, hanya segelintir sahaja yang memberi tumpuan kepada kaedah meta-analisis terhadap estetik visual untuk pengalaman pengguna. Oleh itu, melalui analisis kandungan, kajian ini cuba untuk menentukan sifat-sifat estetik visual untuk pengalaman pengguna berdasarkan deria manusia. Hasilnya, kajian ini telah membina sebuah gabungan model yang terdiri daripada sifat-sifat estetik visual serta hubungannya dengan deria manusia. Model ini boleh menjadi panduan asas untuk pengamal industri kreatif dalam mereka bentuk dan membangunkan interaktif media digital dan kandungan kreatif yang estetik.

Kata kunci: Estetik visual, pengalaman pengguna, produk interaktif, kandungan kreatif

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1.0 INTRODUCTION

Visual aesthetics (VA) in this study are derived from the impact of aesthetics design [1]. Aesthetics design are not only meant for products' feel and looks, but also the whole interaction including how interaction flows, how the design works, how

elegantly the design is made, and also how smooth the content fits in [2].

Aesthetic design is perceived as easier to use than less-aesthetic design [3]. User tolerates the design with more aesthetic elements better and it is easy to be used rather than a design with less aesthetic elements. Aesthetics are favorable compared to unaesthetic design due to its advantages in presenting positive attitudes and also can persuade user to tolerate any design problems [3]. Many studies has been presented by researchers regarding aesthetic value in particular interactive product design such as Web sites [4]. However, there are limited resources on universal visual aesthetic guide-lines in the field of Human-Computer Interaction (HCI) due to the variety of applications and products and the uniqueness of so many use contexts [1].

It is relatively difficult to provide a general guideline especially for developers that provide each VA in every interactive product design due to its diversified function. As an example, there are differences of VA for the Web from those VA for games. In either product, they may have specific features which alienate themselves to win their target user or customer experience (UX). For example, there are games which design might need to be emphasis on text (e.g. most type of *visual novel games*), but some does not rely on text (e.g. *Tetris, Super Mario Bros, The Binding of Isaac*).

This study attempts to identify Visual Aesthetic attributes for User eXperience (VAUX) based on content analysis. It provides a consolidated model that identifies all the reviewed VAUX and attempts to classify these attributes based on human senses.

2.0 METHODOLOGY

This study employs content analysis which integrates meta-analysis to achieve its objective as depicted in Figure 1.

Figure 1 Research Methodology

The first process begins with identifying related previous studies by scholars. Generic keywords "aesthetics attributes", "aesthetics elements", and "aesthetics components" were used at the initial stage of content analysis. Screening was conducted afterwards to ensure these articles are relevant to the scope of interactive digital media. Then, meta-analysis was conducted in order to obtain specific keywords for each VAUX (i.e. text, image, music, sound effect, voice, colour, graphic, layout, shape, form, texture). Internet sources such as Google Scholar site, Research Gate and reputable digital databases such as ACM Digital Library and Science Direct were accessed to obtain the articles used in this study. Amount of sources that have been obtained is illustrated in Figure 2.

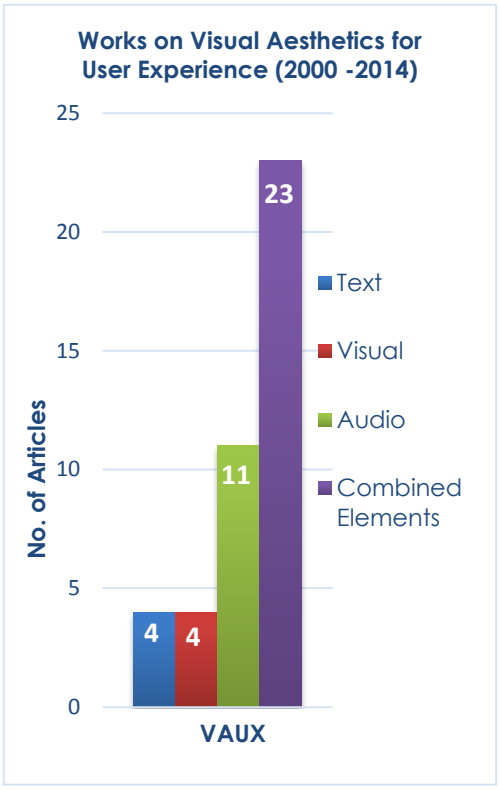

Figure 2 Works on visual aesthetics for user experience from year 2000 to 2014

Based on Figure 2, there are four numbers of articles found for text (i.e. font) and visual (i.e. image). Meanwhile, audio has eleven articles found which includes music (4), sound effect (4), voice (4), and 23 on combined elements which include colour (7), graphic (3), layout (4), shape (3), form (2), and texture (1).

In the second process, all the identified VAUX were listed and classified by means of human senses capabilities towards VAUX.

Lastly, a consolidated model of VAUX is proposed based on these findings. The consolidated model classifies the identified VAUX that originates from human senses.

3.0 RESULTS AND DISCUSSION

It is argued that graphical environments must go beyond vision if it needs be to pursuit aesthetics as other human senses may have similar ability to provide as much detail and sensitivity as can be visualized. Products for disabled persons for example, may need to consider other human senses rather than relying only on vision [5]. According to [6], judgment towards aesthetics quality has al-ways

been an essential part of user opinion towards what are their visual sense abilities. User is a human being which normally has five senses: *seeing, touching, hearing, tasting,* and *smelling* that are connected to their brain in order to do the processing, experiencing and generating responds and judgments [7], [8]. *Seeing, touching,* and *hearing* are considered essential for user experience while interacting with digital products. In order to highlight and classify VAUX, this research focuses on the three mentioned sense of human nature (which can react based on what they experienced on the VAUX - by using the '*product*') and broaden its features. '*Seeing*' refers to any sight both for text and visual, followed by '*hearing*' for listening to any kind of audio, and '*touching*' for an interaction (representative of visual, and/or text, and/or audio). These attributes are categorized as main VAUX because they refers directly to user senses in order to provide relatively good experience.

Thus, three categories of VAUX in HCI development which are text, visual, and audio, as mentioned by various authors are illustrated in Table 1 below.

Table 1 VAUX in HCI development

VAUX		**WORKS**
TEXT	Font	[9], [10], [5], [11]
VISUAL	Image	[4], [12], [13], [11]
AUDIO/SOUND	Music	[14], [15], [12], [16]
	Sound Effect	[14], [17], [12]
	Voice	[18], [5], [14], [12]
COMBINED ELEMENTS	Color	[9], [10], [3], [5], [14], [19], [20]
	Graphic	[9], [21], [11]
	Layout	[9], [10], [22], [19]
	Shape	[10], [5], [20]
	Form	[19], [5]
	Texture	[5]
	Beauty	[14], [19]
	Elegance	[19]

Colour has the highest recommendation by scholars as most essential combined VAUX in HCI development, as illustrated in Table 1. Colour may provide major contribution in term of attraction from the user to the product, thus enhance the user's learning process from "irrelevant" to "relevant" learning (or acknowledgment) of the product, by Deutschmann Barrow and McMillan in 1961 [23].

Based from the review, it is strongly argued that attributes of beauty and are not sup-posed to be considered as an "*attribute*", but in a form of "*characteristic*" instead, as suggested by many scholars. This is because "*attribute*" in this study represents some-thing tangible that can be changed or experimented. This means that researched AUX "*attributes*" in this study are tangible which can affect the UX. Any other intangible "*attributes*" mentioned by other researchers are considered as "characteristics" in this research. In other word, "*attribute*" act as an ingredient for any "*characteristic*". The difference between "*attributes*" and "*characteristics*" may lead into a different meaning. According to [24], "*attribute*" is caused by something indicated, while "*characteristic*" indicating the feature, quality or character of a person or thing (vice versa to "*attribute*"). For example, attribute image/picture is something tangible which can be changed, edited and experimented, while attribute beauty and elegance is something intangible and can only be changed only if other attributes such as image, colour,

and texture are changed. This means that beauty and elegance are more into abstract, and it is not something that should be categorized as stand-alone-"*attribute*", but more into "*characteristic*".

As elegance is out of the scope in this study, the lowest recommendation by scholars is texture. The function of texture are not only tell the looks or feels of a surface on any substance [25], but also provide the realism experience towards the user. For example, the realistic of 3D realism could be achieved by not only imitating the objects from the real world through details, shape, motion, or colour only, but also texture, without concerning the relevance of the features on the object identity [26]. There are various texture studies in 3D development. However, it is very less in other than that (e.g. 2D). It is probably considered as less important to be concerned by the user. Even so, texture could be seen in a quite large domain itself. This is because texture can be in many forms of studies (surface) such as texture on any 2D surface like photograph, digital illustration or any other photorealistic, and not to mention that it also can be in a form of 2D map that applied on 3D model, thus affecting the final rendered 3D model. Moreover, the higher resolution of the image, the better quality of texture can be produced [27]. This shows that there is still need for other texture studies, especially in 2D form.

Text is naturally a part of visual. However, it should be categorized separately as the main VAUX because text is a verbal type of user's communication which has a different process than visual to do the interaction with the '*product*': read, think, understand, and react/interact. Cognitive theory of multimedia learning (CTML) [28] explains on how to use words (text) and pictures (visual) for human learning improvement. This is indirectly supported the reason of why text and visual are categorized as two major elements for UX improvement.

Text may contribute into a few factors, such as emotion [29]; connecting ideas in text, differentiate an important and unimportant content [30]; provide instructions before reading, and awareness during reading [31], before analyse the meaning of the content as a whole. Meanwhile, a previous image prediction study shows that it can measure the level of interestingness of a person towards the content of the picture, which indirectly relate to learning interest [4].

Music, sound effect, and voice are a part of sound/audio. It has been suggested by [16] that there are four essential features that should be main concern in sound/audio development, which are learnability, explorability, feature controllability, and timing controllability. In addition, music can determine either audience (user) loves to continue to listen until the end of the results or not [32]. Meanwhile, voice is essential for the user to judge the 'personality' of the system such as non-playing characters, especially when there were no other cues else to support - other than human voice [18].

There is lack of direct-to-graphic study. However, it significant can be perceived as defined by Oxford dictionary [33], which are graphic is any kind of pictorial/visual representation of an item (i.e. pictures, words, shapes) that perceived and/or described in a very clear way.

Layout aesthetics can be measured in six component, namely cohesion, economy, regularity, sequence, symmetry, and unity [22], [34] for interactive digital media. The finding in their study has proved that the higher level of layout aesthetic, the better the UX, which in term of respond time in a task of visual search.

Both shape and form can easily provide shape/form recognition of something without having people to read the label on it. There is no bias (even among school children) in determining the intended message; either shape/form with or without the label on it [35].

Based on this findings (from Table 1), none of them has categorized the VAUX according to the main VAUX and its subordinates. Therefore, it is argued that VAUX should not be treated equally. This is because there should be "*main*" VAUX as main category and "*combined*" VAUX which should be identified and categorized respectively/systematically according to its specification. The term "*main*" used is to make it easy to be identified either the attribute falls in which category, while "*combined*" is for easier understanding to which ("*main*") category that the attribute can possibly fit in. In order to do so, a consolidated model is proposed to rearrange all VA (combined-VAUX) in their category (main VAUX). Interaction form is as mentioned before in order to give the idea on what kind of interaction does the design required. Figure 3 illustrates this consolidated model of VAUX according to their respective categories based on user's sense for their UX.

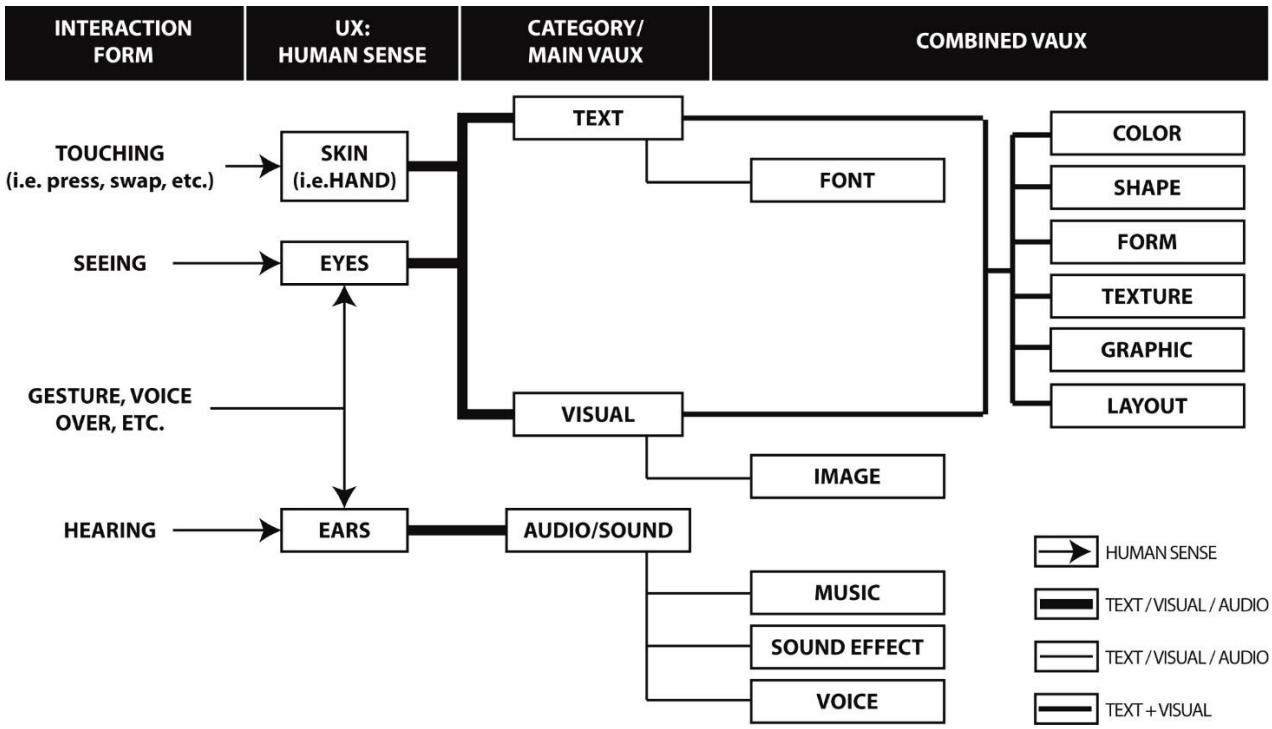

Figure 3 Consolidated Model of VAUX

Figure 3 provides the classification and flow of VAUX which it originates from human sense via interaction. The classification are determined based on each attribute's group through the definition stated by scholars or dictionaries (refer Table 1 and 2). Image, for example, is part of visual "*main*" attribute, while colour, shape, form, texture, graphic and layout could be in a form of text or visual or both. Meanwhile, audio/sound is a "*main*" term for its sub, like music, sound effect and voice. The classification also achieved based on the flow of VAUX, where it is determined from the interaction originated by human senses where it is used in identifying/sensing for each attribute. For example, text and visual can be detected by user using their sense of eyes by seeing, and response back using their sense of skin (hand) by touching interaction method. Meanwhile, the user can acknowledge any form of audio or sound through hearing.

4.0 CONCLUSION

This paper has reviewed visual aesthetics attributes for user experience and developed a consolidated model based on the review. This consolidated model provides basic guidelines for developing computer applications which are based on aesthetic attributes. It attempt to simplify the understanding in developing processes in order to make a good design with recommended VAUX. Future work may include an evaluation method for each identified VAUX as outlined in this. It is eventually a complete universal VAUX guide even it requires a consolidated data from many sources for each identified VAUX.

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