Tangible User Interfaces for Children

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ABSTRACT
Tangible user interfaces, which provide interactivity using real physical objects, hold enormous promise for children. Exploring and manipulating physical objects is a key component of young children’s learning. The educational power of digital technology for children has typically been limited by the fact that users explore and manipulate abstract two-dimensional screen-based representations, and not real physical objects. Embedding interactivity into physical objects, therefore, allows the “best of both worlds” — supporting traditional exploratory play with physical objects that can be extended and enhanced by the interactive power of digital technology. Participants in this SIG are invited to share ideas regarding the design and development of tangible interfaces, and to bring demos or slides/videos showing work in this area. Participants will review as many examples as time allows, and discuss the issues surrounding design and development of such interfaces. A primary goal of this SIG is to foster the development of a community of researchers and practitioners who are focused on designing and developing tangible interfaces for children.

Keywords
Tangible, User Interface, Design, Children, Toys, Play

ACM Classification
H5.2. User Interfaces: Input devices and strategies; Haptic I/O

INTRODUCTION
The ability to use computer interfaces has typically served as a gateway to the world of interactivity and the educational power of digital computing. For young users, traditional interface use is often developmentally inappropriate and can be a stumbling block to interactive learning. Exploring and manipulating physical objects is a key component of young children’s world of and of their learning. The educational power of digital technology for children has typically been limited by the fact that users explore and manipulate abstract two-dimensional screen-based representations, and not real physical objects. Young children can’t read text-based menu selections or type in their responses on a keyboard. In addition they are often unable to use a mouse or any of the standard point-and-click devices. This inability is due to a variety of developmental factors, including the lack of fine motor control needed to use existing pointing devices, the lack of cognitive understanding of the mapping between controller use and what’s happening on screen, and the lack of abstract representational skills necessary to understand typical screen-based displays. (cf., Revelle & Strommen, 1990; Crook, 1992; Lane & Ziviani, 1997; Hourcade et al., 2004; Revelle, 2004).

There are strong cognitive-developmental reasons why interacting with task-appropriate physical objects is the best learning environment for young children. Piaget and developmental psychologists ever since have emphasized the critical importance of manipulation of physical objects for young children’s cognitive development (cf., Piaget, 1962; Inhelder & Piaget, 1964). In addition, Vygotsky (1978) emphasized the importance of play in facilitating child development. The objects used in children’s play can include anything that the child finds handy, such as sticks, rocks or cardboard boxes, but often include objects especially designed to be toys such as dolls, miniature cars and trucks, blocks, and so on.

A promising new approach to interface design holds enormous promise for bringing the educational power of interactivity to the play and learning style of young children. In recent years, a number of researchers have been working on developing “tangible user interfaces” for interactive experiences (Ishii & Ulmer, 1997; Resnick, 1998; Druin et al., 1999; Scarlato & Landry, 2001; Zuckerman & Resnick, 2003; Montemayor et al., 2004). Tangible interfaces provide...
digital interactivity using real physical objects that are relevant to the task, instead of a keyboard or mouse and computer screen. As children’s toys are increasingly equipped with interactive technology, the toys can respond to children’s play in ways that support and facilitate learning. Embedding interactivity into physical objects, therefore, allows the “best of both worlds” – supporting traditional exploratory play with physical objects that can be extended and enhanced by the interactive power of digital technology.

**PROCESS/SCHEDULE/AGENDA**

We hope to facilitate a highly participatory and collaborative session, including group participation and open discussion among all of the participants. We encourage all participants to bring demos, videos or slides to show their projects that involve tangible interfaces for children. We envision a schedule something like the following:

15 min: Self-introductions of participants and overview of schedule/agenda
10 min: Session coordinators outline some of the issues that are relevant to the design and development of tangible interfaces for children
20 min: Demos and discussion of sample tangible interface projects by session coordinators and participants
20 min: Break into small groups to discuss reactions to demos and identify topics for discussion
20 min: Small group presentations and discussion
5 min: Discussion of next steps: creating a web site or list-serve, other mechanisms for facilitating an ongoing community of researchers and practitioners interested in tangible interfaces for children

**ASSUMED ATTENDEE BACKGROUND**

Interest in either research or developing applications related to tangible user interfaces for children.

**RELEVANCE TO THE CHI AUDIENCE**

There has been strong interest among CHI participants in both tangible interfaces and interfaces for children. Combining the two promises to be of interest to many CHI attendees.

**PRIMARY CONTACT**

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**REFERENCES**