Tangible User Interfaces :

Story Telling and Programming with Tangibles

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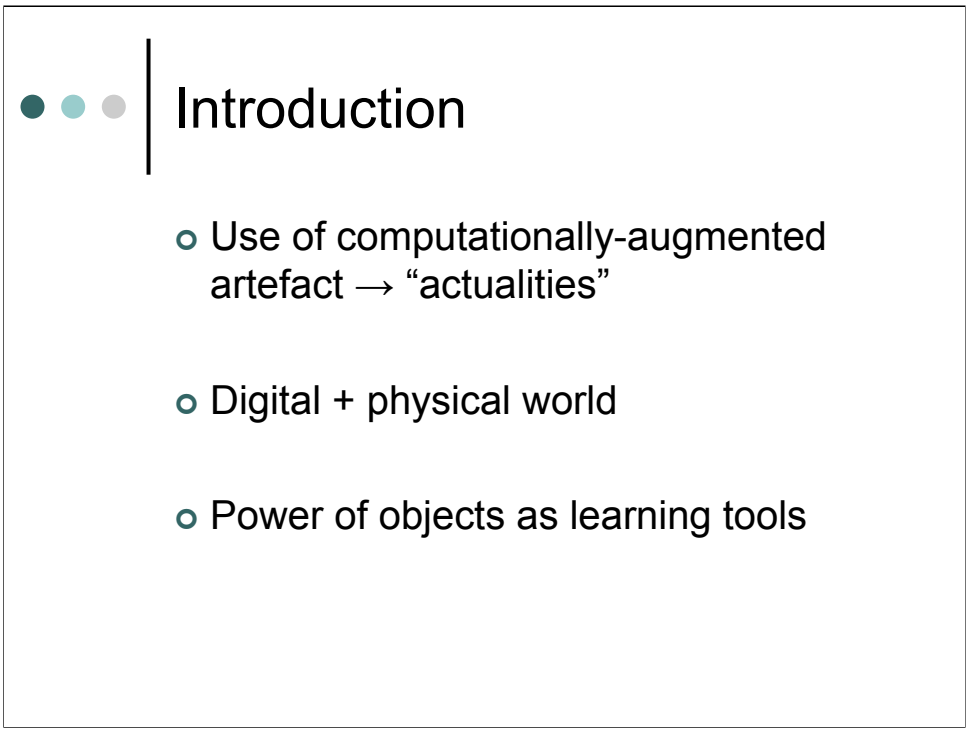
Agenda

- Introduction
- 3 background aspects
- 2 existing systems
- Discussion and conclusion



With new technologies like tangible interfaces give the possibility of using computationally-augmented physical artefacts. As for the Rosebud example [1 & 2], even a toy can be augmented in order to become active. In this way, we can use the advantages of the digital world (networking, ease of abstraction) and the advantages of the physical world (legibility of interface, multi-sensory interaction, emotional value).

Ullmer and Ishii [mentioned in 2] make a comparison between levels of abstraction of tangible user interface icons (phicons): generic, symbolic, model. We can add a next level, named actuality, where the phicon is the object itself. Actualities are excellent devices because of:
- they are a meaningful container: the container reflects the content
- their physicality: appeal to the haptic sense, they are permanent

Objects are powerful: we actively surround ourselves with objects, which help us establish our identities. It is called an autotopography. Keepsake objects play two roles: the narrative of the object with respect to the self, and the narrative with respect to others. A keepsake object is more than a cherished one: if a keepsake object is lost, it cannot be replaced.

This is why we try to replace indirect manipulation of virtual objects, e.g. using a mouse, with tangible user interfaces which physically represent the virtual object inside the computer. In this way, less manual dexterity is required (or even quite none), and we avoid the problem of unpredictable interface delays. We want to let people see and manipulate information as physical objects. As Gershenfeld says, we learn by manipulating, not observing [mentioned in 4]. Some people learn more readily when their bodies are involved.

In this way, we would make abstract fields like programming an activity that is accessible to the hands and minds of younger children by making it more direct and less abstract.

Background aspects n°1: *Children and storytelling*

- Children learn about themselves
- Children learn about the socio-cultural context in which they live
- Written storytelling is difficult
- Children need to be guided

Storytelling teaches children about themselves and about the socio-cultural context in which they live. It plays an important role in children's development, affecting educational achievement by teaching symbolic representation and how to organize and direct ideas.

Traditionally, creating stories is an individual activity. But applying it as a work in group could clearly develop the sociability of a child, and his ability to communicate.

Narration (storytelling) is a tool for learning subjectivity. According to Labov [mentioned in 3], a story is composed of six parts:
- summary: gives an overview of the subject of the story
- orientation: gives information about characters, places and time
- complication: describes the events til the crucial moment
- resolution: recapitulates the final events of the story
- evaluation: comments the narrated events
- coda: signals formally the end of the story

The steps a child requires for imagining a story are:
- exploration: the child must make a personal experience
- inspiration: the child must think and meditate on this experience
- production: the child creates a story by organising the previously earned information
- sharing: the child reads or shows his story to others children

For these steps, the child must be helped, focalised, guided and motivated. Without help, the child will probably create a short story, perhaps with a drawing. His work can be corrected while the child is doing it.

We must differentiate oral from written storytelling. Written storytelling is more abstract and demanding than oral discourse, requiring the ability to decontextualize the writing from the immediate, physical environment, and the ability to be aware of an absent reader. Written storytelling is consequently a difficult skill for children to develop. In this goal, we can use oral storytelling, which is a spontaneous, intellectual and creative activity, but isolated from reading and writing.

Background aspects n°2: *Girls and computer*

- Gender is one important aspect of the identity that storytelling develops
- Women use the technology much less than men as a mean of self-expression
- Computer primarily appeal to male play styles
- Collaboration or sharing appeal to female play styles

Storytelling develops the identity, and gender is one important aspect of that identity. Turkle [mentioned in 3] argues that women have “computer reticence”. Women use the technology much less than men as a mean of self-expression. In addition, computer and video games are designed primarily to appeal to male play styles. The play styles which appeal to girls are collaboration, sharing, editing and revising, for example.

Therefore, an objective is to design a gender-neutral technology. A way of doing it is to use the fact that women, more than men, emphasize the symbolic value of cherished objects for emotional attachment and interpersonal relationship, rather than practical use.

Background aspects n°3: *Children and programming*

- Programming for everyone
  → give users maximum control
- Text-based languages can be daunting, even with the most modern GUI
- Concepts of computer science in a playful environment
- Encouraging collaboration

The goal of programming for everyone is to give users maximum control. We talk about users of everyday programmable machine, like a programmable thermostat. But for the novice programmers, text-based languages can be daunting, and even the most modern GUI is an unnecessary obstacle to programming.

Kids can be programmers, but less and less computer science is taught to school children. They should benefit of concepts of computer science in a playful environment, like Logo [mentioned in 4]. Children want to play, so we could bring the malleability of computing to the interactivity of a Lego [mentioned in 4] set, for example.

The term “tangible programming language” was coined by Suzuki and Kato [mentioned in 4] to describe their AlgoBlock collaborative programming environment for children. These ones arranged physical blocks on a table to communicate to the computer. In the same way as for story telling, children can build a program in a small group. This is a good way to encourage collaboration. With tangibles, programming becomes an activity performed away from a traditional computer.

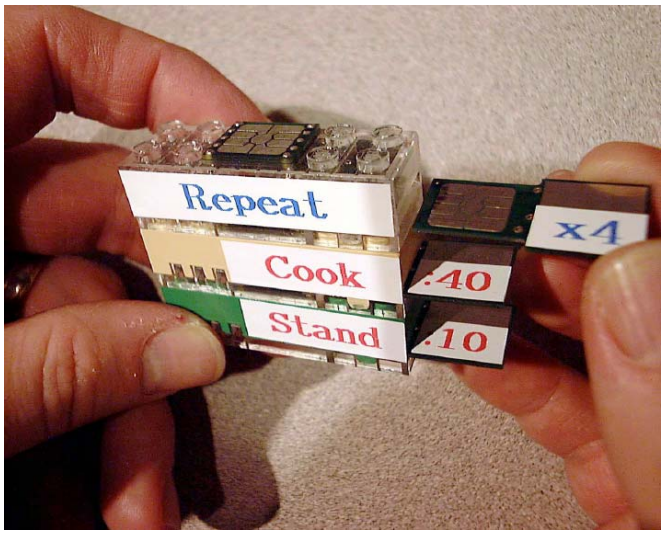
Existing system n°1: *Rosebud*

Rosebud [1 & 2] is a system which links children's stories to their toys. The child takes a computationally-augmented toy, introduces it to the computer by the keyboard, and starts creating a story. He first speaks and acts with his toy, and then writes it through the keyboard.

Once the child has authored a story, the software generates the story-specific feedback and encouragement. If the story is too short, the software asks for more. If there is no time-context information in the story, the software asks for more context-oriented information, teaching the child to include context for an absent reader. The software can also ask the child for reading his story aloud to the computer.

It is a three-way interaction between child, toy, and computer. A physical toy acts as an index to its own stories, creating an object rich in history and stories. The toy can hold the story, allowing the possibility to exchange it among children.

Existing system n°2: *Tangible programming bricks*



These are physical building blocks for constructing simple programs. It consists of labelled bricks (corresponding to different functionalities) with eventually colour leds, simple display, touch sensor and/or card slot for inserting parameters. We can then build a program by stacking bricks below or above other bricks.

Discussion and conclusion

- TUI give structure to the activity
- TUI add some collective aspects
- TUI uses a natural context and the power of personal toys

- The interaction with the computer remains an unnecessary obstacle

It has been showed in [3] that new instruments like tangibles bring a certain structure to the telling activity, and adds some collective aspects. It seems to improve the organisation of the story, according to the Labov model [3]. Tools seem simple to use, and they don't create interferences with the activity. But it could be valuable to have various tools for creating content, even simultaneously.

The space of creation and recording becomes integrated into the natural context of the child's physic world.

The benefit and success of external prompting, e.g. computer prompting, can be very helpful and motivating for the child who have some difficulties, e.g. with decontextualisation.

The interaction with such computationally-augmented toys differs from that with traditional computer toys and games. The relationship between the toy and the computer could be more tightly couple, e.g. through mechanical movement of the physical object.

The characteristic of the toy cannot be lost when augmenting the toy.

Using a cherished and keepsake toy is a great force for getting a child to create a story, and therefore to develop himself. This toy can represent a big part of the child's life, and even a big part of himself. It can as well be used to develop social needs by interacting with other children.

But the way the child must type his story and interact with the computer seems still an unnecessary effort. The only effort we want the child to do is to simply write down his story, after having tried to tell the context of the story.


Thank you for your attention !