Complex game world simulations with simple and abstracted player interaction

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ABSTRACT

Context: Games with complex game world simulations often have a lot of depth but can suffer from a steep learning curve and therefore can be less accessible.

Aim: To explore ways that player interaction with complex game worlds can be abstracted to make playing the game simpler and more accessible while maintaining as much depth as possible.

Method: Create a simulation sandbox game simulated at the level of individual characters. Create two different systems of player interaction, one allowing the player to control individual elements of the game world and one giving the player more limited abstracted controls on the level of setting general policies.

Results: Qualitative data will be gathered via user testing with a survey that asks specific questions about how engaging the experience was, how well the player understood what was happening and what they had control over, and if they felt frustrated / overwhelmed and if so to what degree. Quantitative data will be gathered from the user testing as well. Performance metrics of the final artefact will also be assessed.

Conclusion: The project will attempt to determine if pairing a complex game world simulation with a player control system limited to a simpler more abstracted layer can make the game more accessible and comprehensible while still preserving the depth that the complex game world provides.

Keywords

Game design, game worlds, simulation, abstraction, limited player control, AI.

1. INTRODUCTION

The level of complexity in a game is often thought of as something to be minimised in a tradeoff with depth (Harkey, 2014a). More detailed game worlds allow for more, and subtler, interactions which can easily add a lot of depth. And games will typically get player input at the level of detail at which the game world is simulated, with more complex game worlds naturally having more, and more complex, avenues of player interaction. This can overwhelm a player, particularly a newer player, and be a significant barrier to entry.

Dwarf Fortress (Bay 12 Games, 2006) is a good example of a game with an extraordinarily complex and detailed game world simulation which asks the player to interact at roughly that level of detail and is notoriously hard to learn as a result.

Crusader Kings III (Paradox Development Studio, 2020) is another example of a game with numerous complex and interacting simulation systems each of which the player is expected to engage with at a detailed level simultaneously. Consequently, it is a difficult game to pick up.

This project intends to explore pairing a detailed game world simulation with higher level, more “abstracted”, and relatively simple mechanisms of player control. And examine whether it is possible to preserve most of the depth of a more complex game world without having an equally complex layer of player interaction.

1.1 Aim

To design and develop a detailed game world simulation with two systems of player interaction, one consisting of simple and abstracted levers of player interaction, and one giving the player more direct control. This project will attempt to evaluate how effective the first system is at keeping player interaction simple, engaging, and accessible while still gaining depth from the detail and complexity of the game world in comparison to the second system.

1.2 Objectives

- Research and compare methods of constructing complex game worlds.
- Design two separate systems of player interaction for the sandbox simulation, one giving direct control of elements in the simulation, and one providing more abstracted controls
- Investigate how the systems of player interaction can be best implemented.
- Incorporating the above select compatible approaches for the construction of the game world and the two player interaction systems
- Construct a prototype sandbox simulation showcasing a complex game world simulation with the two distinct systems of player interaction
- Review the success of the selected approaches on relevant performance metrics and with respect to general development principles
- Use user testing to analyze the effectiveness of each system in terms of depth, simplicity, accessibility, engagement, and comprehensibility
- Assess the effectiveness of the more abstracted player control system at being more accessible and easy to understand without obscuring from the player the depth and detail of the game world simulation or compromising too significantly the player’s sense of agency

2. BACKGROUND

This section explores relevant literature on simulation games, the interface of complexity and player control, and theoretical work on abstraction in games. There isn't much literature on the specific topic of simplifying and abstracting the player interaction layer of a game with a complex game world simulation.

2.1 Complex Simulation Games

2.1.1 Dwarf Fortress

Tarn Adams, creator of Dwarf Fortress (Bay 12 Games, 2006), has four guiding principles for the game world simulation in Dwarf Fortress.

He lays out his four principles in an article in Game AI Pro 2 as:

1. Don't Overplan Your Model
2. Break Down and Understand the System
3. Don't Overcomplicate
4. Base Your Model on Real-World Analogs

(Adams, 2015)

When talking about principle three Adams warns against simulating the game world more than one layer below what the player sees. At first glance that may sound like advice that runs counter to the goals of this project. In this context, the idea is not to simulate the game world below the level that the player can see but instead to abstract player interaction to several levels higher than what they can see.

2.1.2 Crusader Kings III

Many of the game mechanics and simulation systems in Crusader Kings III (Paradox Development Studio, 2020) are much more abstracted than those in Dwarf Fortress. But they are still exceedingly complex and the player is expected to follow and engage in parallel with several different systems at once. This can be very overwhelming to a new player,

2.2 Complexity and Player Control

For our purposes complex games can be thought of as modelling an analogue of a slice of the 'real world', they are "designed to function by operating a partial set of formal rules" (Glean, 2005). The rules are not trying to simulate all the rules that exist in the real world. "Instead, they operate on a chosen subset of rules that will govern cause and effect or action and reaction within their complex worlds." (Glean, 2005)

Player control can be defined as "the extent to which a player's actions help to determine the outcome of the game" (Harkey, 2014b). More detailed control of a game's world clearly means more player control, but at extremely detailed levels of control the things the player is making choices about may have so little impact overall that the individual actions feel meaningless.

Complexity can sometimes be a burden on a player's feeling of control, particularly when the ratio of depth to complexity is low. "By decreasing the cognitive burden on players while increasing their opportunity to make interesting decisions, a game will become simpler to balance, more enjoyable to play" (Harkey, 2014a). Harkey, who talks mainly about board games here, recommends eliminating mechanics with a bad depth to complexity ratio. While that may sometimes be the right call for video games as well, the approach in this project of abstracting the player interaction side of a mechanic to a higher level may work as a way of preserving what depth is there while mitigating the complexity.

2.3 Abstraction

Abstraction in games can be thought of in terms of four dimensions of abstraction: the physical, temporal, attributional, and construal. Accordingly, regarding the abstraction of elements, occurrences, attributes, and connotations. These dimensions can be further divided into two "modes" proximity (imposing limits of resolution), and structure (imposing aggregation). (Klein, 1985)

3. METHOD

This project aims to create a simulation sandbox game simulated at the level of individual characters. Two different systems of player interaction will be created: one allowing the player to control individual elements of the game world, and one giving the player more limited abstracted controls on the level of setting general policies.

Qualitative and quantitative data will then be gathered with user testing and additional quantitative data will be gathered on the performance metrics of the final artefact. These data will then be evaluated in a comparison of the two player interaction systems.

3.1 Sandbox Game Concept

The specific idea is to create a very small kingdom simulated at the level of individual characters of various professions perhaps making up "guilds" interacting with each other and a natural environment in a small but complex "economy".

The more direct system of player control will give the player direct control over some elements of the simulation, potentially including the placement of roads, buildings, and fortifications; individual military, and civilian 'units'; and any other mechanisms of direct control of the simulation that seem sensible.

The more abstracted player interaction system will give the player actions like setting the funding available to maintain roads, levying taxes, directing for guilds to be established or abolished, directing broad areas of focus and perhaps choosing leaders for guilds and/or the army.

3.2 Building the Sandbox

The sandbox will be built either in C++ making use of a library such as SFML, or using C# in a game engine such as Unity or Godot.

The early stages of development will be about exploring the options and approaches available and selecting appropriately based on criterion of scope, familiarity, versatility, and effectiveness.

One option is the BitBang framework, a C++ AI library based on an agent-based conceptual model (Menezes, Baptista, and Costa, 2006).

3.3 Building the Player Interaction Systems

One of the most major considerations when selecting an approach to building the simulation is facilitating the creation of the player interaction systems.

For the more direct system of player control, it will need to be possible for player input to directly affect the individual elements of the simulation. This would include the ability to override the behaviour of individual agents in the simulation.

For the more abstracted player interaction system, the simulation will need to be constructed such that player input can affect or set the general rules that agents, and non-agent simulation systems, follow.

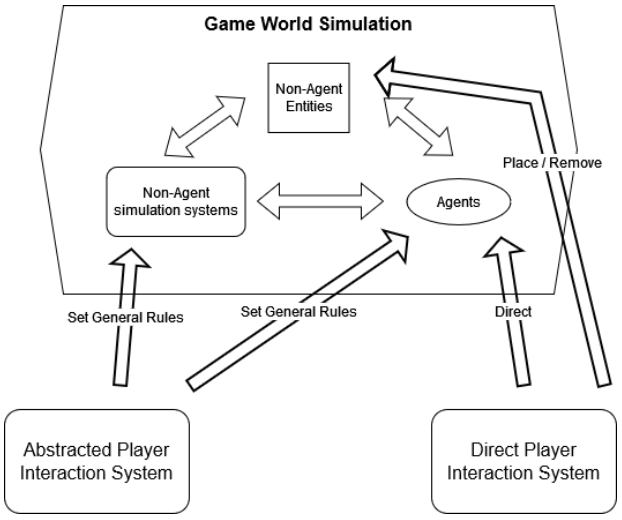

Figure 1 – Diagram of the relationship between the game world simulation and the two systems of player interaction.

3.4 User Testing

User testing will be done by either randomly assigning one of the two systems of player interaction, or by getting testers to test each system in turn in a randomised order. After playing the game for a certain amount of time, perhaps being told to simply explore or possibly with a concrete goal to work towards, testers will be presented with a survey.

The survey will be constructed that asks questions such as how engaging the experience was, how well they understood what was happening and what they had control over, and if they felt frustrated / overwhelmed and if so to what degree.

An investigation into the best way to construct the survey will be undertaken to determine the exact questions and what form they should take (open ended, statements with a scale of agreement, multiple choice).

In-game metrics about player behaviour will also be gathered by the game itself, which may be especially helpful in understanding the experiences of any remote user testing.

3.5 Performance Metrics

The project can also be assessed in terms of the performance metrics of the final artefact. What metrics are relevant should become clear by the time of the feasibility prototype.

3.6 Results Evaluation

The survey results and in-game behaviour metrics will be collated together and compared according to the system of player interaction tested.

These data will be used to evaluate if the more abstracted player interaction system achieves the goal of making the game more accessible and easy to understand without sacrificing too much of the player's control or agency, as well as without obscuring from the player the depth and detail of the game world simulation itself.

4. SUMMARY

The project will attempt to determine if combining a complex game world simulation with a simpler more abstracted player interaction system can achieve a preservation of depth from the complex game world while providing a more accessible and comprehensible experience

The results of this project will hopefully be of interest to anyone with an interest in developing complex simulation games with a good depth to complexity ratio and that are more accessible to new players.

5. REFERENCES

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