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Semantic dimensions: A web-based game to evaluate the meaning of form

Abstract
This paper presents a novel research tool to analyze the semantics of three-dimensional forms. We developed an online game that uses crowdsourcing techniques to gather data about the perceptions of form from different people all over the world. The aspired result of the tool is a collection of statistical data about the semantics of form. The data could be used by designers to better understand and control the connotative meanings embedded in the shape of their designs.

Keywords
Semantic Differentials, Crowdsourcing, Semantics of Form

1 Introduction

Product Semantics has been identified as an important research area in the field of product design. Not only the color, the material, and additional branding add to the meaning of an object, but also the shape of the product itself can support a specific message that the designer wants to transfer to the user.
However, it seems to be difficult to control the perceptions that the user or observer experiences when seeing specific shapes, since these are highly individual. The concept of semantics is based on the intuitive associations of the observer, as well as on collaborative conventions within a culture or community. Both, intuitive associations and collaborative conventions might differ according to context and cultural background of the observer. Of course, there already exist some general understandings—you could also say 'clichés'—e.g. that round shapes look 'more feminine', or that slanted shapes look 'more dynamic and sporty', but what is missing is an empirical analysis of such collaborative understandings of forms; as well as a structured database of such semantic shapes.
The goal of our work is to develop a research tool to collect empirical data about a common meaning of forms. We want to discuss the following questions: How can the design of such a research tool motivate a lot of people to participate in the survey, and how can we ensure high quality of the collected data? The aspired result is a repository of semantic forms that could be used by designers to better control the connotative meanings embedded in their designs.

2 Related work

There have been numerous publications about product semantics, e.g. Steffen [1] summarizes the 'Offenbach approach' in her book "design as product language". The term 'product semantics' was coined by Krippendorff and Butter [2]. They are in-line with Wittgenstein's [3] definition of meaning as use, culminating in the axiom that "humans do not see and act on the physical qualities of things, but on what they mean to them" [4, pp. 47]. According to Wittgenstein [3],

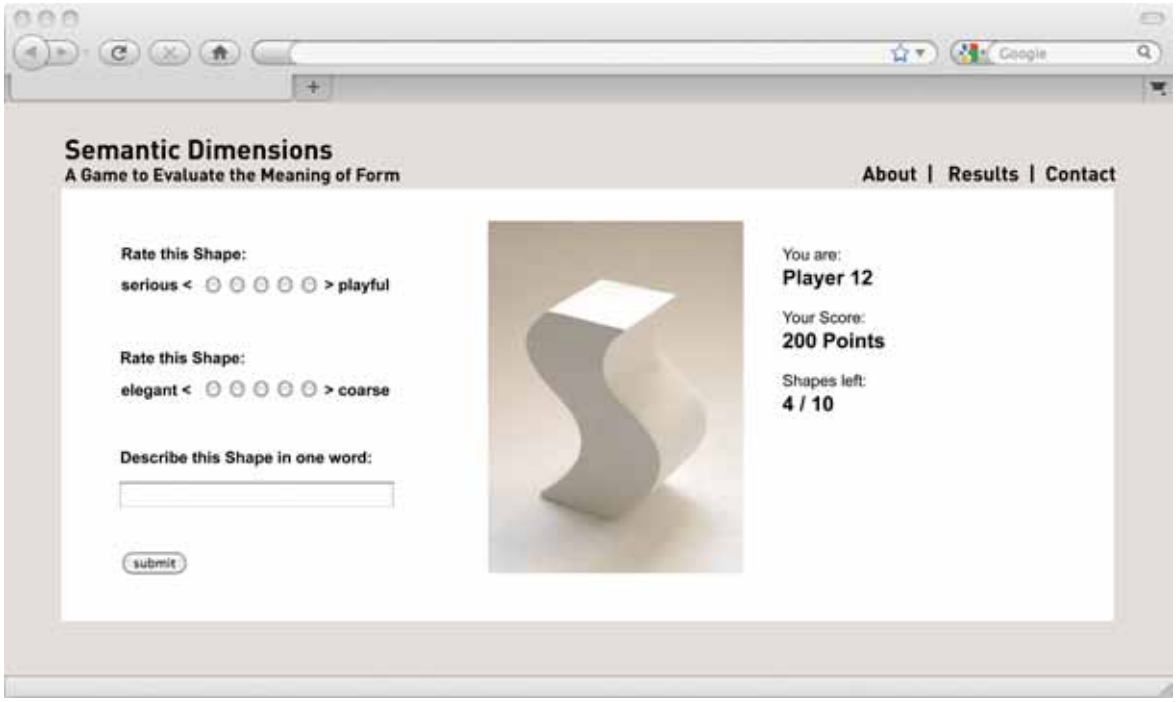

Fig. 1. Screenshot of the web application.

a person knows the meaning of a statement, if they can react in an intelligent way; they can participate in the "language game".

There are some empirical analyses of semantic perceptions of form. MacDonald et al. [5] statistically analyzed the semantics of products by using the example of wine bottles. Hsu et al. [6] compared the semantic perception of users and designers for telephones. Petiot et al. [7] developed a method for evaluating product semantics and applied it for table glasses. However, all prior works analyze only a specific product type and use standard questionnaires for evaluating the product semantics.

Nowadays, the Internet allows different approaches for gathering data for example through crowdsourcing [8]. Crowdsourcing describes a model for problem solving or production using a crowd of people [8]. The problem or assignment is broadcasted to a group of people. Some of the people within the crowd submit a solution or participate in the assignment. In some cases this labor is well compensated, either monetarily, with prizes, or with recognition. In other cases the only rewards may be reputation or intellectual satisfaction. Examples of well-known crowdsourcing applications are Amazon's Mechanical Turk [9] and Google Image Labeler [10] which is based on the ESP game [11]. Amazon's Mechanical Turk is a marketplace for micro tasks, where users participate because they get monetary compensation for completing tasks. Google Image Labeler is a game where two players label a randomly assigned image. Both players get points when they tag one image with the same label. Both applications motivate participants to perform useful but boring tasks that cannot be performed by a computer. The motivation of such applications is usually achieved through fun, monetary incentives, or additional usefulness for the participants.

3 Our approach: The semantic dimensions game

Our concept is a web-based application in the form of a game that motivates people to participate because it is fun to play. The game is actually a research tool, to collect data about what certain three-dimensional shapes mean to people. Two players virtually play with each other by trying to label and analyze images of 3d shapes, that they are presented. The more similar the answers of both players are, the more points they get. For a screenshot of the web application see Figure 1. The design of the game motivates people to participate in a (usually pretty boring) questionnaire about semantic shapes (see [12] for the IT aspects of the prototype). Since they only get points, when both players give similar answers, they will be encouraged to give true answers, and cheating will be discouraged. The random pairing of two players who rate the same image, works as a quality control mechanism. Moreover the game will give the possibility to distinguish between different cultural backgrounds of the participants (by identifying the location) and to evaluate a possible impact of culture on the semantic perceptions of form.

3.1 Collection of shapes

The starting point of the project was to develop nearly 100 different plaster shapes to be presented to the participants of the game. For this purpose we developed

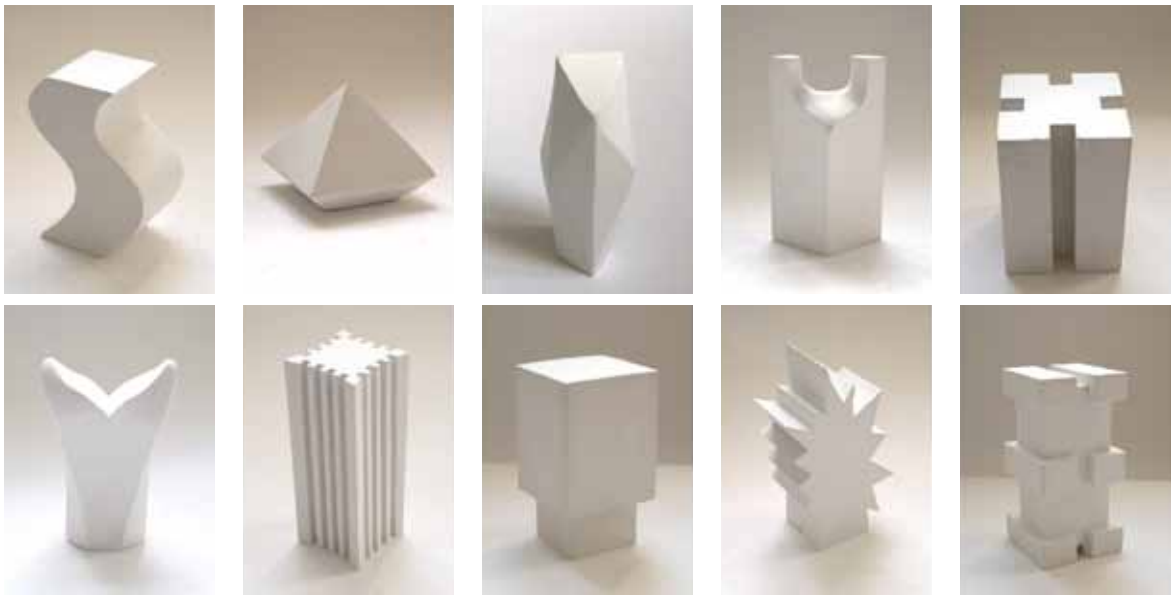

Fig. 2. Some examples of the three-dimensional shapes

an exercise for students of the 1st term 'product design fundamentals' at the Anhalt University of Applied Sciences in Dessau. Every student was given a single phrase from the list of semantic differentials (see section 3.2), and the assignment to design a three-dimensional shape representing that particular phrase. The shape should be derived from a cube with the dimensions of 5 cm x 5 cm x 12 cm in five similar steps. Therefore all the resulting shapes remained comparable. For our game we only used the final (fifth) step of this transformation. Some examples of the resulted shapes can be seen in Figure 2.

3.2 Semantic differentials

The focus of the research tool is to collect data about the individual perceptions of form—the semantics of three-dimensional shapes. We developed a list of semantic antonyms based on Osgood [13], but with a focus on the semantic—not the syntactical aspects of form. That means, terms that are only related to the syntactical aspects of form (such as rounded—edgy) were not considered, because we were interested in the individual semantic perceptions that could in a later stage be mapped to the syntactical form. Table 1 shows a selection of the used semantic differentials.

In the semantic dimensions game, the participants are presented with a picture of a particular shape, and additional questions in the form of a 5-point Likert scale, asking them to rate that shape according to the semantic differential suggested. Those semantic differentials are randomly picked from the list of predefined terms. Additionally, the players get an open question, which asks them to describe the shape in one word.

Term	Opposite Term
Arrogant	Polite
Aggressive	Peaceful
Safe	Dangerous
Conservative	Modern
Comfortable	Uncomfortable
Seductive	Reserved
Fast	Slow
Dumpy	Elegant
Friendly	Unfriendly
Healing	Toxic
Healthy	Unhealthy
Light	Heavy
Young	Old
Loud	Quiet
Brave	Anxious
Static	Dynamic
Cheap	Expensive
Precious	Worthless
Happy	Sad
Weak	Strong

Table 1. List of semantic differentials (Selection)

4 Conclusion

In this paper we present a tool, which can be used to empirically analyze the semantics of form. The motivational benefit for the participants is the fun of playing the game. To the best of our knowledge, the use of a crowdsourcing game with semantic differentials for gathering the meaning of forms has not been developed, so far. Future work is the empirical analysis of the gathered data; especially the effect of the syntactic form on the semantic impressions.

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