MyStoryKnight: A Character-drawing Driven Storytelling System Using LLM Hallucinations

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Abstract: Storytelling is a valuable tradition that plays a crucial role in child development, fostering creativity and a sense of agency. However, many children often consume stories passively, missing out on the opportunity to participate in the creative process. To address this, we propose a storytelling system that creates adventure-type stories with multiple branches that users can explore. We generate these interactive stories using a character drawing as input, with visual features extraction using GPT-4. By leveraging LLM hallucinations, we generate interactive stories using user feedback as a prompt. Finally, we refine the quality of the generated story through a complexity analysis algorithm. We believe that the use of a drawing as input further improves the engagement in the story and characters.

1. Introduction

Creativity is increasingly recognized as a crucial aspect of the modern working environment. In the context of child development, creativity plays a pivotal role in fostering learning and growth [4], which extends to adulthood. As a result, there has been a growing interest in leveraging creative artificial intelligence (AI) and exploring the use of AI agents to stimulate children's creativity. Previous research has demonstrated the positive effects of incorporating AI agents with creative abilities in enhancing children's creative thinking [4]. Additionally, the use of storytelling robots and virtual characters as interactive tools has gained traction in recent years [10]. These advancements highlight the potential of AI technologies in promoting and nurturing creativity in children, thereby shaping their cognitive and emotional development.

One effective way to promote creativity is through storytelling, a popular activity for entertaining and bonding with children [10]. Storytelling plays a crucial role in child development [7] and offers several ultiple benefits [10]. Both story-making and storytelling contribute to the development of verbal and social skills [4], and recent research suggests that storytelling broadens vocabulary, improves narrative comprehension, and accelerates cognitive development in children [10]. Creating fictional worlds and characters helps children improve their language skills, both in comprehension and usage [1].

Collaborative storytelling has been shown to be an effective way of building and strengthening relationships [9], also playing an important role in parent-child bonding [13]. Interactive stories stimulate children's thinking and imagination [3], and help children make sense of their world through shared experiences [7]. Despite these benefits, many parents do not regularly engage in interactive storytelling with their children due to limited availability, time, or energy [7, 12].

To address this, we propose **MyStoryKnight**, a character drawing driven storytelling system that uses LLM hallucinations to generate an adventure-type story with user agency and navigation. Figure 1 shows an overview of our system. Our system uses drawings of characters as input, and generates an unfolding story that the user can navigate through based on their choices. Using a complexity analysis algorithm, we guide the LLM hallucinations to generate a coherent and consistent story. Resulting in a story that is both engaging and easy to follow.

Our contributions are:

- Storytelling system that uses the character drawing as a basis for the story.
- LLM hallucinations to generate an adventure-type story with user navigation.
- Complexity analysis of story generation for coherency and consistency.

2. Related Work

2.1 Interactive Storytelling

Interactive storytelling is a form of storytelling in which

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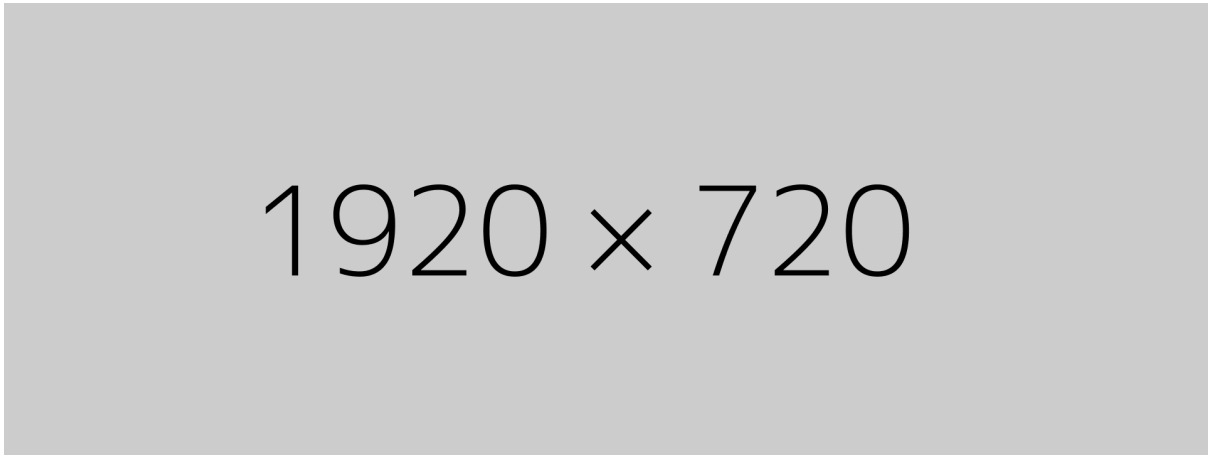

Fig. 1 MyStoryKnight system overview.

the audience is an active participant [12]. Interactive storytelling has been shown to be an effective way of building and strengthening relationships [8], also playing an important role in parent-child bonding [13]. Interactive stories stimulate thinking and imagination [3], and help children make sense of their world through shared experiences [7].

Prior work has explored physical interactivity through the use of tangible objects [7] to create stories, and physical gestures to control characters [6] or generate stories [14]. Other studies have explored the use of sketches to influence character behavior and plot development [3]. However, these studies have not explored the use of character drawings as the driving force behind the story.

2.2 AI Storytelling

AI usage has been experiencing a surge in popularity in recent years, with many applications in the creative arts. Generative AI especially has the potential to contribute to creative processes [11]. One such creative process could be storytelling. Prior work has explored how generative AI can be used to create stories [1], and even collaborate in story generation with humans [9]. Other studies explored how generative AI can be used to expand existing story worlds [2], or generate multi-modal storytelling experiences [5]. However, while consistency and coherency are essential in storytelling, they are often overlooked in AI-generated stories.

2.3 Storytelling with Children

Children oriented storytelling has been explored widely in the past. Prior work has explored the use of robots as storytelling companions [10], and the use of virtual characters to promote collaboreation [6]. Other studies have explored the use of AI agents to stimulate children's creativity [4]. Other studies have shown how AI can support parent-child bonding [13], and encourage physical interaction and play [14]. However, utilizing hallucinations to generate stories has not been explored in the context of user-agency for storytelling with children.

3. System Overview

4. Implementation

5. Evaluation

6. Discussion

7. Conclusion

Acknowledgments Test.

References

[1] Burtenshaw, B.: AI Stories: An Interactive Narrative System for Children, *CoRR*, Vol. abs/2011.04242 (online), available from ⟨https://arxiv.org/abs/2011.04242⟩ (2020).

[2] Chopra, B., Verma, K., Singhal, S. and Singla, U.: Reality Tales: Facilitating User-Character Interaction with Immersive Storytelling, *CHI '21: CHI Conference on Human Factors in Computing Systems, Virtual Event / Yokohama Japan, May 8-13, 2021, Extended Abstracts* (Kitamura, Y., Quigley, A., Isbister, K. and Igarashi, T., eds.), ACM, pp. 489:1–489:7 (online), DOI: 10.1145/3411763.3451522 (2021).

[3] de Lima, E. S., Gheno, F. J. and Viseu, A.: Sketch-Based Interaction for Planning-Based Interactive Storytelling, *19th Brazilian Symposium on Computer Games and Digital Entertainment, SBGames 2020, Recife, Brazil, November 7-10, 2020*, IEEE, pp. 154–162 (online), DOI: 10.1109/SBGAMES51465.2020.00029 (2020).

[4] Elgarf, M. and Peters, C. E.: CreativeBot: a Creative Storyteller Agent Developed by Leveraging Pre-trained Language Models, *IEEE/RSJ International Conference on Intelligent Robots and Systems, IROS 2022, Kyoto, Japan, October 23-27, 2022*, IEEE, pp. 13438–13444 (online), DOI: 10.1109/IROS47612.2022.9981033 (2022).

[5] Han, A. and Cai, Z.: Design implications of generative AI systems for visual storytelling for young learners, *Proceedings of the 22nd Annual ACM Interaction Design and Children Conference, IDC 2023, Chicago, IL, USA, June 19-23, 2023*, ACM, pp. 470–474 (online), DOI: 10.1145/3585088.3593867 (2023).

[6] Liu, C., Liu, K., Wang, P., Chen, G. and Su, M.: Applying tangible story avatars to enhance children's collaborative storytelling, *Br. J. Educ. Technol.*, Vol. 43, No. 1, pp. 39–51 (online), DOI: 10.1111/J.1467-8535.2010.01146.X (2012).

[7] Ryokai, K. and Cassell, J.: StoryMat: a play space for collaborative storytelling, *CHI '99 Extended Abstracts on Human Factors in Computing Systems, CHI Extended Abstracts '99, Pittsburgh, Pennsylvania, USA, May 15-20, 1999* (Atwood, M. E., ed.), ACM, pp. 272–273 (online), DOI: 10.1145/632716.632883 (1999).

[8] Schlauch, M., Sylla, C. and Gil, M.: Investigating Social Emotional Learning at Primary School through Guided Interactive Storytelling, *Extended Abstracts of the Annual Symposium on Computer-Human Interaction in Play, CHI PLAY 2022, Bremen, Germany, November 2-5, 2022* (Gerling, K., Iacovides, J., Malaka, R., Bonsignore, B. and Frommel, J., eds.), ACM, pp. 240–245 (online), DOI: 10.1145/3505270.3558313 (2022).

[9] Shakeri, H., Neustaedter, C. and DiPaola, S.: SAGA: Collaborative Storytelling with GPT-3, *Companion Publication of the 2021 ACM Conference on Computer Supported Cooperative Work and Social Computing, CSCW 2021, Virtual Event, USA, October 23-27, 2021* (Birnholtz, J. P., Ciolfi, L., Ding, S., Fussell, S. R., Monroy-Hernández, A., Munson, S., Shklovski, I. and Naaman, M., eds.), ACM, pp. 163–166 (online), DOI: 10.1145/3462204.3481771 (2021).

[10] Sun, M., Leite, I., Lehman, J. F. and Li, B.: Collaborative Storytelling between Robot and Child: A Feasibility Study, *Proceedings of the 2017 Conference on Interaction Design and Children, Stanford, CA, USA, June 27-30, 2017* (Blikstein, P. and Abrahamson, D., eds.), ACM, pp. 205–214 (online), DOI: 10.1145/3078072.3079714 (2017).

[11] Tholander, J. and Jonsson, M.: Design Ideation with AI - Sketching, Thinking and Talking with Generative Machine Learning Models, *Proceedings of the 2023 ACM Designing Interactive Systems Conference, DIS 2023, Pittsburgh, PA, USA, July 10-14, 2023* (Byrne, D., Martelaro, N., Boucher, A., Chatting, D. J., Alaoui, S. F., Fox, S. E., Nicenboim, I. and MacArthur, C., eds.), ACM, pp. 1930–1940 (online), DOI: 10.1145/3563657.3596014 (2023).

[12] Wang, Z., Romat, H., Chevalier, F., Riche, N. H., Murray-Rust, D. and Bach, B.: Interactive Data Comics, *IEEE Trans. Vis. Comput. Graph.*, Vol. 28, No. 1, pp. 944–954 (online), DOI: 10.1109/TVCG.2021.3114849 (2022).

[13] Zhang, Z., Xu, Y., Wang, Y., Yao, B., Ritchie, D., Wu, T., Yu, M., Wang, D. and Li, T. J.: StoryBuddy: A Human-AI Collaborative Chatbot for Parent-Child Interactive Storytelling with Flexible Parental Involvement, *CHI '22: CHI Conference on Human Factors in Computing Systems, New Orleans, LA, USA, 29 April 2022 - 5 May 2022* (Barbosa, S. D. J., Lampe, C., Appert, C., Shamma, D. A., Drucker, S. M., Williamson, J. R. and Yatani, K., eds.), ACM, pp. 218:1–218:21 (online), DOI: 10.1145/3491102.3517479 (2022).

[14] Zhao, Y. and Bao, X.: Narratron: Collaborative Writing and Shadow-playing of Children Stories with Large Language Models, *Adjunct Proceedings of the 36th Annual ACM Symposium on User Interface Software and Technology, UIST 2023, San Francisco, CA, USA, 29 October 2023- 1 November 2023* (Follmer, S., Han, J., Steimle, J. and Riche, N. H., eds.), ACM, pp. 119:1–119:6 (online), DOI: 10.1145/3586182.3625120 (2023).

Appendix