

Storytelling with a virtual peer as an intervention for children with autism

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Introduction

Story Listening Systems (SLS), a model of technology and literacy development, are shown to promote language skills development in children through storytelling with a virtual peer [4]. However, SLS make several assumptions about children:

- (1) they rely on children's oral storytelling and communication skills;
- (2) they model social skills to engage children in peer play; and,
- (3) they enable imaginative play, allowing children to create their own meaningful content using physical artifacts.

These assumptions inform the design of Sam, an SLS and virtual peer that tells stories with children [5]. Sam interacts with children using speech and gestures modeled after the storytelling roles and turn-taking behaviors children use when interacting with each other. But what if these very assumptions of communication, social skills and imaginative play, seemingly inherent in childhood, are the very skills the child lacks?

This is the case of children with autism (CWA). The very deficits of autism include communication skills, social skills and behavior such as imaginative play. Yet parents, teachers, and others who work with CWA, notice that many of them show an affinity with computers. Therefore, can Sam, which is ultimately a computer program, be used as an intervention for CWA? Instead of relying on the child's communication skills, social skills, and imaginative play, can a virtual peer help the child develop these abilities? This research seeks to provide CWA access to SLS, and ultimately improved social interaction with people, by creating a new SLS that incorporates *story authoring* features. A system that enables children to *control*, then *build* and finally *interact* with a virtual peer may offer a scaffold to social interaction for the child.

Background

A review of related work reveals several key features relevant to the design of SLS for CWA:

- Interventions must be highly personalizable. Social Stories, for example, provide relevant cues in a social situation and describes appropriate responses and are tailored to a specific child's behaviors in a particular situation [1, 2].
- Systems must scaffold the child. The Aurora project [6] investigates the use of robots as a social intervention for CWA. The behaviors first exhibited by the

robots are simple and predictable. As children interact more with the robots they become more complex.

- Artifacts must have constructive applications. Legoff [9] developed a successful social intervention that leveraged the natural appeal of the Lego© artifact. Groups of CWA practice social skills by collaboratively creating Lego© constructions.
- Using roles helps CWA practice social interactions. By taking on roles of “engineer” and “builder” during the Lego© therapy, children were encouraged to interact to complete a task [9].
- Evaluation must consider the transfer of behaviors to other contexts. Research on using virtual environments for social skills interventions [8,10] emphasizes the importance of presenting the same task in two scenarios because transfer of learning to different contexts is problematic for CWA.

To integrate these features into the SLS, I envision incorporating the benefits of Sam, a virtual peer SLS [5], with authoring features similar to those found in a system such as SAGE [3]. SAGE is a storytelling system that enables children to design and build their own storytellers with authoring tools. While creating and testing their storytellers, children learned to imagine a conversational interaction from the point of view of another interlocutor, a task that is especially difficult for CWA.

This research is further supported by Davis, et al’s [7] work on therapeutic narrative elicitation in autism. Their observations of children using the TouchStory system, which was created to test the ability of CWA to create sequential narratives using illustrations, speak to the utility of both narrative and computers in interventions and education.

Research goals

Thus, the goal of this research is to design, create and evaluate a new SLS that will help CWA develop their communication skills, social skills and imaginative play behaviors. By combining a virtual peer SLS with story authoring functionality, the system would be able to run in three modes:

- (1) The child could *control* the virtual peer, and thus practice different behaviors through the agent;
- (2) The child could *build* the virtual peer by creating new stories; and,
- (3) The child could *interact* with the virtual peer by telling stories with the system.

These three modes create a sequence of interaction of *control->build->interact* that will scaffold the child from simple, predictable interactions with the system to social interaction with the system. This SLS would be a highly flexible system adaptable to different uses by creating different stories. Stories could be used like social stories [1,2] to teach children appropriate behaviors for a given situation. Additionally, stories could be used as therapy, similar to the SAGE system where children explore their identity and listen to stories related to their identity [3]. Finally, stories can be educational, as Sam is used to teach literacy skills [5].

The methodology used to design SLS emphasizes the importance of studying behavior before building a system. Therefore, the development of this system must be iterative,

and incorporate three components of observations of CWA. First, observing CWA interacting with computers will inform the design of an authoring interface. Second, observing CWA interacting with an existing SLS, Sam, will reveal its potentials and design problems, as well as storytelling behavior of CWA. Finally, as we begin to prototype our system, children will interact with the system to refine the design.

Status of the research

One study underway is investigating collaborative storytelling of normally developing children with a virtual peer. This study informs the design of methods for researching interaction and storytelling in CWA. In addition, evaluating the interactive potential of a collaborative virtual peer informs the design of the new SLS and authoring system. Observations of two CWA are also underway in the lab.

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