

An AI Enhanced Game Master Assistant for Table Top Role Playing Games

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Abstract. *In this work-in-progress paper, we present the initial implementation of a game master (GM) assistant for Table Top Role Playing Games (TTRPGs) that leverages artificial intelligence (AI), specifically Large Language Models (LLMs), to generate narrative content, non-player characters (NPCs), items, and other game-related material based on GM input. Developed using a design science research methodology, the system is implemented in Python and Ren'Py and integrates the OpenAI application programming interface (API). It enables the GM to display ambient sounds, music, and scene images with dynamically inserted player characters and NPCs. We report on the initial implementation and pilot evaluation results.*

Keywords. game master, table top role playing game, artificial intelligence, large language models, non player character, application programming interface

1 Introduction

The global table top game market has been valued at almost €12 billion in 2023 and is projected to grow up to more than €29 billion in 2032 according to (Fortune Business Insights, 2024, June). The total revenue for role-playing games (RPGs) (which includes computer RPGs) in 2022 is valued at more than €42 billion and is expected to grow up to €66 billion by 2027 (Statista, 2024). Table Top Role Playing Game (TTRPG) games like Dungeons & Dragons (D&D) have gained major popularity in recent years. For example Hasbro, Inc. owner of Wizards of the Coast which produce D&D related content claim that over 50 million people are playing it worldwide (Wizards of the Coast, 2022, August).

TTRPGs are a form of collaborative storytelling and game play in which participants assume the roles of fictional characters within a shared narrative framework. Unlike board games with rigid rule structures and defined win conditions, TTRPGs emphasize improvisation, imagination, and collective decision-

making. Gameplay is typically facilitated by game master (GM), who describes settings, controls non-player characters (NPCs), and adjudicates rules and outcomes of player actions.

Players create and control player characters (PCs), each defined by a set of attributes, abilities, and backstories that inform their interactions with the game world. Sessions unfold as a series of descriptive exchanges, dice rolls, and collaborative problem-solving activities that advance the plot and develop character arcs.

Classic examples of TTRPGs include *Dungeons & Dragons*, *Pathfinder*, and *Call of Cthulhu*, but thousands of systems and settings exist, ranging from high fantasy to science fiction and horror. TTRPGs have gained widespread popularity due to their adaptability, potential for deep role-play, and the strong social bonds they foster among players.

Recent years have seen a resurgence of interest in TTRPGs, driven by live-streamed campaigns, podcasts, and digital tools that enhance play, attract new audiences, and lower barriers to entry. At their core, TTRPGs remain a unique medium combining structured mechanics with open-ended creativity.

In usual TTRPGs a dungeon master (DM), GM, master of ceremonies (MC) or other ceremonially titled narrator which runs the game has to prepare numerous aspects before a games session starts. Such aspects might include the setting (including worldbuilding and lore), story, quests, NPCs, mobs, dialogue, battles, various props like items, maps, figurines, background music and sound effects, balancing personal computers (PCs) statistics, interviewing players, reviewing their character sheets and character art etc. (Page, 2024). In addition to this, for educative TTRPGs an educator has to include and incorporate educative materials into various aspects of the game to achieve the desired learning outcomes. There seems to be no *one size fits it all* approach in designing educative gaming experiences (Khaldi et al., 2023) which is a motivation for us to try to develop a different approach.

In principle, there are two aspects of the prepara-

tion and gaming process of a TTRPG that we would like to support: (1) *theater of the mind*¹ that includes the preparation of descriptions (for example of places, NPCs, lore, items, etc.), dialogue, rulesets, game art, and (in the context of educative games) learning materials (including lesson plan, learning outcomes, exercises etc.); as well as (2) *props* which include all physical items such as player/NPC/mob figurines, miniatures, dice, letters, maps, coins, or artifacts used during gameplay to enhance immersion and provide tangible elements that players can interact with. Herein we propose to use artificial intelligence (AI) or more precisely generative artificial intelligence (GenAI) for the former and pseudo-holography supported by AI for the latter.

GenAI is transforming digital media industries (Markus Schatten, 2024). The possibility of generating text (including programming code) see Yao et al., 2024, for an overview, visual images see Zhang et al., 2023, video see Xing et al., 2023, audio see Latif et al., 2023 and 3D models see Liao et al., 2024 has already incited major players in the media industry to experiment with this breakthrough technology. For example, Marvel Studios has used GenAI to create the opening credits of their series *Secret Invasion* starring Samuel L. Jackson (Sharf, 2023), AAA game studios including Activision Blizzard are reportedly already using AI for game creation (Serin, 2024), and Keyword Studios is creating their center of excellence for the responsible use of GenAI in game development (Wood and Peacock, 2024, March).

In order to support TTRPG play we have implemented a GM assistant tool that allows for generating textual content including but not limited to game narrative, NPC names, descriptions, or dialogue, as well as items and other game related content. In addition to generated content the implemented system allows for import of prepared graphics like setting backgrounds, player characters, NPCs as well as sound effects and background music which can be dynamically shown during game play. Herein we report on the development process and initial results.

The rest of this paper is organized as follows: in section 2 we provide an overview of the development process based on design science. In section 3 we discuss our findings and in section 4 we draw our conclusions and provide guidelines for future research.

2 Development Process

To develop the described system, we adopted a design science approach. Design science is a research methodology in information systems that aims to create novel artifacts—such as models, methods, and sys-

tems—to support people in solving complex problems (Johannesson and Perjons, 2014). This methodology is particularly suitable for developing systems combining various approaches and technologies like artificial intelligence, user interfaces, and content generation as has been showcased in (Markus Schatten and Sačarić, 2024, in press; Markus Schatten, Marinela Schatten, and Inkret Martinčević, 2023).

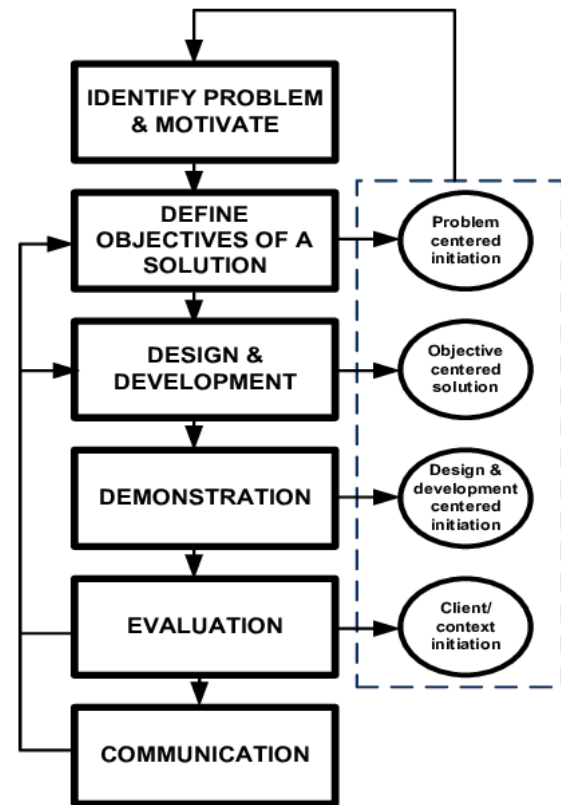


Figure 1. Design science methodology (Azasoo and Boateng, 2015) adapted from (Peffer et al., 2007)

Design science research typically involves a series of steps which may be iteratively revisited. Below, we outline each step and describe how it was applied in the development of our TTRPG assistant:

1. Problem Identification and Motivation:

The identified problem is the lack of tools to support GMs in dynamically generating high-quality narrative content, characters, and settings during live TTRPG sessions. Traditional preparation methods require significant manual effort and time investment, limiting spontaneity and improvisation. With the growing capabilities of Large Language Models (LLMs), there exists an opportunity to augment GMs' creativity through AI assistance.

The motivation for solving this problem stems from the need to enhance player immersion, reduce GM workload, and improve the accessibility of storytelling tools for less experienced GMs.

¹In the context of TTRPGs like D&D, "theater of the mind" refers to a style of gameplay where players and the game master use verbal descriptions and imagination to create and visualize the game world, actions, and events, rather than relying on physical maps or miniatures.

Player immersion, aside from using on-the-fly generated content can be additionally enhanced by including prepared graphics (like backgrounds, player character depictions, NPCs, items etc.) and sound (like background music or sound effects) which can be used during a gameplay session.

2. Define the Objectives for a Solution:

Based on this problem, we defined the following objectives:

- (a) *Dynamic content generation.* Enable GMs to generate character backstories, locations, and narrative events during gameplay in real time.
- (b) *Ease of use.* Develop an intuitive, minimalistic interface requiring no advanced technical skills.
- (c) *Content consistency.* Ensure reproducibility and coherence of generated content across sessions.
- (d) *Multimedia integration.* Support visuals and audio to enrich immersion.
- (e) *Cross-platform demonstration.* Deliver a publicly accessible application demonstrating the artifact's functionality.

3. Design and Development:

The artifact was designed and implemented through iterative prototyping. We selected Python as the main programming language due to its rich ecosystem of libraries for AI integration and cross-platform graphical user interface (GUI) development.

The development process comprised the following phases:

- (a) *Technology selection.* We adopted the OpenAI application programming interface (API) for natural language generation, specifically the GPT-3.5 Turbo model, balancing performance and cost. For user interfaces, we utilized the `tkinter` library for the main GUI, `pygame` for audio playback, and `PIL` for image manipulation. The RenPy engine was integrated to display visual novel-style scenes.
- (b) *API integration.* The system prompt, which defines the AI's role and output style, was hardcoded for consistency but designed to be stored externally for future iterations. Temperature and other model parameters were fine-tuned to balance creativity with predictability. Conversation history management was implemented to maintain narrative coherence.
- (c) *User interface design.* We designed three core interfaces:

- A setup screen to load characters, backgrounds, music, and NPCs.
- The RenPy-powered narrative display.
- An AI chat interface styled as a "magic mirror" to enhance immersion.

The UI emphasized high contrast, clear grouping of functions, and minimalistic aesthetics to reduce cognitive load.

- (d) *Multimedia elements.* Frames and decorative elements were generated using DALL-E and processed in GIMP. A system for automatic refreshing of the Ren'Py game engine was implemented to instantly display newly added content without restarting the application.

An overview of the system's architecture is shown in Fig. 2.

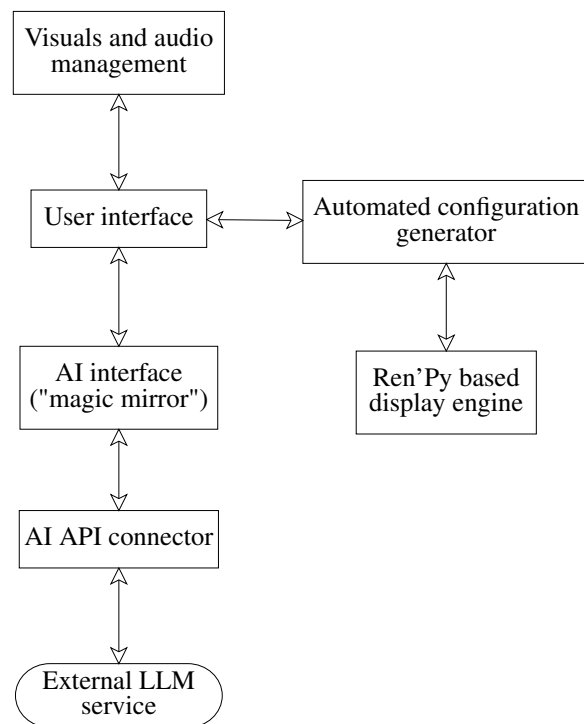


Figure 2. System architecture overview

4. Demonstration:

The artifact was deployed as a public demonstration on the itch.io platform, accessible at:

<https://ailab-foi.itch.io/prri-ttrpg2025>

This allowed GMs and players to experience the assistant in realistic gameplay scenarios. Fig. 3 shows example screenshots from the system.



Figure 3. Screenshots from the TTRPG game master assistant (above: main interface, below: AI interface - "magic mirror")

5. Evaluation:

An initial pilot evaluation was conducted through four gameplay sessions involving a GM and three players per session. Observations were made regarding usability, output quality, and overall player experience. Feedback collected during and after the sessions included:

- The assistant significantly reduced preparation time for GMs.
- Generated narratives were generally coherent and contextually relevant.
- Minor issues arose with content consistency when context windows exceeded token limits.
- The immersive visual and audio features were highly appreciated by players.
- Some users suggested adding more fine-grained control over AI creativity.
- GMs suggested adding the possibility to generate visuals and audio as well as using different AI services instead of the currently only available ChatGPT system.

Based on this feedback, recommendations were documented for future development iterations, including externalizing system prompts for easier customization, improving caching mechanisms to

handle long dialogues, adding support for different back-end LLMs and other AI services for audio and visuals creation, adding and refining UI interactions.

Future evaluation will consist of structured sessions with prepared surveys and interviews.

6. Communication:

Beyond this paper, the system and its source code have been published on GitHub under an open source license (available here <https://github.com/AI-Lab-FOI/PRRI-TTRPG2025>) to enable broader adoption and feedback. The itch.io page provides demonstration downloads, and additional dissemination is planned via conference presentations and workshops focused on AI applications in digital games.

3 Discussion

The initial implementation and evaluation of the AI-enhanced TTRPG game master assistant have yielded several insights relevant both for the development of similar tools and for understanding the opportunities and challenges of integrating generative AI into collaborative storytelling environments.

First, the demonstration and evaluation confirmed the central hypothesis that large language models can substantially reduce the preparation burden for GMs while simultaneously enhancing narrative richness and player immersion. During the four gameplay sessions, GMs consistently reported a significant decrease in the time required to prepare non-player characters, narrative hooks, and descriptive content. This aligns with similar findings in adjacent domains such as AI-supported educational games (Horn and Göbel, 2024) and digital interactive fiction (Hua and Raley, 2020), where generative AI has been shown to improve both efficiency and perceived content quality.

However, several limitations were observed. One recurring issue concerned the management of long-running dialogues. Specifically, when the conversation history grew beyond the context window supported by the GPT-3.5 Turbo model, players noted occasional inconsistencies or loss of relevant context in generated responses. This limitation highlights the importance of designing effective memory and summarization strategies to maintain coherence over extended interactions. Future iterations of the system should explore segmenting sessions or employing retrieval-augmented generation to mitigate these issues.

Another important observation relates to content creativity and control. While most GMs appreciated the assistant's ability to generate novel and engaging content, some expressed the desire for more granular adjustment of output creativity (e.g., dynamically controlling temperature settings or style parameters). This

reflects a broader trade-off between automation and creative direction in generative tools. Providing intuitive controls that allow GMs to calibrate the AI's output to match their narrative intentions will be an important focus in future development.

Regarding the multimedia components, players and GMs consistently highlighted that the inclusion of images, ambient sounds, and background music contributed positively to immersion. The integration with RenPy and the modular design for importing assets were perceived as strengths of the system. Nonetheless, several participants suggested expanding the assistant's capabilities to generate or recommend multimedia assets dynamically, potentially through the integration of additional AI services for text-to-image and text-to-audio generation. This direction would further reduce preparation time and provide a more seamless experience.

From a usability perspective, the minimalist interface design and clear grouping of functions were largely successful in reducing cognitive load and facilitating adoption. New users required minimal instruction to begin generating content and managing multimedia elements. However, several participants noted that more robust error handling and guidance would be beneficial, particularly when API connectivity issues or input validation errors occur.

Finally, the public demonstration of the system on the itch.io platform and open-source publication of the source code have already begun to generate interest and feedback from the broader community of TTRPG enthusiasts and developers. This community engagement is expected to be an important catalyst for iterative improvement and adaptation of the system to diverse game systems and play styles.

Overall, the findings indicate that AI-powered assistants hold considerable promise for augmenting TTRPG play, but also underscore the need for careful design of context management, user control, and multimodal content integration. The lessons learned from this initial implementation will inform future research and development aimed at refining both the technical foundations and user experience of AI-assisted game mastering.

4 Conclusion and Future Research

This paper has presented the design, development, and preliminary evaluation of an AI-enhanced game master assistant for tabletop role-playing games. By combining large language models, an implemented GUI, the RenPy game engine, and multimedia integration, the implemented system demonstrates the potential of generative artificial intelligence to augment the creative process of game mastering, reduce preparation workload, and enrich the immersive experience for players.

The results of four initial pilot gameplay sessions suggest that the assistant effectively supports dynamic

content generation and narrative consistency, while the modular architecture facilitates the inclusion of pre-prepared visual and audio assets. User feedback highlighted the strengths of the approach, particularly regarding ease of use and enhanced immersion, while also identifying areas for improvement, such as better context management for longer dialogues, finer control over creativity parameters, and expanded capabilities to recommend or generate multimedia content.

Future research and development will focus on several directions. One priority is exploring the integration of additional generative models capable of producing diverse types of content beyond text, including images, music, ambient soundscapes, video, and animation. This multimodal generation could enable GMs to create fully customized experiences with minimal manual effort.

Additionally, we aim to investigate the application of the assistant in educational contexts, where TTRPGs are increasingly used as a vehicle for teaching and learning. Research will examine how AI-generated narratives and multimedia can be adapted to align with pedagogical goals, curriculum requirements, and differentiated learning needs. Controlled studies will be conducted to assess the impact of such tools on learner engagement, knowledge retention, and the development of transversal skills such as collaboration and problem solving.

Taken together, this work contributes to the growing body of evidence that generative AI can play a transformative role in digital and analogue game development. By continuing to refine technical capabilities and expand practical applications, we hope to advance the field toward more accessible, engaging, and creative TTRPG experiences for both recreational and educational settings.

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