

Tools for Creativity: Sketching with the EDC and PSPD

Andrew Warr, Eamonn O'Neill
HCI Group, Department of Computer Science
University of Bath
Bath, BA2 7AY, UK
{cspaw, eamonn}@cs.bath.ac.uk

ABSTRACT

Many researchers have developed creativity support tools (CSTs). In this paper we present a summary of our observations of the creative process using one such tool – the Envisionment and Discovery Collaboratory (EDC) – focusing on the nurturing of creativity through the use of sketching. We go on to describe lessons that we have learnt and applied in the development of a tool to support sketching in creative design processes – Public Social Private Design (PSPD).

Author Keywords

Creativity, Creative Processes, Design, Sketching, Technological Support

INTRODUCTION

In this paper, we present a summary of our observations of support for sketching within a creative design process using a computer-based creativity support tool: the EDC [1]. We go on to describe lessons that we have learnt and applied in the development of a further tool to support sketching in creative design processes: PSPD.

THE ENVISIONMENT AND DISCOVERY COLLABORATORY (EDC)

The EDC [1] is a computerized tool for supporting social creativity. The main goal of the EDC is to ‘support social creativity by creating shared understanding among various stakeholders, contextualizing information to the task at hand, and creating objects-to-think-with in collaborative design activities’ [1]. While the EDC in concept can be applied to many collaborative activities, its test bed domains have been urban planning and decision making. The current implementation of EDC comprises a projected image on a table which can be manipulated via physical objects using an embedded grid structure within the table and an ultrasonic sketching tool, allowing boundary objects (i.e. sketches) to be created and evolve, facilitating interaction and communication between participants [1].

EVALUATION OVERVIEW

We briefly report an evaluation of the EDC with particular focus on the creative process and the use of sketches. 7 groups of 4 participants collaborated to decide on the future development of land-use and the development of new bus routes, including bus stops, for the Gunbarrel area of Boulder, Colorado. Interaction with the EDC and amongst the participants was captured for post-analysis via two digital video cameras and screen capture software.

The Creative Process

The creative process across all seven groups included processes of problem framing, idea generation and idea evaluation [8]. As argued by many researchers [1, 2] problem framing is essential to the creative process, leading to shared understandings and the development of common ground. Throughout the process of problem framing, participants frequently referenced externalizations of existing knowledge and new ideas represented through the EDC.

The process of idea generation fuelled further phases of problem framing and idea evaluation. The EDC facilitated idea generation allowing participants to create and reference sketches. Sketches provided a means to externalize ideas – moving from mental representation to visual, tangible objects – facilitating shared understandings.

Idea evaluation facilitated by these sketches then led to the group needing to re-frame the problem further to develop a shared understanding, refine an idea or generate new ideas.

Sketching with the EDC

The EDC provided an ultrasonic sketch tool to support the production of rapid, informal representations. With the exception of one participant using a sketch to externalize an instance of knowledge to other group members during the problem framing process, these sketches were produced only during idea generation. While sketches were mainly *created* during the idea generation process, they were frequently referred to in the problem framing and idea evaluation processes.

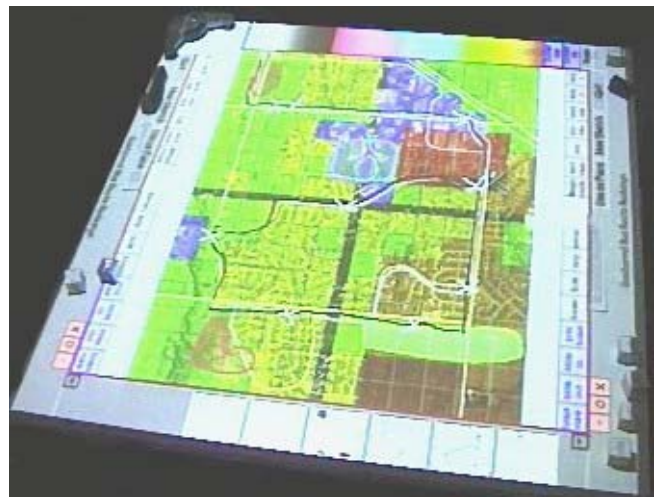


Figure 1. The use of sketching using the EDC

New ideas were initially verbalized and gestured, and were subsequently transformed to tangible representations using the sketch tool. These representations took the form of lines, shapes and filled shapes to depict bus routes, bus stops and land-use zoning respectively (Figure 1). Using these sketches as a basis for discussion, participants iterated through phases of problem framing and idea evaluation. This ultimately led to the refinement of the ideas. Again, refined ideas were initially verbalized between members of the group and only when some consensus had been reached regarding the refined ideas were they actually sketched. The other main use of sketching was when confusion amongst group members led to the necessity for clarification of ideas. In very few cases, annotations were also used with the sketches.

Design Requirements for Future Support Tools

From this evaluation we identified some requirements for the future development of CSTs:

- Support the dynamic reconfiguration of group composition, as groups split into sub-groups or individuals and reform.
- Provide different spaces for externalizing ideas. Sketches for various phases of the design process have different purposes. Separate spaces could reduce confusion between sketches for different purposes.
- Allow the capture of user interactions. Interactions provide the context of a sketch. When the interactions are lost, this context is lost.
- Provide multiple views of the solution space. Multiple views allow multiple ideas to be presented simultaneously, allowing exploration of different sketches.

PUBLIC SOCIAL PRIVATE DESIGN (PSPD)

PSPD is our vision of a support environment for creative activities in design. PSPD exploits the different interaction spaces inherent in different technologies [3]. An interactive tabletop, tablet PCs and PDAs support group, sub-group and individual activities in design. The PSPD software application is designed to support the creative process of representing ideas through sketching and annotation [5].

The development of this application was informed by previous research observing Disney animators [4] and our own studies observing how people sketch – 12 participants performed an individual sketching task and 6 pairs performed a collaborative sketching task. This led to the following requirements for the PSPD sketch application:

- The interface is a blank canvas, allowing users to be presented simply with their ideas. Ideas can be represented graphically with annotations. Functionality is provided through pie menus and gestures
- The ability to select sizes, pressures and hardness for the drawing tool

- The ability to transform the sketch: move, rotate, scale and zoom
- Vector graphics to maintain high quality images between devices and throughout transformations
- The sharing of sketches across devices

PSPD provides collaborative sketching tools for users to frame knowledge and establish common ground, generate and manipulate ideas, and evaluate and compare ideas, supporting the various activities of the creative process [8].

CONCLUSIONS

Interactions with sketches facilitate shared understandings amongst participants in design activities, providing an effective complement to verbal communication. The creation of sketches allows ideas to move from mere mental representations to sharable, tangible objects. The use of sketches goes beyond developing shared understandings and common ground, to facilitating the design process through the collaborative assessment of ideas.

From our evaluation of the EDC and our other theoretical and empirical work [6-8] we have developed a set of requirements for CSTs based on an understanding of creativity. Through the development of future tools effectively to support collaborative sketching, we can look towards improving the practice of design and the products of the creative design process.

ACKNOWLEDGEMENTS

We would like to thank the members of L3D at the University of Colorado, Boulder, with special thanks to Gerhard Fischer, Hal Eden and Elisa Giaccardi.

REFERENCES

1. Fischer, G. Domain-Oriented Design Environments: Supporting Individual and Social Creativity. *Computational Models of Creative Design IV* (1999), 83-111
2. O'Neill, E. *User-developer cooperation in software development: building common ground and usable systems*. Springer Verlag, London, 2000
3. O'Neill, E., Woodgate, D., Kostakos, V., Easing the wait in the Emergency Room: building a theory of public information systems. *Proc. DIS*, (2004), ACM Press, 17-25
4. Sedivy, J., Johnson, H. Multimodal tool support for creative tasks in the visual arts. *Knowledge Based Systems*, 13, (2000), 441-450
5. van der Lugt, R., Functions of Sketching in Design Idea Generation Meetings. *Proc. Creativity and Cognition*, (2002), ACM Press, 72-79
6. Warr, A., O'Neill, E., Getting Creative with Participatory Design. *Proc. Participatory Design Conference*, (2004), 57-60
7. Warr, A., O'Neill, E., The Effect of Operational Mechanisms on Creativity. *Proc. Interact*, (2005), ACM Press, 629-642
8. Warr, A., O'Neill, E., Understanding Design as a Social Creative Process. *Proc. Creativity and Cognition*, (2005), ACM Press, 118-127