Black Box: Exploring Simple Electronic Interaction

Kristina Andersen
STEIM
Achtergracht 19
Amsterdam, The Netherlands
Kristina@tinything.com

ABSTRACT

This paper proposes a series of simple interactive boxes designed to investigate children's experience and understanding of abstract electronic interaction. The black box project is the first step of an investigation into the width of the potential uses of electronic sensing devices.

Keywords

Children, interaction, electronics, perception.

INTRODUCTION

How do we understand electronic interfaces? While we might understand how a Light Dependant Resistor functions of a technical level – do we understand how it feels to interact with it?

The black box project is an attempt to gather impressions that can shed some light on how such electronic interactions *feel* to preschool children. It is worth noting that we are not testing a functional interface for children but rather asking them to help us describe the phenomenological impact of a set of interactive interfaces. The objects described in this paper are explorative; they are first steps towards a more detailed investigation of how children view and intuit these kinds of experiences. The longer-term aim of this project is to illuminate and inspire creative use of electronic sensors in interfaces and interactions; not just for problem solving or interfaces for learning but for play, expression and exploration - by both children and adults.

BACKGROUND

As children grow they develop theories about the world around them. These theories tend to focus on skills that are essential to human development and survival: language acquisition, facial recognition, object permanence, etc. [5] Children's understanding of the physical properties of the objects around them were described by the two gestalt psychologists Otto Lipmann and Hellmuth Bogen in 1923 who coined the term "Naive Physik"[6]. The term was later picked up by the artificial intelligence community through Hayes' now classic Naive Physics Manifesto, which states that: "Naive Physics is the body of knowledge that people have about the surrounding physical world" [4]

It seems a logical extrapolation that modern technological objects augmented with electronic sensing capabilities would require us to develop new intuitions or naïve understandings about both the resulting hybrid-object and the specific affordances of the electronic sensor itself [1]. The black box project is an attempt to begin to probe such an understanding of 'naïve electronics' in preschool children.

This process is aided and inspired by existing work on children working with technology. Some examples are Storyroom by Montemayor et al. [7], Electronic Block by Wyeth et al. [9] and E-CUBes by Dahiya [2]. Projects of this type tend to focus on situations learning and problem solving or the active creation of storytelling material. The black box project differs in that it aims to facilitate the verbalisation and/or physical demonstration of vague and often inaccurate intuitions about technology without requiring any particular form of resulting product or educational benefit.

Fig 1. Sound to light box

DESCRIPTION

The black box series is a set of nine input/output boxes using light, sound and touch/vibrate. Each box has a tight connection between input and output with no perceivable lag. As an example the sound-to-light box will translate

any change in sound input level into an immediate change in light output levels. (Fig. 1) The boxes are created on a simple matrix of input and output seen in fig 2. The modalities are limited to light, sound and touch/vibrate so that each combination is present in a relative small set. The boxes are battery-powered and fitted with simple electronic circuitry. They do not require any technological infrastructure. They are inactive and silent until the user engages them.
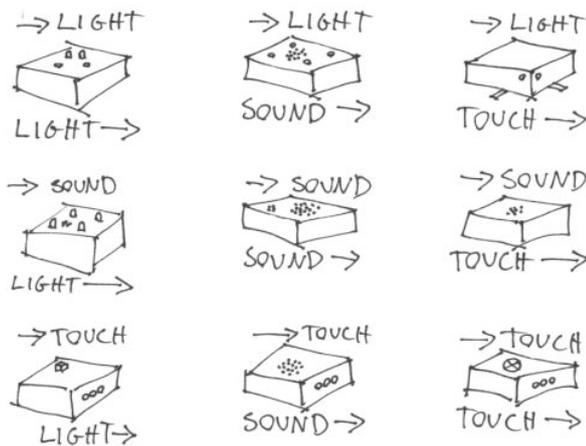

Fig 2. Interaction matrix

SOME EARLY OBSERATIONS

The boxes are investigated through playful conversations where they act as both boundary objects and investigative tools [8]. Each box acts as an initial talking point, with the children telling us *what it is* and *how it works*. The child does this by simply handling the box and observing what it does. The exploration is often wordless, holding the box, moving it, covering and uncovering the various elements on the surface. Often the child will describe the action either pragmatically "it is like the blinking lights on the road, when we are driving" or fantastically "it is like a little fairy very far away, and it is also in the dark". From that point on, the focus tends to be on playing with and learning to control the output. An example of this is the girl who dances around the room with the light-to-touch box (two Light Dependant Resistors are controlling the motion of two small motors inside the box) before deciding to put it under a sofa to "make it quiet". In this way the workshop situation tends to spontaneously evolve from play through discovery to serious testing of interface and control.

TEI08 AND FURTHER DEVELOPMENT

The black box project is designed to amuse or surprise and through that excitement facilitate and support the communication of insights and intuitions. By placing ourselves on the threshold between the everyday and the unexpected we hope to create situations where the children feel free to help us investigate and generate insights for new iterations. Over the next year the boxes will be explored

together with small groups of children in various workshop and festival environments.

The project is conducted within a music and arts community and as such it is clearly lacking in expertise in developmental psychology and several other relevant disciplines. In reflection of this we are proposing to present this project as a poster and demonstration at TEI08. The aim is to find opportunities to engage other researchers in conversations about how these types of experiments can be developed and quantified, both within an art and a science context. While the boxes blink, squeak and move we would like to engage in informal discussions about both how the interaction feels but also how we may best capture such feelings during forthcoming workshops.

ACKNOWLEDGMENTS

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