Sketching and Creativity

Željko Obrenović
Department of Industrial Design
Eindhoven University of Technology (TU/e)
Eindhoven, The Netherlands
Tel: +31 40 247 5245
z.obrenovic@tue.nl

ABSTRACT
Sketching is at the heart of design and creativity, an omnipresent element of any disciplined activity of design. In this tutorial we summarize many of the existing studies of sketching, emphasis its role in supporting creativity. We look at how sketching aids in reflection and conversation, and supports the designers' memory and cognition. We discuss the relation of sketching to prototyping and engineering, and present some of the software tools for sketching. We also address the need for extending sketching to other forms than simple creation of a pencil trace on paper.

Keywords
Sketching, creativity, user experience, interaction design

INTRODUCTION

Many studies of design practice, such as more recent contributions from Buxton [Buxton 2007], Krippendorff [Krippendorff 2006], and Moggridge [Moggridge 2007], have called attention to sketching as an omnipresent element of any disciplined activity of design. In this tutorial we will summarize these and other studies of sketching, emphasis its role in supporting creativity. We will look at how sketching aids in reflection and conversation, and supports the designers' memory and cognition. We will discuss the relation of sketching to prototyping and engineering, and present some of the software tools for sketching.

THE ROLE OF SKETCHING

Sketching as a Medium for Reflection and Conversation

Designers often speak of "holding a conversation with a drawing", and many studies on the design practice recognize that such reflection is an important part of design [Fish 2004]. Schön was the first to provide an elaborate explanation of designing in terms of a reflective conversation with the materials of a situation [Schön 1983]. He characterized sketching as a prototypical example of such a reflective conversation. In his view, a designer starts by shaping and representing the situation according to his initial understanding. This initial representation "talks back" to him, in the sense that it helps him to better understand the situation and the possibilities being offered, to which the designer responds by making changes, improving and correcting his ideas in successive steps. Schön describes sketching as a recursive *seeing-drawing-seeing* loop:

Working in some visual medium – such as drawings – the designer sees what is "there" in some representation, draws in relation to it, and sees what he or she has drawn, thereby informing further designing. In all this "seeing," the designer not only visually registers information but also constructs its meaning – identifies patterns and gives them meanings beyond themselves. [Schön 1983, page 153]

Goldschmidt also describes sketching in conversational terms, saying that sketches enable a dialog between the designer and the sketch through "seeing that" and "seeing as" reasoning modalities [Goldschmidt 1991]. "Seeing that" can be viewed as making an inductive summary of the sketch, while "seeing as" as a reinterpretation of this summary where new understanding is developed. The ambiguity within sketches is an important aspect of this process, as it enables imagining parts that are only suggested in the actual sketches, stimulating creative discovery.

An important property of reflective conversation is that it can *help in identifying and solving some of the unforeseen problems that a design may have*. As designers usually deal with very complex situations, the designer's moves may produce consequences other than the intended ones. With a sketch, the limitations of an idea may become visible, and in such situations a designer is forced to proceed by solving newly discovered problems, being "stimulated by surprise".

Sketches also play an important role in the discussion with colleagues and users. As they are readily available, other designers and users can comment on them early on in the design process, can criticize them or suggest changes. As sketches clearly suggest that it is work in progress, others are usually keen to comment on them.

Sketching as an Extension of the Memory and Cognition

In dealing with complex design situations, designers can perform only limited transformations in the mind [Goldschmidt 1991]. In such complex situations, designers need tools that can help them to cope with limitations in memory and cognition. Jonathan Fish, for example, states

that the primary function of sketches is "to support the user's brain as he or she imagines possible objects". Earlier findings of Ullman also point out that designers have to externalize ideas because of the limitations in the storage capacity of human short-term memory [Ullman et al. 1990].

Fish, based on an analysis of numerous studies on the practice of sketching, characterizes sketching as "cognitive catalysis" [Fish 2004]. According to his metaphor:

Early design sketches are like catalysts in that they can combine with and transform at high speed superimposed mental information in working memory. They are not complete representations but temporary representation holding structures that help the "inner designer" to manipulate and transform the invisible representations of design thought. [Fish 2004, page 169]

Fish distinguishes two types of mental "reactions" to sketches. The first type is related to the retrieval of implicit knowledge, in which case sketched components provide retrieval cues for remembered objects, that is, "written notes and the untidy, incomplete contour fragments and object parts that occur in sketches are access keys to much larger memory components". In this way designers effectively extend their working memory beyond the limitations of short term memory. Through interaction with the sketch they can easily get cues to access memory "chunks" from long term memory. The second type of reaction is to use contour fragments of sparse and untidy sketches as "skeleton support structures for superimposed mental images". Through interaction with a sketch, designers create hybrid images in their minds, using the sketch as a frame to superimpose mental images.

Support for treating sketches as an extension of designers memory and cognitive abilities we can also find in work of Edwin Hutchins who introduced the concept of "material anchors for conceptual blends" [Hutchins 2005]. This concept builds partly on his earlier work on distributed cognition, where cognition is treated as a set of activities distributed across the individual and the artifacts surrounding him, artifacts often playing the role of "material anchors" for human cognition [Hutchins 1995].

Sketches can play the role of material anchor, as they can be used by the designer to represent part of his ideas, so that his mind can be free to explore, while a sketch provides a reference point for this exploration and a skeleton for superimposing mental images.

BEYOND PAPER SKETCHES

As one of the focus of the tutorial, we will address the need for extending sketching to other forms than simple creation of a pencil trace on paper. This need is especially evident in the domain of interaction design, where designer also need means to deal with attributes of the overall user experience, such as time, phrasing, and feel. While disciplines such as graphical design and architecture have rich practice of sketching and courses that student can take in order to improve their sketching skills, interaction designers cannot efficiently employ existing sketching techniques while designing the new classes of user interfaces. We will present some novel ideas and approaches that that try to go beyond these limitations and redefine sketching as a creativity support tool that can be supported through various media. For example, in his book *Sketching User Experiences* [Buxton 2007], Bill Buxton provides a view on sketches and sketching that abstracts from the media being used (p. 111). He distinguishes sketch properties in two groups, those regarding the language of the sketch, and those regarding the process of building the sketch. In terms of language used, a sketch should have clear vocabulary and distinct gesture, have minimal details and appropriate degree of refinement, suggest and explore rather than confirm, and be ambiguous. In terms of the sketching process, that is, its timing, price and quantity of sketches, it should enable building sketches quickly and timely, produce inexpensive and disposable sketches, produce plentiful of sketches.

SOFTWARE TOOLS FOR SKETCHING

We also discuss and demonstrate several software tools that can be used to support sketching.

SELECTED BIBLIOGRAPHY

1. Bill Buxton (2007), *Sketching User Experiences: Getting the Design Right and the Right Design*, Morgan Kaufmann
2. Moggridge, B. (2007). *Designing interactions*. Cambridge, MA: MIT Press.
3. Krippendorff, K. (2006). *The semantic turn: A new foundation for design*. Boca Raton: Taylor & Francis.
1. Fish J. (2004) , "Cognitive Catalysis: Sketches for a Time-lagged Brain", In Goldschmidt G. and Porter W.L. (Eds.) Design Representation, Part III, Springer London, pp. 151-184.
2. Goldschmidt G. (1991) The dialectics of sketching. Creativity Research Journal, 4 (2), 123--143.
3. Hutchins E. (1995), *Cognition in the Wild*, MIT Press.
4. Hutchins E. (2005), Material anchors for conceptual blends, Journal of Pragmatics, Volume 37, Issue 10, Conceptual Blending Theory, October 2005, Pages 1555-1577
5. Schön, D. A. (1983). *The reflective practitioner: How Professionals Think In Action*. New York: Basic Books.
6. Ullman D.G., Wood S., and Craig D. (1990), The importance of drawing in the mechanical design process, Computers and graphics, Volume 14, Issue 2, Pages 263-27.

ACM Creativity and Cognition 2009
Tutorial Description