Design for Repurposing: Rethinking Children's Interaction with Tangibles

Linda de Valk

Industrial Design Department,
Eindhoven University of
Technology, the Netherlands
l.c.t.d.valk@tue.nl

Yoram Chisik

Madeira Interactive Technologies
Institute, University of Madeira,
Funchal, Portugal
ychisik@gmail.com

Saskia Bakker

Industrial Design Department,
Eindhoven University of
Technology, the Netherlands
s.bakker@tue.nl

Iris Soute

Industrial Design Department,
Eindhoven University of
Technology, the Netherlands
i.a.c.soute@tue.nl

Abstract

Numerous everyday objects are repurposed by children: an ordinary pencil becomes a magical device that can make wishes come true, or a cuddly toy becomes a living creature that can save the world. The affordances of these physical objects allow them to be used in many different ways. Children shape an imaginary world with everyday objects around them. Digital objects on the other hand are designed to be multipurpose but their affordances are harder to perceive. Therefore, designing digitally enhanced tangible objects with 'repurposability' in mind is less straightforward. This workshop aims to explore how to design for repurposing in the field of Interaction Design and Children. This workshop will discuss repurposing and related research and design work. Hereby, we aim to come to a common understanding of repurposing as a research area and identify the relevant challenges and opportunities for future research.

Author Keywords

Repurposing; children; tangible interaction; open-endedness; interaction design.

ACM Classification Keywords

H5.2. Information interfaces and presentation: User interfaces, Interaction styles, User-centered design.

Introduction

Today is Luke's 5th birthday. From his grandparents he gets a large gift-wrapped box. Luke's eyes light up; this

must be a great present! He quickly unwraps the present. It is the bulldozer he wanted! He plays with his present for a little while, but then his eyes are drawn towards the large box the present was in. He puts the box over his head and moves around with it, bumping into furniture. Together with his older sister, he decides to cut out two holes in the box for his eyes. He puts the box back on his head. "I am a robot!" he says while making robot-moves.

The scenario above illustrates children's behavior familiar to most parents; when children finally get the present they wanted so dearly, they do not play with the toy but with the box it was in. Apparently, the box is more interesting than its content. Its open-endedness and possibilities for adaptation create appealing play opportunities. In other words, the box's affordances allow it to be easily *repurposed* to anything that the child can imagine. Similarly, numerous everyday artifacts are often repurposed by children. For example, a pen becomes a magic wand or a book becomes a car. In literature several reasons can be found for why children repurpose objects and how this influences the child's development, e.g. make-believe play may help children make sense of the world [6], and supports practicing social skills.

Physical objects have traditionally been designed for one objective, a box is for storing things, a fork is for picking them up, etc. and their physical properties closely reflect these objectives. Repurposing in this case is driven by the affordances of the object in question; a box can turn into a mask, a castle, or a car, depending on its size and the proclivity of the child's imagination; while a fork can assume the role of a garden rake moving peas about the plate or the role of a catapult slinging peas about a room.

Digital objects on the other hand are by and large designed to be multipurpose; an iPhone can act as a phone, a camera, a game console, etc. As children get exposed to digital technology at an ever early age they develop an expectation that all digital devices are multipurpose objects. However the affordances of digital objects are harder to perceive as their surfaces offer few, if any clues, to their abilities and potentials. For example, a digital device such as an Xbox is a black box in both the literal and figurative sense of the word. Thus repurposing digital technology is far less straightforward then repurposing their physical counterparts.

As digital technology has evolved to the point where it can be embedded into virtually any object allowing for the complete integration of the digital and the physical it has become possible to construct digitally enhanced physical objects that will support repurposing and the powers of make belief.

Tangibles, Repurposing and Design

The canonical example of a design for children that aptly supports repurposing and make belief is LEGO. LEGO kits come with a set of instructions for building a predefined object such as a fire truck or a house but the interchangeable nature of the blocks supports repurposing to any number of other constructions. LEGO Mindstorms brings the design into the digital domain by incorporating various sorts of sensors and circuitry into the blocks allowing children to create and command robots. Another example is GlowSteps [8], an open-ended interactive play environment that offers interaction opportunities to children that they can

attach meaning to. GlowSteps uses different colors of light feedback to react to children's behavior. Children can incorporate this feedback in their play and create rules and goals with it. In this way, children repurpose the design to fit their current wishes and demands. A third example is RaPIDO [7], a platform for prototyping mobile and interactive technology. RaPIDO consists of a set of interactive devices that can for instance be used in outdoor gaming. Potentially, children can rapidly try out various game variations while repurposing RaPIDO.

Currently, there is much research focusing on motivating and enabling children to create software and even (embedded) hardware. Typically, these take the form of toolkits and/or programming languages that support children (but also adults) in creating tailor-made software and objects. Examples of such toolkits are Scratch [3], a visual programming environment for children; Makey Makey toolkit [1]; and Topobo [4], a 3D tangible construction kit. These toolkits are typically situated within an educational context such as learning computer and/or electronics skills. Also, typically, the toolkits offer *components* that users can put together to create their own designs (such as sensors or actuators), however there is more emphasis on creating a finished project and less on thinking how that object might be repurposed.

The idea of repurposing is also related to design research and the development of methods and techniques in participatory design for engaging children in the design process as co-designers or informants [2,5] and where repurposing of materials and artifacts in "bags-of-stuff" [9] is common practice. However the methods and techniques of participatory design need not only be in the service of product design but can serve as a fun and educational activity on their own right as exemplified by a series of workshops conducted before and during the ACE 2013 conference.

Despite the significant amount of work already conducted in the fields of tangible interaction [1,4] and participatory design [2,5] about the nature of repurposing and what role should be taken up by children during the development of 'repurposable' interactive objects, much is still unknown and open for discussion, and it is this discussion we want to encourage and promote in the proposed workshop.

Workshop Aims and Goals

This full-day workshop will bring together researchers and designers who share an interest in understanding the challenges of how to design for repurposing of interactive tangible objects by children. We believe this to be an essential part of 21st century digital literacy skills and thus highly relevant to the IDC community.

We invite people who are interested in exploring the field of repurposing by children, or are currently engaged in research related to this topic. Topics of interest include, but are not limited to: what is repurposing and how can it be exemplified; how to design interactive tangible objects that can be repurposed and how can children be supported in this; and which application and/or activity areas can be of interest for repurposing.

The workshop has the following main goals. (1) To build a community of researchers, designers and practitioners from various fields who are interested in or working on repurposing interactive tangible objects by children. (2) To come to a common understanding of repurposing in the context of designing interactive

tangible objects for children. (3) To share and discuss experiences of designing objects for repurposing and collect examples of design cases, in order to identify the challenges and opportunities in this research area.

Structure of the Workshop

Before the workshop: Potential participants submit a four-page position paper, in which they directly or indirectly address the topic of this workshop. These position papers should include a description of the relation of the presented work to repurposing interactive objects. Participants are encouraged, but by no means required, to bring a demonstrator or video of their work to the workshop. Before the workshop, participants are invited to read all papers from other participants that will be uploaded to the workshop's website.

During the workshop: The workshop is conceived as a full day workshop, with 15 to 20 participants. The day will be divided into three parts: introductions, hands-on activities and discussion. During the introduction, participants will get to know each other through short presentations. Following the organizers will moderate hands-on explorations of the theme of the workshop. We will continue the workshop with discussions in small groups on emerging topics of interest, leading to a final plenary conclusion.

After the workshop: Depending on the outcome of the workshop we may organize a special journal issue on the subject aggregating a select number of expanded workshop papers and/or invited papers. We also intend to maintain the website that will be set up for the workshop as a means of continuing the discussion that was started during the conference.

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