# Rosebud: Technological Toys for Storytelling

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## ABSTRACT

Rosebud is a user-interface prototype which elicits storytelling by child users though interaction with a computationally-augmented physical artifact. In particular, Rosebud links children's stories to their toys, such that toy and computer augment one another. The toy engages children in a familiar mode of interaction, while the computer makes a previously passive object active. The children are able to write, edit, collaborate, and share their stories, activities which have particular attraction for female users.

### Keywords

storytelling, children, gender, tangible interface, education

## MOTIVATION AND BACKGROUND

Children's oral storytelling with their toys and stuffed animals is natural and spontaneous. However, this intellectual and creative activity is isolated from reading and writing. Rosebud, through multimodal interface and computer prompting, builds on this common style of children's play with the goal of encouraging children's use of technology for written storytelling.

### Merging Physical and Digital Interfaces

Ubiquitous computing and augmented reality face the design challenge of marrying the advantages of the digital world (networking, ease of abstraction) and the advantages of the physical world (legibility of interface, multi-sensory interaction.) Rosebud looks specifically at the effect of such integrated interfaces with respect to children, gender, and storytelling.

### Gender and Exposure to Technology

While computer and video games foster interest and familiarity with computer technology, they are designed primarily to appeal to male play styles. The result can be seen in the low number of women in computer related fields. Studies have agreed on certain elements in female-correlated play styles [3], including: creative activity by the child, collaboration, real-life skill development, narratives and storytelling. It has been claimed that storytelling applications offer a unique way of engaging girls in technology [1]. Rosebud explores this claim.

### Encouraging Written Storytelling

Storytelling plays an important role in children's development, affecting educational achievement by teaching symbolic representation and how to organize and direct ideas. Storytelling at a young age often centers around oral storytelling, both alone and with others. Written storytelling, lacking external prompting and the stimulus of others as encouragement, can be discouraging to children. It 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 [4]. Written storytelling is consequently a difficult skill for children to develop.

The benefit of external prompting has been illustrated specifically in advancing children's narrative skills. It has been shown that not only the fact of prompting, but the prompt itself, can make a difference in the child's development. As mentioned before, one of the challenges of written, versus oral, storytelling is decontextualization. This includes providing necessary and sufficient orientating information. Eliciting such information affects children's storytelling: "context-eliciting questions ... foster context-setting skills in children." [5] Rosebud uses such prompts to encourage storytelling.

## DESIGN PROTOTYPE

### Description

Rosebud is a system which links children's stories to their toys. A particular physical toy acts as an index to its own stories which accrete over time, creating an object rich in history and stories. An old teddy bear, handed down, might hold stories written by older siblings or a grandmother when she was young, giving the child a sense of family, history, and continuity. The toy serves as both a medium of exchange to give the stories to others, and as a storage medium to archive the stories for the self.

Once a child has authored a story, Rosebud extracts data from the story to generate story-specific feedback and encouragement. If the story is short, the system prompts the user not to be shy and asks for more. This simple prompting was chosen to aid children with initial hesitations. The system also searches for time-context information, and in its absence, prompts for more context-orienting information. This prompting aims to improve children's written storytelling skills, teaching them to include context for an absent reader.

When introduced to new toys, Rosebud asks for the toy's name and whether that toy "knows" other toys the child has

used. If Rosebud has information about the toy, it presents it to the child. For example, if presented with a stuffed animal platypus, the computer asks if the child knows what a platypus is and tells a little about the animal. These questions cement the three-way interaction between child, toy, and computer.

Rosebud encourages children to do more with their stories. It saves the stories, creating a "storybook" which the child can refer to. Creating this storybook is empowering, and with it, children can collaborate, share, edit, and revise. All of these aspects are play styles which appeal to girls.

### Implementation

The stuffed animal contains an infrared transmitter [6] which sends an identity signal which the computer reads when the toy is in front of the machine. The computer can uniquely identify the toy and access information virtually linked to it. The computer's dialogue appears in text on the screen, above an empty text box where the stories are typed by the child. A second window holds the "storybook" with a chronological listing of all the stories by the current user about the current toy. All narrative input is via the keyboard. To avoid imbalancimg the interaction or misleading the user, computer-generated speech is not used. Prompts are generated according to current user, toy, and story. The system currently uses word count and word searches on the stories, but we also plan to include a parts-of-speech tagger as well.

**Figure 1**: Marc, a seven year old boy, writing a story using Rosebud. He is using both the traditional stuffed animal toy and the computer simultaneously, merging the physical and digital worlds.

## USER EXPERIENCE

Rosebud has been used at various stages by six children, boys and girls, ranging from age seven to twelve, producing a total of eleven stories. Children understood intuitively that to introduce the toy to the computer, it is held facing the machine. Early difficulties of children writing extremely short stories were surmounted with simple encouragement prompting. The use of context-eliciting prompts met with mixed results, most often the children giving the requested information, but failing to incorporate it into the story. Precise wording of the prompts requires further experimentation. Overall, responses were favorable with children enjoying the three-way interaction between themselves, their toy, and the computer.

## FUTURE WORK

Beginning in the spring, we plan to conduct a long-term user study of ten twelve-year-old girls using Rosebud to test such questions as how do interactions with Rosebud differ from that with traditional computer toys and games. We are exploring better ways of extracting computationally usable data from children's stories for generation of appropriate computer responses. We are working to more tightly couple the relationship between the toy and the computer, perhaps through mechanical movement of the physical object.

## CONCLUSIONS

Computationally-augmented toys are an effective tool for engaging children in technology and storytelling. Rosebud attempts to illustrate how three-way interaction between child, toy, and computer bridges oral and written storytelling, helping to develop stoytelling skills as well as collaboration, sharing, and the notion of revision. A particular emphasis on female users geared the research towards attracting them to computer technology. In sum, the combined physical and digital interface allows for a richer and more powerful interaction.

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