



Mystery of Lehigh Gap: Interaction and Dialogue Systems

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Abstract. This iLEAD contribution paper shares the process of designing and developing the dialogue system for the desktop Virtual Reality (dVR) game "Mystery of the Lehigh Gap". An outline of tools used and interaction types are presented. Design principles, use of dialogue system plugins, gameful design for learning, the use of various dialogue menus, and other interactive interfaces within the game experience are discussed.

Keywords: Desktop Virtual Reality, Dialogue system, Interactive, Game Design.

1 Introduction

The Mystery of the Lehigh Gap is a time travel journey back to the 18th century, illustrating the development of the zinc mining and manufacturing industry around the Lehigh Gap area and its impact on the natural environment. The dialogue boxes, along with the design of avatars, backgrounds, newspapers, mini games, and other interactive components in the game, provide learners with a deeper understanding of time and history during gameplay [1]. Our development goal was to simulate a physical tour by having players virtually enter the Lehigh Gap Nature Center, both in the game's prologue and epilogue, to give players a sense of what they can expect during their future visit.

1.1 Design Principle: Do Not Reinvent the Wheel

A key principle of our design and development group Lehigh RiVR Lab is not reinventing the wheel. Through experiencing challenges in developing a dialogue system in a previous project [2], the group learned how difficult it can be to create a dialogue system from scratch. A sustainable solution for implementing the dialogue system was needed so that the group could focus on other aspects of the project.

1.2 Fungus: A Dialogue System Plugin for Game Development

Using the Fungus extension in Unity to create dialogue boxes enabled our group to build an interactive historical gaming environment. For this reason, the group chose Fungus, a storytelling extension for Unity, and learned how to use the system through Paul McGrath's Fungus Tutorials YouTube channel [3].

2 Gameful Design for Learning

2.1 Clickable Features: Highlighted Words and Animated Interfaces

The game's dialogue includes terms and materials associated with the zinc mining industry. Because the game is designed for individuals of all ages with interest in historic, environment, or virtual reality technology, learners

may not be familiar with mining terms or what a mineral looks like (e.g., "Calamine", "Anthracite"). We developed a "clickable text" feature, which provides explanations to learners without interrupting the game flow for those familiar with these terms (see Fig. 1a). Those unfamiliar with terms can click the terms to see a detailed description that includes images used in the mini games within Mystery of the Lehigh Gap. Using the same images from the mini games helps to build understanding and a stronger connection with the game. Furthermore, the newspapers' images convey contextual information to players. This animated interface prompts players to click and further engage with the storyline (see Fig. 1b).

2.2 Checking for Understanding and Providing Pathway Options

During gameplay, especially after the video tutorials, learners are presented with choices on how to proceed and opportunities to seek clarification via the narrator's dialogue boxes. Learners can choose to continue with gameplay or review information if needed (see Figure 1c).



Fig. 1. (a) Clickable texts are colored in yellow and underlined to inform player, (b) clickable newspaper, (c) pathway options menu.

3 Dialogue Menus

Multiple types of interactive menus allow players to select from options throughout the storyline. They branch the game/actions for the player to take after they dialogue with the non-playable characters (NPCs). This provides a personalized gameplay experience with an increased sense of autonomy, creating an immersive and engaging environment where players feel they can influence the course of their virtual journey.

3.1 The “Pathway” Menu

This dialogue menu allows the player to choose which pathway they would like to take (see Fig. 2a and Fig. 2b), and the selected option will disappear after being clicked. Another example is a “pathway” menu during the closing dialogue, which provides players with options to either continue or conclude gameplay. These methods empower players to choose whichever path most interests them during gameplay. This enables the players to select the tone of the character they play, and guides them to their next game pathway (see Fig. 2c).

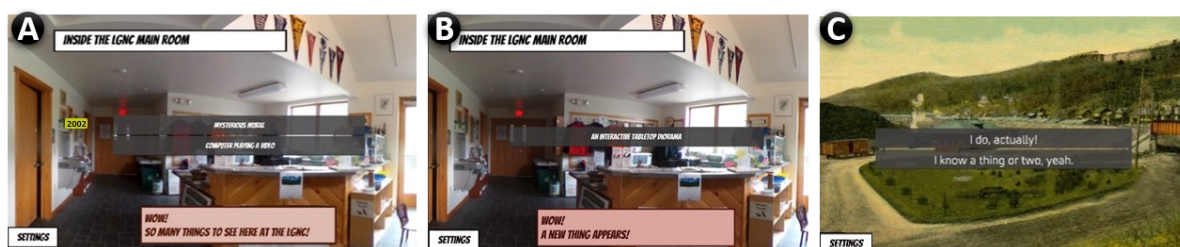


Fig. 2. (a)(b) Menu pathways for next step, (c) tone options.

3.2 The “Survey” Menu

In this menu dialogue, we rearranged the interface of the menu dialogue provided by Fungus. During the game epilogue, this menu prompts the player at two different times (see Fig. 3a). When the player hovers above

an option, it brightens and the other options dim. We use this method as an embedded game interaction strategy for data collection. Fig. 3b shows how we include Likert scale survey items as part of the narrative.

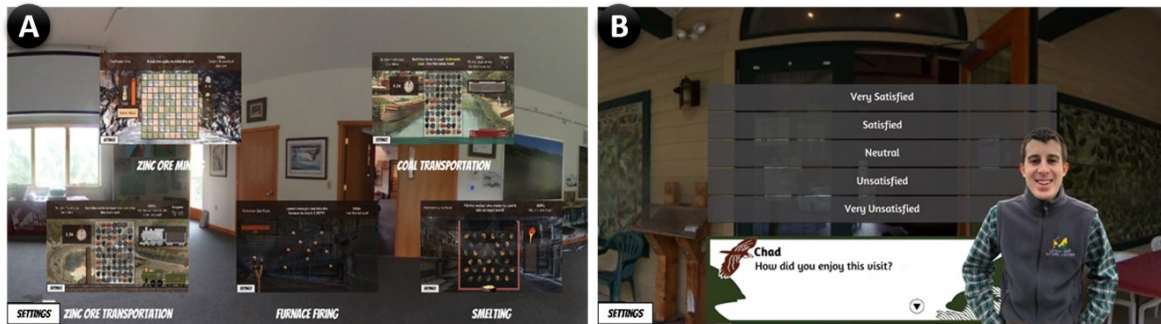


Fig. 3. (a) Favorite mini-game survey, (b) gameplay satisfaction survey.

4 Other Interactive Interfaces

The interactive elements embedded into the game (e.g., the interactive mural, the historic newspapers, and the closing dialogue) encourage players to further explore their immersive journey.

4.1 Interactive Mural

Players can trace the timeline by clicking through the panels to see the enlarged photos with related thumbnail text summaries. The interface allows users to magnify and retract text by clicking 'zoom in' and 'back' buttons. In 'zoom in' mode, the players can read the expanded text when hovering over the image, facilitating a seamless reading experience. Players can exit pictures using the "x" in the top right corner, then navigate to the subsequent years. As they click through the panels in order, players are presented with a visual transformation of nature, enhancing their understanding of the environmental recovery process. Besides the chronological viewing mode, the clickable information panels are also designed to allow free exploration of the three time periods at the player's discretion. Fig. 4 sequence illustrates such interaction dynamics. Yellow buttons were added to the information panels (Fig. 4a) to improve readability of their respective plaques. Each photo illustrates and describes important stages of the remediation process, including the years 2002, 2004, and 2008.



Fig. 4. This zoom feature allows players to toggle between images and text for comparative observations (b)(c).

4.2 Closing Dialogue

After players return to the present time, they find themselves again in the Lehigh Gap Nature Center. Then, players must choose from the options of receiving more instruction, preparing to leave the game, or engaging with the interactive 3D diorama once again. When players decide to continue exploring, it triggers a longer dialogue sequence that allows them to engage with information boxes to learn more. During this closing dialogue, players have more choice and agency. During our design discussions, we decided to refrain from including a clickable external website link in the dialogue to keep players engaged with the storyline and to minimize extraneous distractions.

References

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