Academical: A Dynamic Interactive Narrative Game for Responsible Conduct of Research Training

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***Abstract*—Our demo showcases a choice-based interactive narrative game created to teach responsible conduct of research and research ethics. It re-imagines the experience of a game previously published in the literature, using a content-selection system that dynamically constructs dialogue choices during play. Our goal is to provide players with more opportunities to experience agency than they would have with the original game's hand-authored branching narrative structure. Primarily, our system implements a conversation thread-switching mechanic that allows players to fluidly enter/exit conversation topics as one would in a real-life conversation.**

I. Introduction

Learning Responsible Conduct of Research (RCR) and research ethics is a crucial task on the journey of all researchers. However, conventional training methods typically involve reading through many pages of historical justification and/or slideware [1]. Serious games provide an alternative learning method that provides more opportunities for engagement. Using ideas from Self-Determination Theory, specifically focusing on players' feelings of autonomy, relatedness, and competence (ARC), has been shown to positively influence learning outcomes in games [2].

In our game, the player embodies the character Brad, a graduate student new to human subject research who is guilted by a recent blunder in required research procedures. Through Brad's conversations with his advisor, Ned, the player can learn more about RCR and research ethics.

Our demo teaches RCR through a choice-based narrative in which a player takes on the role of a graduate student talking with their advisor about an ethical problem that occurred during human subjects research. This game is based on a similar game previously published in the literature [3]. The original game used a static branching narrative structure that gave players limited control over the flow of the conversation. Conversely, our game aims to increase players' feelings of autonomy by giving them more control over conversation flow throughout gameplay. We accomplished this by leveraging a storylet architecture [4] to support natural switching between conversation topics during dialogue.

In this paper, we briefly discuss the design of our interactive storytelling system, how it enables dynamic conversation thread switching, and how authors had to adjust to this writing style.

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II. System Description

Our game was built in Unity and follows the basic design and style of a visual novel [5]. To support dynamic content sequencing at runtime, it uses a reimplementation of StoryAssembler [6] written in Step [7].

StoryAssembler is a framework for dynamically creating choice-based narratives in JavaScript using a forward-state space planner and a hierarchical task network (HTN) planner. StoryAssembler constructs sequences of character dialogue and choices at runtime by searching over a library of narrative "fragments," each containing text, logical preconditions, and effects that are applied upon visitation. The system begins with a defined starting state and a set of narrative goals, which outline desired outcomes or narrative beats. StoryAssembler's search algorithm then looks for potential fragments to provide as choices to the player, prioritizing those that satisfy story goals.

Our specific implementation of StoryAssembler was written in Step, a logic programming text generation language [7]. Step was chosen because of its native C# compatibility with the Unity platform. We then implemented a subset of the original StoryAssembler features: dynamic choice population, state-space planning, and HTN planning. Although most content authoring used spreadsheets, Step gave writers access to a fully-featured programming language.

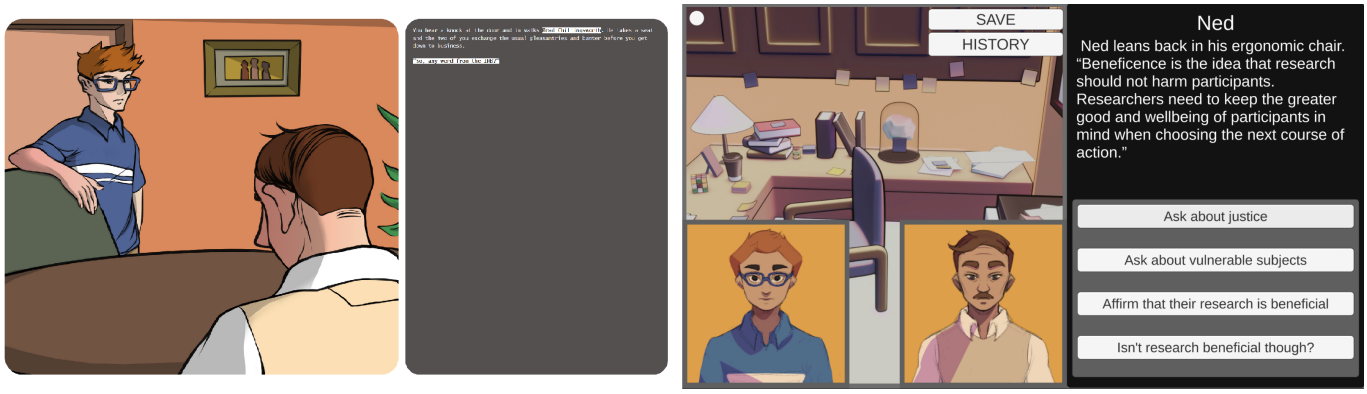

Fig. 1. A side-by-side comparison of Academical 1 (left) with Academical 2 (right). This screenshot demonstrates the multiple available conversation threads available to the player at the same time. This makes the system more conversational than a statically authored visual novel game.

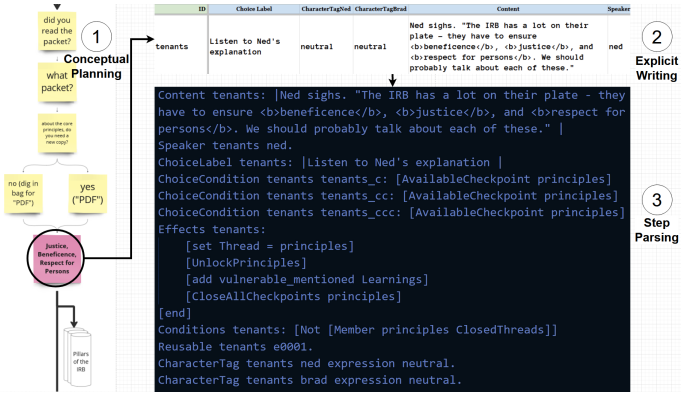

Fig. 2. A visual representation of the writing process of Academical 2. Authors would 1) Conceptually plan a given thread, 2) Write the explicit content in a spreadsheet, which would then be 3) Parsed into Step code.

We implemented conversation thread switching by creating special Step macros to associate fragments with specific conversation threads. We then defined another that allows us to mark a subset of fragments as checkpoints that can be "open" or "closed" to allow players to move between threads. Checkpoints may be modified at any point in the story, allowing writers to open checkpoints when players encounter certain information or choices.

III. Discussion

Authoring for StoryAssembler involves creating a diverse library of these narrative fragments. Writers needed to specify story text, preconditions, effects, and dynamic player choices to be populated at runtime. They also needed to specify story goals, which included pedagogical goals outlining things players need to learn by the end of the game. This modular approach allowed authors to craft narratives without explicitly enumerating every possible path. Rather, they focused on creating conversation threads that were locally-coherent but had avenues for the system to sequence them into compelling narratives based on player decisions. An example of thread authoring as well as Step fragments can be seen in fig. 2.

With a team of 3 writers and one system engineer, we created a roughly 10-minute experience, covering basic RCR topics like what is the Institutional Review Board and the basic tenets of human subjects research (beneficence, respect for persons, and justice).

IV. Conclusion

This demo shows there is utility in combining branching narrative structures with storylet systems to enable dynamic conversations. This content architecture allows for natural-feeling conversations that flow in and out of conversation topics. The combination of static branching with dynamic transitions gives authors the space to create segments of cohesive conversation that are dynamically interleaved based on the current story state and storytelling goals.

Future work for this project involves performing a user study to evaluate how this dynamic content structure affects learning outcomes for players.

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