Popup Workshop: Supporting and Observing Children's Pop-up Design

Ph.D. Dissertation Proposal

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Overview

- *Children and design*
- *Thesis question*
- *This proposal*
- *The domain and previous work*
- *The system*
- *Evaluation*
- *Contributions*
- *Schedule*

Children make physical objects and could use software help in designing them. But what sort of help? How much help?

Children's design

To examine design software for children, we need a domain–one that will be engrossing and fun for the child, and informative for the investigator.

Pop-ups are interesting

People enjoy them.

While everyone likes them, few people make them.

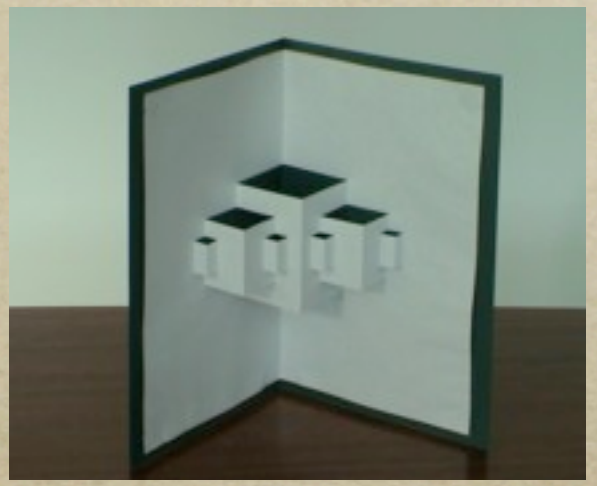
Can be very simple to make.

Children can and do make them.

Pop-ups in the classroom

Mathematical instruction:

iteration
series
limits
fractals



Also have been used in writing and art classes at the primary level.

Pop-ups as design domain

Can be simple or complex.

Modular construction--made of simpler elements.

Constrained by physical rules in order to open and close smoothly .

Paper is strong, common and cheap.

Construction can be difficult for children–due to complex constraints.

There is no current flexible tool for children.

Thesis question

Can a computer-aided design system
using constraint satisfaction algorithms,
which present pop-up books and cards
as dynamic objects, be created
that will enable children to design pop-ups
and that will add to our knowledge
of the process of design
and the features of software
which support children's design?

Build a children's pop-up design system with animation using constraints and recording ability.

This proposal

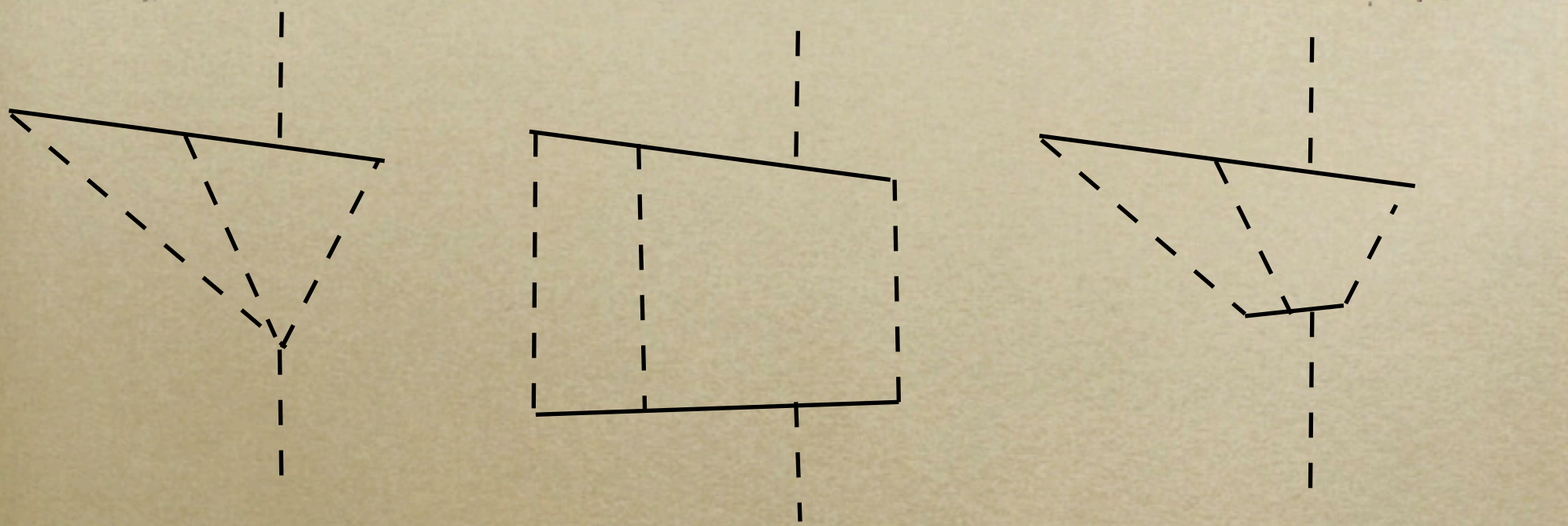
Use this environment to study how children use it to design, how their designs change over time, and how their descriptions change.

Single-sheet

Pop-up elements

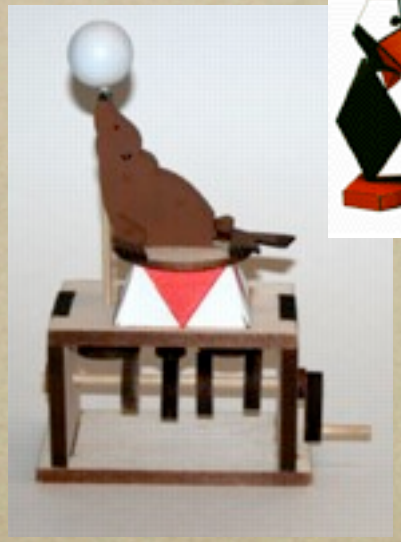
Applied

Element Constraints



single slit *parallel double slit* *non-parallel double slit*

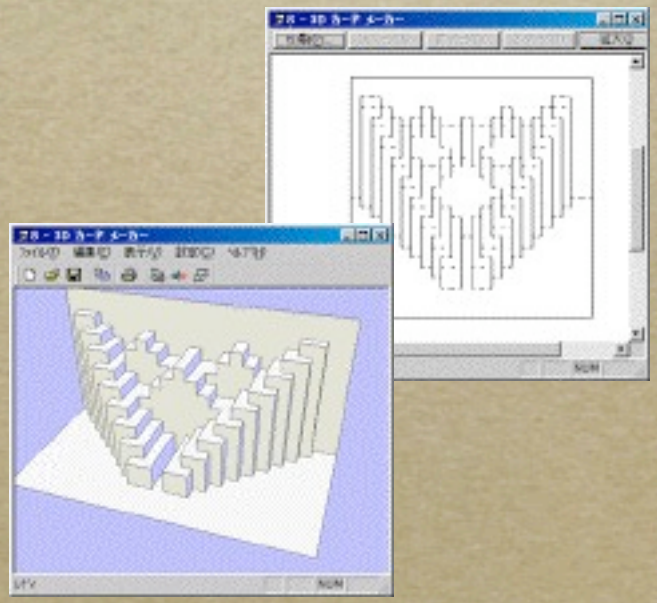
Single-sheet elements



Hypergami, Javagami, MachineShop

Related work - software

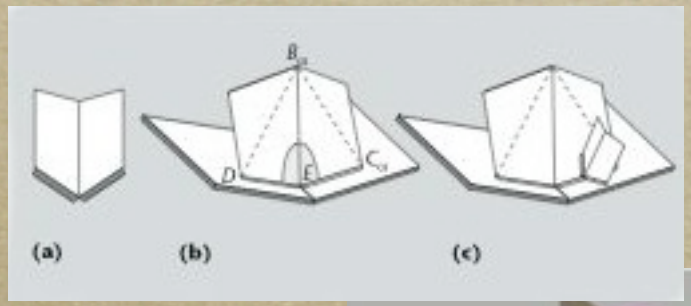
3D Card Maker

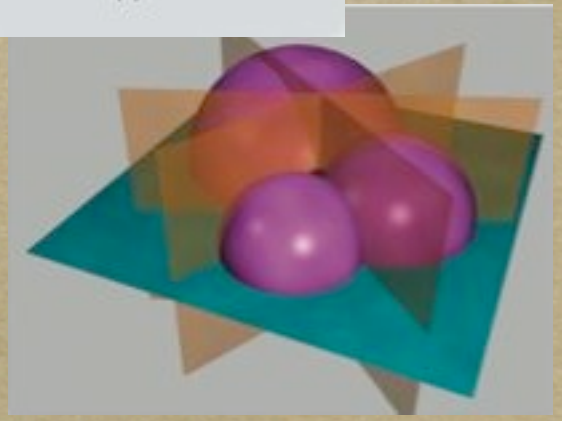


Other related work

Glassner: Single-sheet elements and v-folds
Formulas, not constraints
Drag and drop interface

Lee: Mathematical treatment of v-folds



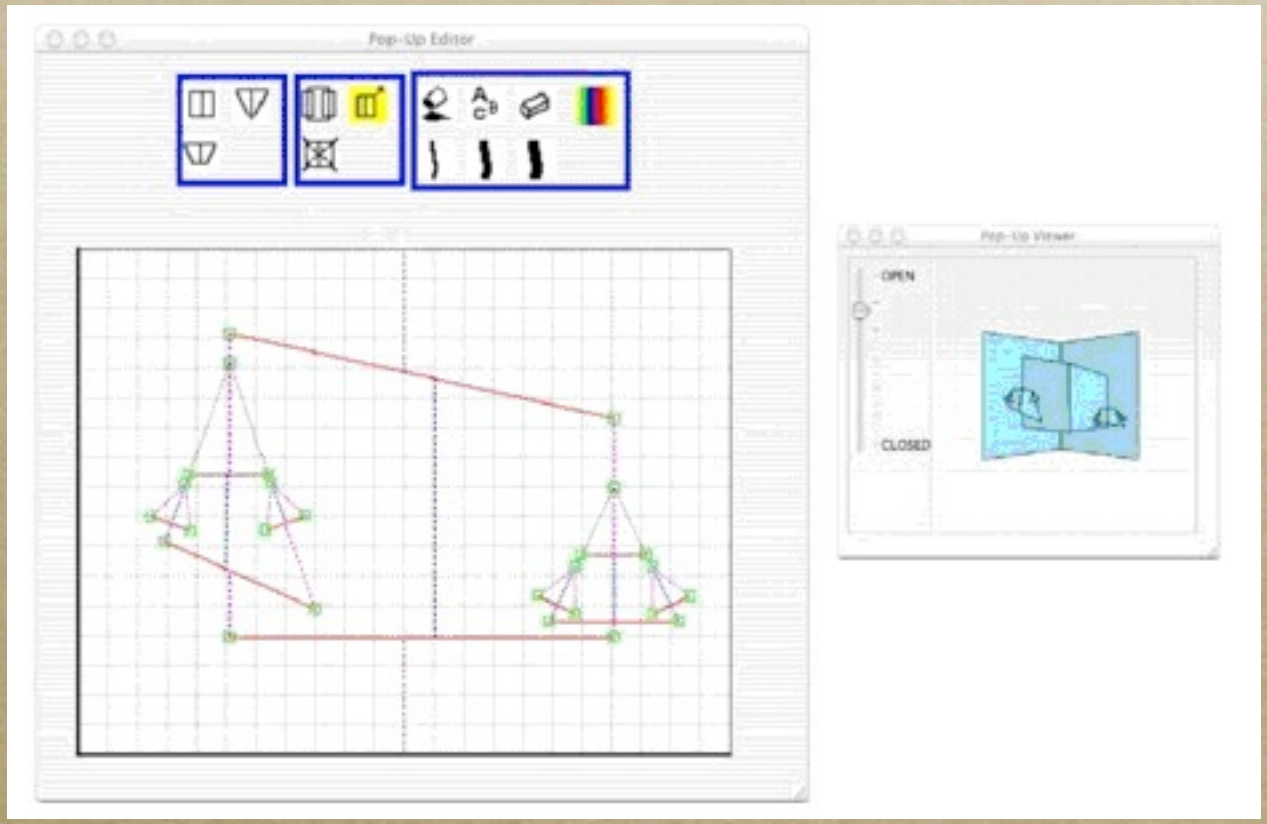


Popup Workshop Prototype

single-sheet elements

add, delete, change, replicate

animation via simple constraint system

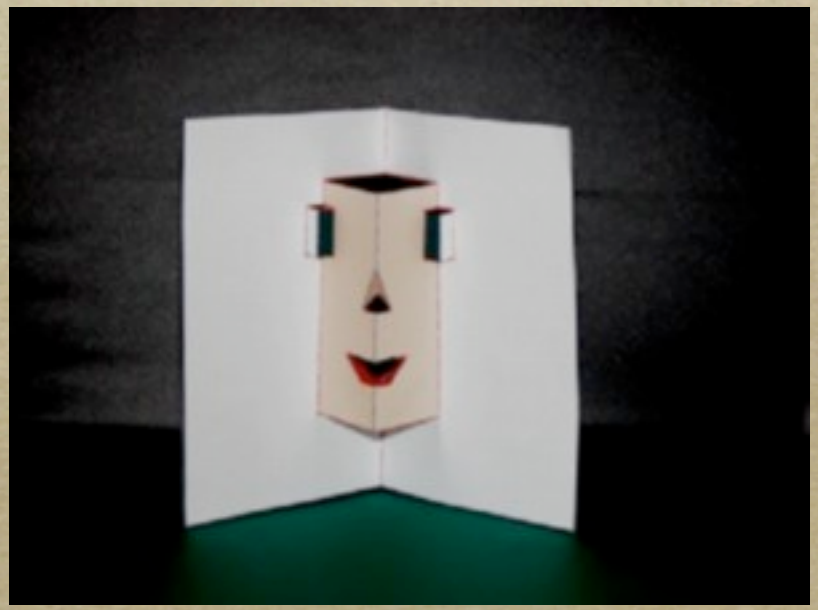


Major changes to prototype

- *Add save, open, print, and export*
- *Better constraint system for animation*
- *Add tool for recording (with redo and undo)*
- *Add applied element type(s)*

Evaluation

- *Think-alouds for system evaluation*
- *Case studies*
  - *6-8 students*
  - *4th to 7th grade*
  - *Videotaped*
  - *Single student at a time*



During case studies

- *Before the experiments*
  - *Conversation and construction*
- *During the experiments*
  - *Work periods with tool and construction of pop-ups*
- *After the experiments*
  - *Conversation and construction*

System evaluation

Design process:
order and type of operations

Analysis

Changes in designs and construction:
novice vs. expert

Vocabulary:
From observations

Contributions - design tools

- *It will have created a tool which can be used by children to create pop-ups.*
- *It will have shown that constraint systems can be used in modelling pop-up action.*
- *It will have produced data to determine to what extent automated data collection and analysis can illuminate our understanding of computerized design tools.*

Contributions - children's design

- *It will have produced data about the kinds of pop-up designs produced by children, and how they change over time.*
- *It will have produced data about the design processes in paper engineering used by children.*
- *It will have produced data about vocabulary and the change in vocabulary used by children in describing pop-ups.*

Schedule

Spring 2004

- *Propose*
- *Coding and testing*

Summer 2004

- *Get HRC approval*
- *Coding and testing*
- *Informal user testing*
- *Test protocols complete*
- *Find subjects*

Fall 2004

- *User testing*
- *System modifications*

Spring 2005

- *User Testing*
- *Begin analysis*
- *Begin writing*

Summer 2005

- *Finish analysis*
- *Write dissertation*

Fall 2005

- *Write dissertation*
- *Defend dissertation*

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