

The Effects of Language Stimuli on Design Creativity

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Abstract

We have been studying the effects of language stimuli on design concept creativity. We are motivated to study language and design because of the established relationship between language and cognitive processes central to design such as reasoning. As creativity is an important measure of design, many design methods use stimuli with the aim of increasing concept creativity. Language relationships such as the opposition relationship provide a systematic method of generating non-obvious stimuli that may increase concept creativity. In this paper, we summarize and discuss two experiments where participants used oppositely related and similarly related word stimuli in conceptual design. We found that designers using oppositely related word stimuli developed more novel concepts. We also observed that opposite stimuli elicited designer behaviours that may encourage creative concepts. These results suggest that opposite stimuli is a practical method for encouraging creative design.

Keywords: Engineering design, concept generation, design stimuli, creativity, language

1 Introduction

We have been studying the application of natural language, i.e., human language, not artificial language, to the process of conceptual design. Language appears inherent in people and also appears connected to cognition. Researchers have established a link between language and cognition, although the exact relationship is disputed; some have shown that language affects cognition (Levinson, 1996), while others have shown that language reflects cognition (Pinker, 2007).

Design is a cognitively intense task that has been characterized as an information gathering and manipulation task, a search task, and a decision-making task, amongst others (Simon, 1969; Gero et al., 1994). The cognition required of design implies

that we can take advantage of the relationship between language and cognition.

For a product to be successful, it must have creative properties as well as functional and performance properties. Customers and end-users seek creative products although they may not explicitly indicate creativity as a requirement. So while creativity can be difficult to define and measure, it is still an important measure of design (Kan & Gero, 2007). Most researchers on the subject agree that creativity is associated with novelty and originality as well as other measures such as quantity, variety and usefulness (Shah et al., 2000; Kan & Gero, 2007).

In this paper, we will first present related work in language and design. Then we will describe and discuss our experiments with respect to the specific effects of different types of word stimuli on concept novelty. We will then discuss the effects of word stimuli on designer behaviour.

2 Related Work

Although natural language is not generally considered a conventional engineering tool, language and language concepts have been incorporated throughout the engineering design process. Language has been applied to requirements gathering (Nuseibeh and Easterbrook, 2000), concept generation and synthesis (Hacco & Shu 2002; Chiu & Shu, 2007a; Nagai & Taura, 2006), design representation (Stone and Wood, 2000), and design analysis (Dong et al., 2003).

Some concept generation and creativity methods explicitly use language. Nagai and Taura (2006) investigated the interpretation of noun-noun combinations for promoting creativity in concept synthesis. Our work in biomimetics uses functional keywords to systematically retrieve analogies from biological corpora for use as stimuli in engineering design (Hacco & Shu 2002; Chiu & Shu, 2007a). Our retrieval process relies on concepts from computational linguistics including lexical relationships (Miller et al., 1993), word frequencies, word collocations and syntax. It was in this