

Visual Aesthetics of Interaction Design

Mati Mõttus

Institute of Informatics
Tallinn University
Narva mnt 29,
Tallinn, Estonia
mati@foti.ee

David Lamas

Institute of Informatics
Tallinn University
Narva mnt 29
Tallinn, Estonia
drl@tlu.ee

ABSTRACT

There are no clear instructions for making nice looking visual design. Beauty depends on many aspects, starting with person who looks at the object and ending with style, accepted at present moment of time [4]. Absolute truth can not be revealed, but there exist some guidelines that are called composition rules [5]. Few talented people create masterpieces intuitively, but if others follow composition rules, the work will be done attractively as well.

Visual aesthetics of interaction design influences both pragmatic and hedonic properties of interactive product. Relations between aesthetics and interaction design have been already well researched and proved, that aesthetic look of interface adds attractiveness, helps to engage users and will be positively remembered providing better User Experience (UX).

This paper focuses on establishing connections between visual aesthetics of interface and its interactive features. The intention of study is to show that aesthetic interaction design does not only provide better UX but also increases its pragmatic properties e.g. usability.

Keywords

Visual aesthetics; interaction design; aesthetics evaluation; user experience; user engagement; affordances; evaluation methods.

ACM Classification Keywords

H.5.2. Information interfaces and presentation (e.g., HCI): User Interfaces - Evaluation/methodology.

INTRODUCTION

Visual Image

Significant part of Human Computer Interaction (HCI) is based on visual image - the interface that user sees. Visual image may hold different kind of information. For example text - it has two meanings. First one is readable message and second is shape, colour and position of letters! Second one is called visual message, which exists in every picture, animation or even 3D scene. Visual message provides quicker way of delivering information. Instead of reading the label user needs to take a quick look at the image (Figure 1).

Sometimes the usability of certain objects needs to be



Figure 1.

international. In this case visual message helps to overcome language problem.

Interaction designer can attract users, help to understand interface logics and make the product easier to use, by meaningful composing of visual message. Composing the image in graphic design means page layout: arranging objects, cropping and framing, choosing colour, etc. The practical purpose of the well composed image is to send intended visual message to the viewer. Good composition helps viewers (users) to understand this message, which in interaction design, leads to smooth interaction flow.

Aesthetics of Interaction Design

Beauty is in the eye of the beholder. Aesthetics of visual image trigger emotions in person, who looks at the image [15]. Part of HCI, which deals with user's emotions is User Experience (UX) [12]. When evaluating aesthetics, the value has two sides: pragmatic and hedonic. Pragmatic side deals with guiding users attention on the screen and making objects more visible. Hedonics are about first impression and satisfaction. The same principles of pragmatics and hedonics belong also to UX: pragmatics are about usability and accessibility but hedonics describe for example pleasure of product's use.

Outcome of Aesthetics Study

Goal of this study is to explain relations between visual aesthetics of interface and UX. In other words, to show that aesthetical interface provides better UX. Aesthetic value is the result of human perception. Nevertheless, not only

perception plays the role while judging beauty, but also interpretation of perceived information. The aesthetics and UX behave similarly while interpreting. Result depends on person's previous experience, cultural background, education, age and many more factors which all together represent users profile. This paper focuses to main aspects of interaction design which are related to human perception of beauty in the context of user profile.

INTERACTION DESIGN

Even unprofessional users can notice, when some functionality does not work properly in interaction design. Shortages in aesthetical level are more difficult to notice. People do not pay attention to aesthetics of single product but they will compare aesthetics when they already have previous similar experience with other product. Having used more than one product, users can easily tell, which one they like more [3]. Comparing experiences makes aesthetics more important, therefore is UX chosen as main connection point between aesthetics and interaction design.

User Experience

Best way to approach UX seems to be from two directions, first from the user's judgement of their experience and, secondly, from the design perspective to enquire which features or qualities might deliver a high-quality user experience [12]. Aesthetics is connected to both of these sides. Users side is about perception and interpretation of beauty and designers side is about creating aesthetical interfaces.

Conception of UX has three main components: content, user and context (Figure 2). Aesthetics can be described in exactly the same way. Previously mentioned user side is the blue circle, designer side represents content(green). Context means both user profile and conditions of use. Conditions of

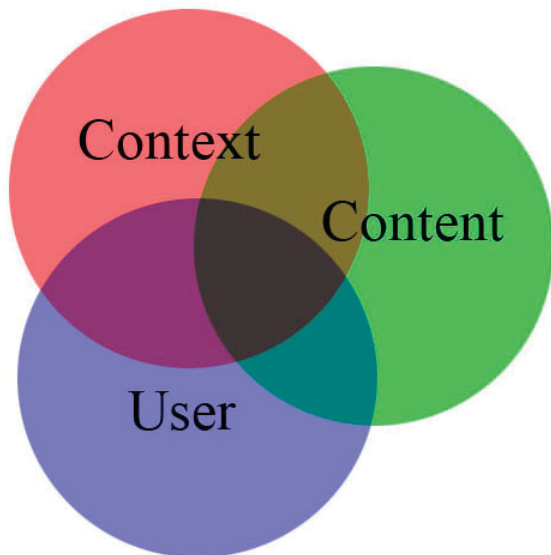


Figure 2.

use depend on displays and devices, but also on surrounding environment.

Besides the hedonics, UX has pragmatic properties as well. This contains part of usability in overlapping blue and green circles (Figure 3). Pragmatics of UX include effectiveness and efficiency of completing interactive task. User engagement, affordances, first impression, learnability are most important aspects of interaction.design. These aspects, similarly to usability, also overlap the UX-s blue circle (Figure 3). Showing, how aesthetics influence UX, might reveal more ideas for improving user engagement and learnability, provide better first impression and enlarge the choice of affordances.

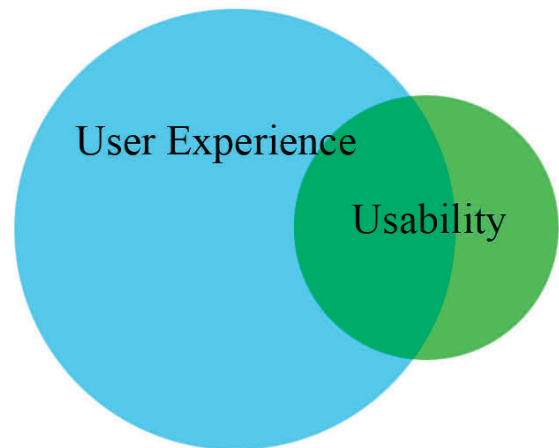


Figure 3.

User engagement

For avoiding bigger mistakes in interface design, Alistair Sutcliffe brings up guide rules that concern user engagement (UE) [12]. The purpose of these rules is to keep the user interacting till the necessary task is completed. To do this, user needs to be in state of mental flow. Maintaining flow state means not to be bored by too simple task or frustrated when task is too difficult. Too simple tasks need some challenging ideas that rise additional interest and complex tasks must provide some encouragement not to quit before the end. Aesthetics play crucial role, when focusing user's attention and trying to attract user with positive first impression. Even if new and unfamiliar design seems a bit confusing and its functionality is unclear, more aesthetical, new design will be chosen by most users. Aesthetics will help later, after first impression, to keep interaction process flowing smoothly with providing pleasing experience of use.

Affordances

Interactive objects or items are designed to afford user some "goodies" or opportunity for action. Many everyday items have more than one affordances, for example plastic bottle can be used to hold liquid, but also to play the bottle spinning game. Exactly the same happens with interaction design. Aesthetics

help to explain the purpose of some objects when it's use appears unclear. It becomes most obvious when designer uses symbols instead of text. Symbols and pictograms are perceived faster, but can be often misunderstood. That is why designer's knowledge about aesthetics in context of user profile is important. Meanwhile, the creative design of pictograms can cheer up users and provide better UE. Van Vugt et al describe an experiment where good looking and ugly characters were provided to users of Sims2 game [13]. As a result, ugly characters showed lower scores and the game was dropped more often with ugly characters.

Learnability

Users do not like to read large amount of small text that explains how to deal with certain interfaces. Instead of studying the manual, before using new product first time, they start action with all hopes on their intuition. Intuition is mostly based on previous experience, but it also contains a little "unexplainable" knowledge from ancestors. Intuition often fails during first use. Second time of use would certainly be more successful, but sadly often happens that product is considered "not usable" and cast aside before. To avoid this, designer may find help from aesthetics. Composition rules represent so called Classical Aesthetics and help to predict many important issues [6] for example:

- What spots on interface are noticed first?
- What way moves user's gaze on layout?
- What objects are perceived as group?

More creative kind of visual design principles are explained by expressive aesthetics, for example:

- Meaningful pictures.
- Guiding shapes.
- Color coded messages.
- Attractive photos, animations or 3D scenes.

Creativity of designer with combining classical and expressive aesthetics may help to achieve better learnability.

AESTHETICS

Interaction design principles of visual layout were explained in previous chapter. Knowledge about esthetical composition is important as well, to explain connections between interactivity and aesthetics. Guide rules as design advice for interaction, are brought up by Alistair Sutcliffe, which concern aesthetics of visual image [12]. These rules are based on psychology of visual perception. Creative idea is certainly most important while designing but sometimes, when in doubt, there is need for support in making decisions. Designer may also need to walk through initial design for finding problems. In such cases are following rules very useful.

Judicious use of colour

Colour use should be balanced and low saturation pastel colours should be used for backgrounds. Designs should not

use more than 2-3 fully saturated intense colours. Yellow is salient for alerting, red/green have danger/safety positive/negative associations (color coded messages), and blue is more effective for background. Low saturated colours (pale shades with white) have a calming effect and are also useful for backgrounds. Colour is a complex subject in its own right.

Gestalt effects

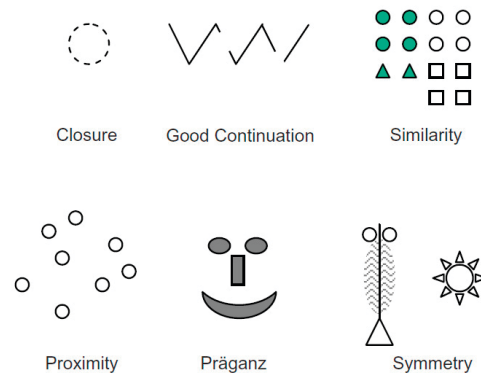


Figure 4. Gestalt effects

there are several visual patterns (Figure 4) which we recognize and interpret instinctively. These phenomena are known as 'Gestalt' effects in perceptual psychology.

Depth of field: use of layers in an image stimulates interest and can attract by promoting curiosity. Use of background image with low saturated colour provides depth for foreground components.

Use of shape: use of curved shapes conveys an attractive visual style, in contrast to blocks and rectangles which portray structure, categories and order in a layout.

Visual structure and organization: dividing an image into thirds (Right, Centre, Left or Top, Middle, Bottom) provides an attractive visual organization while rectangular shapes following the golden ratio (height/width=1.618) are aesthetically pleasing.

Closure: we naturally see the complete object such as a circle, even if it is not complete.

Good continuation: items organized in a visual sequence or on a curve are perceived to be related or belong to a structure.

Similarity: objects which share visual attributes (colour, size, shape) will be seen as a category or group.

Proximity: objects which are placed close together and separate from others are perceived as a group.

Prägnanz: the tendency to ascribe meaning to images based on similarity to images we remember.

Symmetry: symmetrical visual layouts, e.g., bilateral, radial or rotational organization that can be folded over to show the symmetrical match, have pleasing effects.

Figure ground: the juxtaposition of visual features or grouping of shapes causes higher-order structures to emerge

from the image. This effect can be used with verbal priming to create surprise when the structure is not immediately apparent.

Aesthetics Dimensions

The terms “classical aesthetics” and “expressive aesthetics” are here explained once again, but in this time from aesthetics point of view.

Classical Aesthetics - pertains to aesthetic notions that presided from antiquity until the 18th century. These notions emphasize orderly and clear design and are closely related to many of the design rules advocated by usability experts.

Expressive Aesthetics - created by the designer’s creativity and originality and by the ability to break design conventions.

Classical aesthetics dimension is important for making interface design more pleasing and attractive. Expressive aesthetics is used as designers creative idea for engaging users and guiding them in interaction process.

Antonella De Angeli, Alistair Sutcliffe & Jan Hartmann [3] took two interactive web sites with exactly the same content for comparison. One traditional, menu based and other metaphor-based. The metaphor-based interface was preferred on the expressive aesthetic dimension and was rated as more engaging. The menu based interface had better usability; it elicited more positive memories, and was perceived as providing better content.

There have been a research of connections between interaction related affordances and design aesthetics [15]. Conclusions were, when given a choices, in first glimpse, users always decide to try better looking, more aesthetical option. Only, when, the choice turn out to be wrong (affordances are not good), the other options will be chosen. Both aesthetics and affordances are considered to be measures of product success, each one for the role it plays in the design process. Thus, designers always want to know, how they could use these two ostensibly distinct theoretical elements in order to provide effective ways of interaction through their products [13]. An aesthetically pleasing appearance is only a part of a successful product. The other part is understandability and usability, which are more important than attractiveness. These two parts of design should go ‘hand in hand’ because focusing on aesthetics could blind the designer to the lack of usability. Designers incorporate interactive potentialities to artifacts as interactive affordances that confirm the dynamic presuppositions of interaction and reduce the design-uncertainty.

Style

When some images look similar, it may be expressed, as the same style. In the visual arts, style is a “...distinctive manner which permits the grouping of works into related categories.” [4]. Historically certain periods have the same style, which describes how aesthetics was understood these days. Renaissance, Classicism, Romanticism, Art Nouveau, Art Deco etc. are most important in Europe’s history.

Modern styles change very quickly. Renaissance lasted 3-4 centuries, classicism 2 centuries, Art Nouveau and Art Deco some 20-30 years. Human nature needs fresh ideas, thus new styles appear from time to time. Aesthetic preferences in interaction design change faster, even in 2-3 years, because new ideas become available through new technologies. Such developments cause the need for regular renewing of design.

RESEARCH METHODS

For studying relations between Interaction design and aesthetics, properties of both instances need to be evaluated. Two different ways of evaluating aesthetics are objective and subjective approach [1]. Assessable aspects in interaction design are it’s hedonic and pragmatic properties.

Evaluating Aesthetics

Objective evaluation of visual aesthetics means that assessment is conducted through analysis of layout structure. Subjective methods use person’s emotional response to aesthetic content. Overview of different evaluation methods is listed by Pajusalu [10].

Objective methods:

1. Counts based method - aesthetical value depends on number of objects in layout.
2. Model of visual aesthetics [9] - 14 measures that describe layout and are calculated using properties of balance, equilibrium, symmetry, sequence, cohesion, unity, proportion, simplicity, density, regularity, economy, homogeneity, rhythm, order and complexity
3. Aesthetic colouring system [14]- a method to produce aesthetically pleasing colour schema for interface layout.
4. Measuring the physiological changes [11] - the physiological parameters like heart rate, skin conductance, gaze movements can be recorded during aesthetic experiment. These changes are not directly controlled mentally by test person, so the method can be called objective. Still this method assess person’s response to visual stimuli, therefore it can be subjective as well.

Subjective methods:

1. Classical aesthetics - Questionnaire in structured form to find out the aesthetical value according to classical aesthetics.
2. Expressive aesthetics - Questionnaire in structured form to find out the aesthetical value according to expressive aesthetics.
3. VisAWI [8] - Questionnaire which includes 4 aspects of aesthetics: simplicity, diversity, colorfulness and craftsmanship.
4. Interface criticism [2] - subjective method, which includes also aesthetical measures. Interface criticism is a method based on literary and art criticism traditions. The only method that allows to evaluate the aspect of style.

Evaluating Interaction design

The overlapping of UX and usability allows to bind them together for studying and separate the aspects of hedonics and pragmatics. Hedonic properties of interaction express users emotions during use. Pragmatics are about measuring physical parameters.

Hedonics can include large number of different properties that may evoke either positive or negative emotions while using interactive product. Here are listed few: satisfaction, pleasure, attractiveness, trust, aesthetics (Beauty). Methods for evaluating hedonics are:

1. Questionnaire - survey, structured questions, open questions. For example AttrakDiff [6]
2. Interview - personal interview, group interview, focus group, structured or open interviews.
3. Observation - taking notes, audio recording, video recording.
4. Recording physiological changes - eye tracking, skin conductance, ECG, EEG

Pragmatics means measuring time, counting errors, registering successful operations etc. Most important measures of usability are:

1. Accessibility - finding out any issues that can restrict to use product by purpose or make it unusable at all. For example support for disabled people and compliance with different web browsers or devices.
2. Time to task - how long it took to complete the task?
3. Errors made - how many errors happened during use?
4. Success to task - was the task completed successfully?
5. Effort made - how many operations user completed for completing the task? (mouse clicks, keystrokes, lever movements etc)

CONCLUSIONS

Measurable aspects are now brought out for both visual aesthetics and interaction design. Let's call these aspects as connection points between aesthetics and interaction design. Next step for future study will be to define exactly, which connection points and in what way are related. Before to start collecting data is necessary to define objects for evaluating, choose the methods and find test users. Following are general remarks and suggestions for further study.

Objects for Evaluation

Interactive objects are everywhere and most of them have visual interfaces. Using one type of interfaces (web pages seem to be most convenient to study) might not give reliable data for all cases. The same is for appearance of visual interface, which is not always static picture, but mostly includes animations and 3D scenes. The scope of study is growing dangerously wide to handle properly. Therefore seems wise to split it into subsections and keep in mind that results are valid only for chosen subsection. Certain aesthetical or interactive aspects can be picked up knowingly

to target certain connection points.

Choosing the Methods

The choice of Methods allows to separate desired connection points. WisAWI method, Classical and Expressive aesthetics methods are developed for evaluating aesthetics. AttrakDiff method is developed for evaluating UX. These methods are ready to use and proved to work well. Creating completely new questionnaires and conducting interviews include risk with asking wrong questions. The questions must be worded carefully and new questionnaires piloted prior to data collection to make sure the correct connection point is targeted. Audio and video recording on usability tests and observation sessions is always recommended.

User Profile

Easy way to conduct user studies is convenience sample, but doing so, the validity of data will be limited. Correct procedure would be to choose test users accordingly with objects for evaluation. Leading questions can be added to questionnaire for specifying user profile: age, gender, education, computer experience, etc.

The Model of Interface Aesthetics

As the ultimate goal of aesthetics study, all possible correlations between connection points will be collected. This collection will be structured and called The Model of Interface Aesthetics. The model is meant to allow evaluating visual aesthetics via image analysis and mathematical calculations. Existing model of visual aesthetics created by Ngo et al [9] could be good starting point for developing it further.

The model of interface aesthetics can help Interaction designers to create aesthetic prototypes. Authors hope is that the model can provide practical help at least in initial state of interface design and save at least one round of expensive and time consuming user study.

REFERENCES

1. Altoboli, A., & Lin, Y. Objective and Subjective Measures of Visual Aesthetics of Website Interface Design: The Two Sides of the Coin. Human-Computer Interaction, Part I, HCII 2011, 35–44.
2. Bardzell, J. Interaction Criticism and Aesthetics. CHI 2009 April 4–9, 2009, Boston, MA, USA.
3. De Angeli, A., Sutcliffe, A., Hartmann, J.: Interaction, Usability and Aesthetics: What Influences Users' Preferences? Proceedings: Conference on Designing Interactive Systems, DIS-06, pp. 271–280. New York: ACM Press. (2006)
4. Fernie, Eric. Art History and its Methods: A critical anthology. London: Phaidon, 1995, p. 361. ISBN 978-0-7148-2991-3
5. Freeman, M.: The Photographers Eye: Composition and Design for better Digital Photos, Focal Press (2007)

6. Hassenzahl, M., Burmester, M., & Koller, F. (2003). AttrakDiff: Ein Fragebogen zur Messung wahrgenommener hedonischer und pragmatischer Qualität [AttracDiff: A questionnaire to measure perceived hedonic and pragmatic quality]. In J. Ziegler & G. Szwillus (Eds.), *Mensch&Computer 2003. Interaktion in Bewegung* (pp. 187–196). Stuttgart, Leipzig: B. G. Teubner.
7. Lavie, T., and Tractinsky, N.: Assessing Dimensions of Perceived Visual Aesthetics of Web Sites, *International Journal of Human-Computer Studies*, 60, pp. 269–298. (2004)
8. Moshagen, M. & Thielsch, M. Facets of visual aesthetics. *International Journal of Human-Computer Studies*, 68(10), 689-709 (2010).
9. Ngo, C., L., N, Teo, L., S., Byrne, J., G. Modelling interface aesthetics. *Information Sciences* 152 (2003), Elsevier
10. Pajusalu, M. The Evaluation of User Interface Aesthetics. Tallinn University Institute of Informatics (2012) http://www.cs.tlu.ee/teemad/get_file.php?id=202
11. Strebe, R. Visual aesthetics of websites: the visceral level of perception and its influence on user behaviour. *Research and Advanced Technology for Digital Libraries*, 523–526. Springer. (2011).
12. Sutcliffe, A.: *Designing for User Engagement: Aesthetic and Attractive User Interfaces*. Morgan & Claypool (2010)
13. van Vugt, H. C., Hoorn, J. F., Konijn, E. A., de Bie Dimitriadou A.: *Affective affordances: Improving interface character engagement through interaction*. Elsevier Ltd. (2006)
14. Zhang, Q., Kang, W., Zhao, C., & Ming, X. Aesthetic Coloring for Complex Layout Using Genetic Algorithm. 2009 WRI Global Congress on Intelligent Systems, 406-410.
15. Xenakis I., Arnellos A., Darzentas J. The functional role of emotions in aesthetic judgment. *New Ideas in Psychology* 30 (2012) 212–226