Computer-Assisted Engineering for Children: a Pop-Up Design Application

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Introduction: Computationally-Enriched Children's Crafts

We have argued for the design of *computationally-enriched craft activities* [Eisenberg et al. 2003; Eisenberg, 2002; Eisenberg, Rubin, and Chen 1998]: activities that combine the affordances of computational media with those of children's educational crafts. In this poster, we present and describe such an application: a system for the design of pop-up forms in paper, geared toward use by K-12 students. Briefly, the application, *Popup Workshop*, permits students to create a paper template from which a pop-up form will be created, and to see that form simulated in a three-dimensional rendering. Once the design has been created to the child's satisfaction, the template may be printed and cut to produce the predicted moving structure.

Popup Workshop: An Overview of the Software

There are two main windows in the system: an *Editor* window in which pop-up forms may be designed, and a *Viewer* in which the current forms may be observed in a simple 3D rendering. The various buttons at the top of the Editor window are grouped according to function. At the left is a group of buttons for creating distinct types of pop-up elements: four-sided with parallel sides, four-sided with non-parallel sides (the trapezoid-shaped icon) and three-sided (the triangle-shaped icon). In the center group, there are three buttons for operations on current pop-up elements: a "duplicate" button that permits the user to quickly copy a given element on both sides of the page; a "delete" button that permits the user to erase a pop-up element; and a "change" button that allows the user to alter current elements in a variety of (geometrically-constrained) ways. Finally, the button group at the right contains decorative options, including fill, erase, and pen-draw controls (the text button is not yet operational at the time of this writing). Most of the Editor window (the bottom region) is employed to show the "flat" version of the pop-up under construction.

Directions for Future Work

Although Popup Workshop is operational in its current state, it is still at a relatively early stage of continuing development. Some of these planned improvements are a matter of adding functionality: for instance, our goal is to add at least one or two (and possibly more) types of folds to the (still-minimal) basic set already present in the program. The system has been implemented in the Java language (using classes available in both Macintosh and PC versions of the language).

Concurrent with our continuing development of the program itself, we have recently begun our first pilot-tests of the system with fifth-grade children in a local elementary school. Although this work with children is early and informal, it has been encouraging.

References

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