FantasIA: Immersive, Child-driven Social Stories in Interactive Smart Spaces

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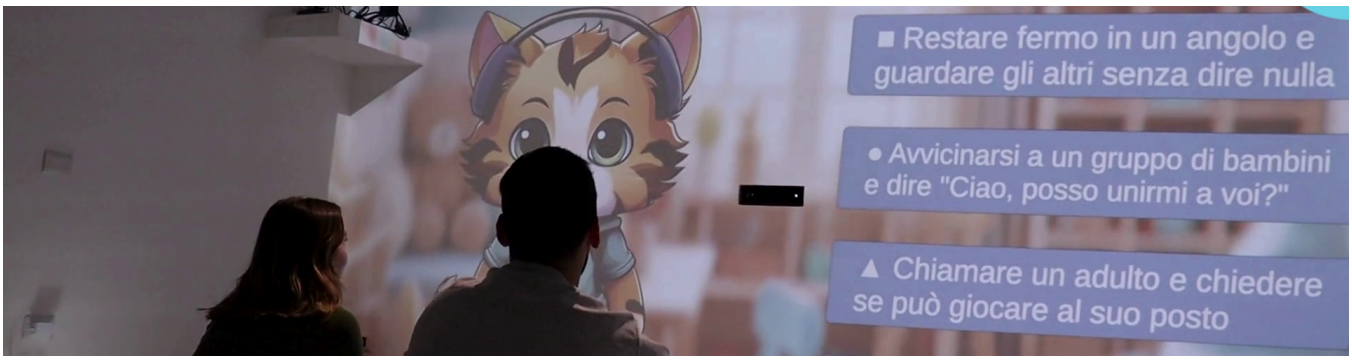

Figure 1: FantasIA activity.

Abstract

Social Stories are widely used to help children with Autism Spectrum Disorder understand social situations. Clinical practice emphasizes the importance of co-constructing Social Stories with children, mediated by a therapist. In this paper, we present FantasIA, a system that leverages the latest Generative Artificial Intelligence models to support the co-construction of Social Stories within Interactive Smart Spaces, while preserving therapist control over the creation process. These Social Stories provide immersive experiences in which embodied interaction and multisensory stimulation enhance children's engagement in narrative activities.

CCS Concepts

• **Applied computing** → Collaborative learning; **Interactive learning environments**; • **Social and professional topics** → **People with disabilities**; **Children**; • **Human-centered computing** → **Mixed / augmented reality**; • **General and reference** → General conference proceedings; • **Computing methodologies** → **Artificial intelligence**; Intelligent agents.

Keywords

Generative Artificial Intelligence,Social Stories,Autism Spectrum Disorder,Interactive Smart Spaces

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1 Introduction

A Social Story is a structured narrative designed to help children with Autism Spectrum Disorder (ASD) understand specific social situations, expectations, or behaviors [8]. A number of studies highlight that these narratives tend to be more effective when co-constructed with the child [1–3, 18, 19]. The literature documents numerous attempts to exploit digital technologies support the creation, presentation, and use of Social Stories [11, 13] offering different modes for children to interact with the multimedia narratives [9, 14, 15]. Some studies for example have investigated the interaction with Social Stories in virtual spaces [10, 12], while other works have explored the children's experience with Social Stories

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that are integrated in Interactive Smart Spaces (ISS) [5]. ISSs are physical environments that support embodied interaction [4, 6, 7]. To the best of our knowledge, no research has yet investigated the use of generative AI to support children's co-creation of Social Stories (SS) in ISS.

2 FantasIA

We developed FantasIA (Fig. 1) to explore the technical feasibility of combining GenAI with ISS for SS-based interventions, which would allow to enhance SSs with Embodied and Sensory Integration capabilities [16, 17]. Moreover, the implementation explored the use of GenAI to support the co-creation of multi-modal Social Stories. The activity is designed for group neuro-psychomotor therapy sessions involving 1-3 high-functioning autistic (HFA) children aged 7-10.

The activity was developed in continuous consultation with a licensed neuro- and psychomotricity therapist for developmental age (TNPEE), who acted as a domain expert and clinical validator throughout the design process. Their involvement ensured that the experience reflects the cognitive, emotional, and communicative needs of children with autism, while preserving consistency with the typical structure of therapy sessions.

The collaboration took place over approximately four months, with biweekly structured discussions. The therapist was involved in 1) providing clinical insight into user needs and therapy session dynamics; 2) supplying reference material on social story methodology; 3) validating the structure of the interactive activities; 4) reviewing the AI-generated narrative framework; 5) designing the evaluation procedure.

2.1 Activity design

The experience is structured as an interactive SS divided into sequential chapters. The story is dynamically generated according to therapist-defined goals, settings, and children's characteristics, and alternates storytelling moments with individual and collaborative activities. GenAI models construct the narrative flow, the content of quizzes, and visual and auditory stimuli. Children are actively involved in shaping the narrative through guided decisions and spoken answers.

The environment adapts visual projections, ambient sounds, and lighting conditions to the evolving story, creating a coherent multisensory experience. The therapist maintains control over the session and can enable or disable interaction features and stimuli.

Activity setup. The caregiver configures the narrative through a setup form that includes each child's profile, the session goal, and the story setting. Children then create their avatars by scanning one stuffed animal and one accessory card on the glowing sphere

Narrative chapters. Narrative chapters (Fig. 2) show the title and content of the current narration superimposed on a background image. Below the text, the avatar of the playing children are displayed. Ambient sounds are selected by the game engine and played to enhance immersion[1]. The smart light of the room can also be controlled by the activity engine. The caregiver can interact with the system to advance to the next chapter.

[1]Ambient sounds can be optionally disabled by the therapist to better adapt the experience to the children's sensory needs

Multiple choice quiz. The room addresses a child, presenting multiple-choice scenarios (Fig. 3) to work on the child's specific therapeutic characteristic. The answer is provided by stepping on a floor projected square. A multi-sensory feedback mechanism reinforces this learning; and errors are explained before allowing the child to select a different answer.

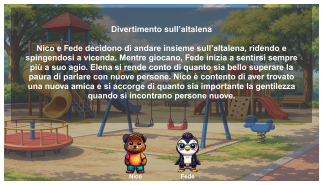

Figure 2: Narrative chapter.

Figure 3: Multiple choice quiz.

Emotion quiz. The room prompts the child to guess their character's feelings in response to a narrated event. The avatar is depicted in three distinct postures, each representing the body language associated with a specific emotion, and the child must mimic the avatar's pose of the correct emotion.

Open-ended quiz. The room asks a specific child to make a decision cooperating with the others, requiring a simple and straightforward answer (e.g., "Which game the characters play?") to limit ambiguity. The therapist can activate a recording mode that allows the children to verbally formulate their answer.

3 Future work

The proposed design has been implemented into a working prototype that should now undergo empirical validation. To evaluate the effectiveness of our approach, we will first conduct a study with domain experts to assess the quality and appropriateness of the AI-generated multimedia content used in the Social Stories, as well as the therapeutic potential of the co-creation process. Subsequently, we will carry out longitudinal studies involving children with ASD to evaluate the benefits of these generated Social Stories within the immersive, multisensory environments provided by Interactive Smart Spaces (ISS). This phase will also include a comparative analysis of storytelling experiences in ISS and those delivered through more traditional digital tools.

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