FarmQuest: A Demonstration of an AI Director Video Game Test Bed

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Abstract

In AI director research, it is not straightforward for researchers to understand how each algorithm affects the player experience. This demo introduces FarmQuest, which is a new fully developed video game test bed to evaluate AI directors. This demo includes 3 different AI director algorithms in order to help researchers improve their intuition for understanding the differences between potential algorithms, and also provides insight on the framework required to author a new AI director. This test bed can support future AI director research by allowing for direct comparisons of new algorithms.

Introduction

AI directors in video games modify different parts of the game to try to provide a better player experience. Researchers interested AI directors face a common problem in evaluating their AI director. Many researchers build custom experiences to evaluate their AI director. (Thue 2007; Harrison and Roberts 2014; Giannatos et al. 2011; Yu and Riedl 2013). These test beds show off the proposed AI director, but do not always include other AI directors for comparison. This had made understanding the differences in experience each AI director provides difficult to understand.

In industry, AI directors are not formally defined, and often serve different purposes (Valve 2008; Tommy Thompson 2016) which makes straightforward comparisons difficult or impossible. Due to the ambiguity surrounding AI directors in published games, researchers cannot use published games as a common domain. It would be valuable for a researcher in this area to develop an intuitive understanding of the ways different algorithms affect player experience. This could help inform the researcher on what kinds of algorithms could potentially solve perceived shortcomings in the player experience, as well as support better experiment design.

This demo introduces PWR, a novel video game test bed for AI director research. The purpose of this demo is three-fold. The first is to introduce the video game as a way to support further research for AI directors. The second is to showcase the authorability of the PWR experience, in order to show how easy it is to add a new AI director. The third is to allow researchers to experience three different AI directors in a direct side-by-side comparison, in order to help
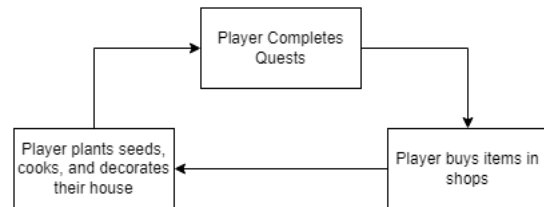
Figure 1: The game loop of PWR

researchers better understand the differences between each algorithm.

Player Experience and AI Director Options

PWR is a fully developed video game with an established game loop that requires the player to interact with the AI director. Figure 1 shows the game loop, where the player completes quests to earn currency to then buy items in the shop. These items help the player complete more quests. The main gameplay is farming vegetables, cooking recipes, and decorating the house. PWR is modeled after Animal Crossing: New Horizons (Nintendo 2020) because the Nook Miles+ quest system is a natural fit for an AI director (Yu, Guzdial, and Sturtevant 2021a,b).

Since quests are an integral part of the game loop, the quests that the player has to complete have the potential to have a large impact on the player experience. Players could be presented with quests they do not want to do, which could create a negative player experience. Conversely, players could be presented quests that are interesting to them, which could create a positive player experience. Thus, the problem for the AI director is to create a personalized experience by providing players with appropriate quests and hopefully create a better player experience.

PWR offers three different AI directors that players can use. The first is a random algorithm, which will randomly select three quests each in-game day. The second is a reinforcement algorithm that we have been working on as a novel AI director. This algorithm learns the player preferences based on the quests that a player chooses to do. The third is a version of PaSSAGE, an AI director that uses player actions to build a model and create an interactive story (Thue 2007). The original PaSSAGE chose branches of
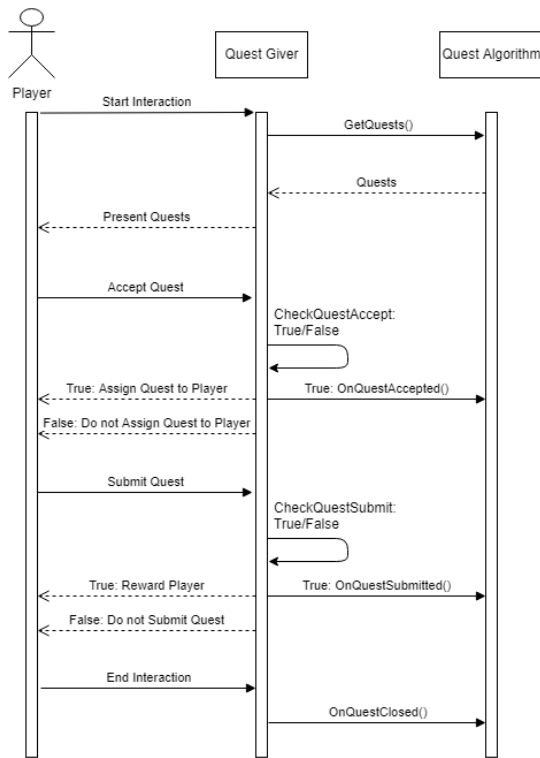
Figure 2: Sequence diagram of the interaction layers and the AI director layer

an interactive narrative based on player preference. We have adapted this algorithm to select a particular set of quests, treating the different quest options as narrative branches.

Players can use a menu to choose between which AI director they are playing. This allows players to understand any differences in player experience they might notice and attribute it to a specific algorithm. These baseline AI directors are intended to provide a broad understanding of the problem space, and can help inform other potential algorithms that can be used for AI director problems.

Authoring a New AI Director

This section discusses the architecture of the AI director in order to showcase how easy it is to add a new AI director. Figure 2 shows the sequence of events when the player interacts with a quest giver in the game. An example of a dedicated quest giver is the use of an NPC to give the player a quest, and the player needs to return to the NPC to complete the quest. The use of a quest giver is inspired by popular quest based games (Bethesda 2011; Bioware 2014).

There are two layers to this sequence diagram. The first layer is the interaction layer, which defines the allowed interactions with the quest giver. In this demo, players are allowed to do the following:

- Start Interaction: The player begins an interaction with the Quest Giver
- Accept Quest: The player accepts a quest that they are going to complete

- Submit Quest: The player submits a quest that has already been completed
- End Interaction: The player stops an interaction with the Quest Giver

In the interaction layer, a player can reject a quest by not accepting it in the menu.

The quest giver is an in game object and acts as a intermediary between the AI director and the player. The quest giver does not contain logic for selecting quests in order to facilitate the addition of AI directors. The job of the quest giver is to validate the actions of the player, pass relevant information to the AI director, and present quests to the player. The quest giver does the following:

- Present Quests: Show the quests to the player
- CheckQuestAccept: Check that the player has the ability to accept the quest, and returns true or false
- Assign Quest to Player: Creates a quest object, and adds the quest to the player
- Can not Assign Quest to Player: Tells the player the quest cannot be accepted
- CheckQuestSubmit: Checks if the quest is completed and can be submitted
- Reward Player: Gives the player the reward for successfully completing a quest
- Can not Submit Quest: Tells the player that the quest cannot be submitted

Finally, the second layer defines the processing layer, where the quest giver gives the AI director the information to compute which quests the AI director should provide. Each AI director extends an abstract class, and additional AI Directors can be added by extending this class. The functions are defined below:

- GetQuests(): ask the AI director for quests
- OnQuestAccepted(): notifies the AI director which quests were accepted
- OnQuestSubmitted(): notifies the AI director that a quest has been submitted
- OnQuestClosed(): notifies the AI director that the player has stopped interacting with the quest giver

Conclusion

This demo introduces PWR, a new video game test bed for AI director research. This test bed features a complete game loop where the player must interact with an AI director through the quest giver. This demo features three different options for AI director, in order to allow the player to develop an understanding of the differences between AI directors. Finally, this demo showcases the structure to allow for the addition of new AI directors.

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