Sketch-A-Move - Design Inspired Technology for Children

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ABSTRACT

Sketch-a-Move allows children to explore the unique relationships between drawn movements made on a surface and actual physical movements. It creates a new engaging space for play amongst children of a wide age group. This paper accompanies the research video on the Sketch-a-Move prototypes and presents the first two working prototypes.

1. INTRODUCTION

In the early days of ubiquitous computing, technology was the driving force for many novel systems. Systems were built focusing on the technology, not on users. Design and technology research place a lot of emphasis on human-centered design today. While a lot of projects continue to focus on solving problems, new design innovations in systems and objects take place when technology can be re-appropriated to create new, engaging experiences.

In this work we start out from a completely different direction. As Rogers et al. [4] state it: 'Creative exploration with an eye to serendipity can be excellent heuristics for research work.'

We present an innovative design concept for a smart toy of the future, the *Sketch-A-Move* car, taking into account potential users and emerging technologies. The idea was initially realized as a concept video, and it raised a lot of attention from people, young and old. This lead to the development of real prototypes using ubiquitous computing technology.

As the idea alone, presented to people, raised so much attention, we tried to transfer the idea of the toy car of the future into reality using ubiquitous computing technology.

This work accompanies the Sketch-a-Move research video. The initial concept is introduced, the developed prototypes are presented and an outline for future research is given.

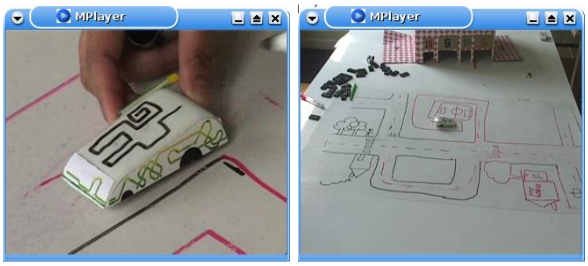
2. DESIGN CONCEPT

Children can play with small toy cars for hours, imagining streets, places or races they would drive with those cars. They seem to play for hours without getting bored.

As we explored cars and track sets in the toy market, we realized that today most of the play scenarios for these toys were predetermined and did not offer many opportunities for flexible play and development of intuitive skills in children. The technology of remote controlled cars limits the way of interaction that were possible with non-technological model cars, e.g. flying over a obstacle which is not possible with remote controlled cars. We explored new possibilities of play through innovative design of tracks rather than that of the car itself.

Very often kids create invisible movements by driving their cars around the house and on different surfaces. We explored the idea of creating invisible memory tracks, whereby the car remembers the last path it was driven on and repeats that movement.

As our exploration continued, we developed the idea of Sketch-A-Move, which seemed very exciting. Could one draw the tracks on the car itself? Could the car follow the track that was drawn on it?



(a) sketching a move (b) driving the move

Figure 1: Sketch-a-Move concept: you sketch a move on the roof of the car. After finishing it, the car autonomously translates the drawn move into steering instructions. Here the car drives through a sketched city and eventually stops in a parking lot.

Sketch-a-move allows you to explore the unique relationships between small surface doodles and actual physical movements. If you draw a circle on the top of the toy car, it will move in a circle. If you draw a complicated spiral, the car will move in a spiral. This idea opened up fascinating play possibilities and showed how not only children, but even adults could spend hours playing with it.

Our focus in the project lay in the conceptual development of the toy and exploration of play scenarios, not in technical implementation and prototyping.

3. FROM CONCEPT TO PROTOTYPE

The enormous feedback this concept attracted in several public magazines and websites as well as in blogs challenged us. People stated that this would be exactly what they as children ever dreamt of and that it was so sad that it was only an idea.

We wanted to know if it would be possible to actually build this future toy by employing ubicomp technology. We set up a collaboration of designers and technologists to tackle this challenge.

(a) Small Sketch-a-Move (b) Big Sketch-a-Move

Figure 2: The Sketch-a-Move prototypes. The small car is about the size of the original concept car. The big car has a Nokia 770 bag packed for visualizing the sketched move.

We built two prototypes as depicted in Fig. 2. We are especially interested in whether children preferred to make up a move in their mind as they do now with toy cars or if they found a graphical drawing canvas more inspiring.
The small car adheres more strictly to the original concept of a small toy car. The move is sketched on a capacitive touch pad which is connected to a Particle Computer. The input data is processed to derive driving instructions, stored on an MMC card and then executed by an interface to the original remote control. The original remote control is controlled by two digital switches connected to the Particle Computer as we did not want to build a new RF remote control.
The big car offers visible feedback of the drawn move. It uses a modified Nokia 770 tablet PC. It was switched in USB host mode and the internal USB chip was powered by an external power supply. An USB to serial converter takes the driving instructions and sends them via a Particle Computer to a motor IC chip.
Both cars do not use any odometry or location system for position estimation as would have been employed in robotics. So the translation from sketched movement to driving instructions is done once and then executed. This keeps the amount of necessary technology very small. The small car for example is used as it was bought. For the big car wheel encoders or sensors were not used in our prototype. We found that it does not pose any limits on the fun children have while playing with it if the translation is only nearly perfect. Also, no sensors means less costs and fewer things can break - which is an important argument when designing toys for children.

4. FROM PROTOTPYE TO INTERACTION

What did we get by building a technology prototype from a pure fictional concept? First, we verified during a user study with 11 children, male and female, aged 12 to 14, that the concept translates very well to real fun.
Children loved to draw moves on the two cars and enjoyed watching the cars following their directions. It did not annoy the children when the cars hit a wall or were otherwise interrupted.
The technology was virtually invisible and unobtrusive to the children, hey just saw and interacted with a toy.

5. FUTURE WORK

We plan to conduct a larger user study with both cars later this year to evaluate our prototypes.
We observed a kid who just drew a move saying to his friends: ‘Did you see that?’. Currently, we only store the move of both prototypes on an MMC card. We will add an exchange mode where children will be able to exchange moves like they do with ring-tones.
Furthermore, we will evaluate the numerous comments and feedback we got on the concept and integrate them in our work.

6. RELATED WORK

The idea of using toys to foster learning which is at the heart of our design is discussed by Resnik et al. [3] where they present the ’applications and implications of the Programmable Brick’.
Memorizing a track and repeating that movement offered exciting possibilities. McNerney [1] presents a similar idea, the Logo Floor Turtle, in the context of phyiscal programming. Whereas in our design the children imaging and then draw the move, the Logo Turtle is taught the move by moving it on the floor.
The concept of first defining movement or motion and then having an object to visualize it has previously been demonstrated by Raffle et al. [2] in their Topobo system where they introduce the notion of kinetic memory. Here a movable object is constructed from simple parts. The parts are prior to joining them taught their motion. The joint object then performs the sum of the movement of its part.

7. ACKNOWLEDGMENTS

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