How Does Visualising RRT Pathfinding in an NPC Effect the Perceived Intelligence of the NPC?

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***Abstract*—The abstract goes here.**

I. Introduction

INTRODUCTION section

The research questions proposed in this project are: how does visualising RRT path finding in a Non Player Character (NPC) effect the perceived intelligence of the NPC in digital games? and how does visualising RRT path finding in a Non Player Character (NPC) effect the way players navigate a level of game?

The project will look at different methods of visualising RRT path finding to investigate what effects that can have on how the player plays the game and explores the level. Previous papers have researched visualising Artifical Intelligence (AI) and foregrounding AI but not at what effect this has on how the player play the game.

A. Hypothesis:

Null: Visualising RRT has no effect on how the partcipant plays a level of game.
Hypothesis: Visualising RRT has a significant effect on how the partcipant plays a level of game.

II. Literature Review

A. Visualising Data and AI

AI is frequently used in digital games. However, Treanor *et al* say that the AI is often designed to fit the game and is therefore rudimentary??? [1]. They suggest a series of design patterns that foregrounds AI in games. .... They surveyed many games that foreground AI and proposed design patterns for different methods of foregrounding AI. The two design patterns of interest for this paper are AI as a Villian and AI is visualised. The design pattern "AI as Villian" is where the enemy's AI is trying to create an experience instead or out right defeating the player. This related the this paper as the visualising of RRT is not to find a way to find the player but to give the player a way to predict or interpret what the Ai is doing and therfore overcome it. Another design pattern of interest is "AI is Visualised". This pattern involves visualising the AI's state and decision making. This is normally hidden from the player but this design pattern looks at making a mechanic from visualising it. The example given by Treanor *et al* is Third Eye Crime. Third Eye Crime is a game that followed the "AI is Visualised" design pattern [2]. Third Eye Crime displayed the enemy's path finding to the player using Occupancy maps. This was designed to make the player want trigger the mechanic ... Again this paper will also use this design pattern by visualising the NPC's pathfinding. The RRT pathfinding will be visualised in different ways.

While Haworth *et al* do not visualise an AI process they do visualise the possible decsision in a game on a tree structure [3]. They research visualising decision trees in a game to see what effect it had on children's analytical reasoning and game play. While they did not come to any definite conclusions their results suggested that data aided players in playing the game as in later level the children struggled to beat the game without the visualised tree. However, an issue they noted was that the game could be unbalanced at the end making the usefulness of the tree being questionable.

A further issue is that Haworth *et al* only tested the tree in a relatively simple 2D game that was tested on children. This does not give any data on 3D games on the market??? In contrast, Isla's visualised pathfinding in Third Eye Crime is on sale?? (Word it better) [2].

Like Haworth *et al*, Bauer *et al* also research visualising tree structures [4]. However, they did use an AI technique, they used Rapidly-Exploring Random Trees (RRT). They used RRT in level design tools to predict possible moves the player could make. They then used a clustering algorithm to organise the tree to make it legiable?

B. Pathfinding

In digital games the A* path finding algorithm appears to be the most widely used [5].

Third Eye Crime [2] visualises enemy path finding as the main mechanic. Isla uses occupancy maps this does not produced an exact path but shows the probability of the players being in an area.

Algfoor *et al* surveyed numerous papers on path finding.

Wang and Lu looked at path finding in 3D while the paper applied to planes it may be relevant here... [6]

PAPER ON RRT

III. Methodology

The methodology that will be used to seek the answers to the proposed questions will be play testing and questionnaires. This will require human partcipants to play the game and fill in the questionnaires.

A. Playtest Variations

A-B testing!!! There will be mulitple variations of the game. The first will have no visualiation the NPC will use pathfinding to patrol the level but the will be no visualisation to indicate

what it is doing. The second variation will have a visualisation of the RRT pathfinding in front of it. While the RRT will be used to pathfind in a large area on a small area will be visualised in an attempt to not confuse the partcipants. The third variation will also have visualised RRt pathfinding but instead of a visual tree it will be environmental queues that give the partcipants clues to where the NPC may go.

While the participant is playing the game will export their location to a CSV file every second for use in R. There will also be a questionnaire for the participants to fill out after completing the play test.

B. Preliminary Results

What preliminary results have you obtained? None??

IV. Conclusion

The conclusion goes here.

References

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