ABSTRACT
The present study examined how objective design factors of a website such as bilateral symmetry, color hue, color saturation, and color brightness can be linked to different facets of subjective aesthetic perception. Our results from multiple online studies suggest that each design factor affects the facets of the Visual Aesthetics of Website Inventory [4] in a different way. Our findings may help designers to systematically target specific facets of visual aesthetics.

Author Keywords
Aesthetics measures; Aesthetic perception; Web-design factors; VisAWI; Visual aesthetics

ACM Classification Keywords
H.5.2 Screen design; H.5.2 Evaluation/methodology

INTRODUCTION & RELATED WORK
Within the field of human-computer interaction (HCI) and especially in the context of user experience (UX) research, the aesthetics of user interfaces has become a topic of major interest. Numerous studies show the influence of aesthetics on various HCI aspects such as usability, trust, credibility and overall satisfaction [for a review, see 5]. Hence, it is important to understand which interface design features affect the users’ aesthetic perception and how interface aesthetics can be measured.

There are mainly two approaches to measure interface aesthetics [1]. First, the objective screen-design-based approach relates screen design factors and layout elements to the users' perception of visual aesthetics [e.g. 2, 6]. Second, there is the subjective questionnaire-based approach that uses questionnaire-based instruments to measure the impact on users' perception of visual aesthetics [e.g. 3, 4].

So far, only little is known about how these two approaches are related. In a recent article, Altaboli and Lin [1] calculated objective measures of 42 web pages and compared these to subjective questionnaire scores. Results showed significant correlations between several of the selected objective screen layout-based measures and the subjective questionnaire-based measures. To further examine these correlations, they concluded that there is a need of experimental studies. Consequently, the present study aims at investigating experimentally as to how objective screen-design factors are related to facets of subjective questionnaire-based measures of visual aesthetics.

METHOD
In order to address our research question we manipulated the following objective design factors on screenshots of real existing websites: bilateral symmetry (symmetric vs. asymmetric; for an example, see Fig. 1), hue (red = 0; yellow = 60; green = 150; blue = 210; violet = 300 on the HSB scale), saturation (low = 10% vs. medium = 40% vs. high = 70%) and brightness (low = 60% vs. medium = 79% vs. high = 98%). For reasons of practicality, design factors were manipulated independently from each other. Hence, possible interactions between factors are not taken into account. All manipulated screenshots were validated by means of a preliminary online study. For the main study (consisting of four independent online studies) five sets of web page screenshots were selected per each design factor. Each set consisted of several manipulated versions of the same web page according to the different levels of the factors. Totally, we used 55 different websites (symmetry: 10 websites; hue: 25 websites; saturation: 15 websites, brightness: 15 websites).

To measure the facets of subjective visual aesthetics we applied the Visual Aesthetics of Website Inventory (VisAWI) by Moshagen and Thielisch [4]. The VisAWI is a valid questionnaire that allows for a reliable and precise
assessments of perceived visual aesthetics of web pages. It distinguishes between four facets of visual aesthetics: simplicity (relates to unity, clarity), diversity (relates to dynamics, variety, creativity), colorfulness (covers selection, placement, and combination of colors) and craftsmanship (relates to coherent integration, design with skill and care).

A total of 120 subjects (64% female, Ø age: 28 years) participated in the four online studies (33-53 per study). We used a within-subject design. The manipulated web page screenshots were presented in random order and the subjects had to rate each screenshot on visual aesthetics by means of the VisAWI.

RESULTS

We used repeated measure ANOVAs to analyze the data. Results show that all objective design factors had a significant effect on subjective visual aesthetics, whereas different objective design factors correspond with different facets of visual aesthetics. Table 1 shows which facet was affected how strongly by which design factor: (1) Simplicity was most affected by symmetry, followed by brightness and hue, which had a considerably smaller effect. Saturation, however, had not a significant effect on simplicity. (2) Diversity was only influenced by the layout symmetry, for all other factors no significant effect was found. The subjective perception of (3) colorfulness was influenced by hue, saturation and brightness, whereas hue had the strongest influence. For symmetry no significant effect was found. Finally, (4) craftsmanship was significantly affected by hue and symmetry, whereas symmetry had a stronger effect.

To sum up, on all facets, except for colorfulness, symmetry had the largest effect. The same was observed for the overall score. In contrast, the perception of the facet colorfulness was influenced the most by a combination of hue, saturation and brightness.

DISCUSSION

Our results suggest that the investigated objective screen design factors all affected subjective visual aesthetics. Furthermore, our study shows that the different objective design factors can be linked to specific facets of the subjective evaluation of aesthetics. This finding partially contradicts the correlational results from Altaboli and Lin [1], who did not find a significant correlation between symmetry and any of the VisAWI facets. This is even more surprising because symmetry had the largest effect for three out of four facets in the present study. Nevertheless, a strong relation between symmetry and aesthetic perception was already revealed in other studies [e.g. 6], which supports our results. The use of color (hue, saturation, brightness) is an extension of the study of Altaboli and Lin [1]; these objective factors showed a medium effect on the overall VisAWI score. However, as this study was conducted with sample consisting of mainly of Swiss participants, it is unclear to what extend the findings apply to people with other cultural backgrounds.

Our findings may help designers to systematically target specific facets of visual aesthetics. In our future work we would like to extend our studies to further layout factors like visual complexity. It would also be interesting to see how these findings could be applied to other types of interfaces.

REFERENCES


