This Is the Title of the Paper

AUTHOR 1
Affiliation 1
and
AUTHOR 2 AND AUTHOR 3
Affiliation 2

This research investigates the role of interface manipulation style on reflective cognition and concept learning through comparison of the effectiveness of three versions of a software application for learning two-dimensional transformation geometry. The three versions, respectively, utilize a Direct Object Manipulation (DOM) interface - in which the user manipulates the visual representation of objects being transformed; a Direct Concept Manipulation (DCM) interface - in which the user manipulates the visual representation of the transfroamtion being applied to the object; and a Reflective Direct Concept Manipulation (RDCM) interface - in which the DCM approach is extended with scaffolding.

1. INTRODUCTION

A great deal of interface design research has been devoted to determining mechanisms for making productivity tools (e.g., word processors and drawing tools) easy to use and intuitive so that users can perform a given task more smoothly and efficiently.

Abdelbar et al. [Abdelbar and Hedetniemi 1998] outline different aspects of ”directness.” They state:

> The Gulf of Execution is bridged by making the commands and mechanisms of the system match the thoughts and goals of the user as much as possible. The Gulf of Evaluation is bridged by making the output displays present a good Conceptual Model of the system that is readily perceived, interpreted, and evaluated.

The research presented in this paper addresses the following questions arising in the preceding discussion:

(1) Is a shift from DOM to DCM conducive to effective learning?
(2) Does DCM afford more reflective cognition and concious processing of concepts?
(3) How can the interface support reflective cognition, and are there scaffolding strategies that would support and enhance the DCM metaphor?

2. PRIMARY HEAD

2.1 Secondary Head

In the DOM version, the user manipulates the geometric shapes directly. Buttons on the side allow users to select drag, clockwise rotate, counter-clockwise rotate, horizontal flip, or vertical flip mode (see Figure 5).

2.1.1 *Tertiary Head.* This can be illustrated by the following equation:

$$T_{Attempt}(m) = T_{Overread}(m) + R(m).T_{Intput}(m) \quad (1)$$

ACKNOWLEDGMENTS

Many thanks to my former colleagues at the University of Illinois who developed the earlier prototypes of the system described here.

REFERENCES

ABDELBAR, A. AND HEDETNIEMI, S. 1998. Approximating maps for belief networks in np-hard and other theorems. *Artificial Intelligence 102*, 21–38.

GINSBERG, M. 1987. *Readings in Nonmonotonic Reasoning*. Morgan Kaufmann, Los Altos, CA, USA.

GREINER, M. 1999. Explanation-based learning. In *The Encyclopedia of Cognitive Science*, R. Wilson and F. Keil, Eds. MIT Press, Cambridge, MA, USA, 301–303.

MAREK, W. AND TRUSZCZNSKI, M. 1989. Relating autoepistemic and default logics. In *Proceedings of the 1st International Conference on Principles of Knowledge Representation and Reasoning*, H. Brachman and R. Reiter, Eds. Morgan Kaufmann, San Mateo, CA, USA, 276–288.

Author 1 is a senior lecture at Affiliation 1 and is the lead research of the Department 1 lab. Their latest publication is entitled "Using the SIGWEB Newsletter" and will be published in the ACM International Conference of Hypertext and Hypermedia.

Author 2 and 3 work in Affiliation 2. Author 2 is an assistant professor of computer science and Author 3 is a PhD student. Both are interested in the use of hypertext as a way of expressing and documenting significant social events.