Ai unit behaviour for rts games

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Introduction

In this project I will be using a point of interest based system to use for ai units in rts games. The goal is to make units appear to have a mind of their own and be able to make certain decisions based on surroundings. This system will help make games feel more alive and with further development could be integrated to help set up narrative actions.

Rationale

I have chosen this project as I play a lot of rts games but often feel that the immersion is taken away a bit when your attention goes elsewhere and your units just stand their getting fired at by enemies outside their range. I feel that units being able to do at least some thinking for themselves would help immerse the player more while playing the game. A good simple example would be in the total war games where the players units will retreat when morale is too low which makes battles more believable and immersive.

I believe that further development on the behaviour of units could benefit not only gameplay but narrative storytelling as well. As long as the players keeps the main control over the orders the units have so not too much control is taken away from the player.

I have decided to use unity for this project as unity is an engine I am familiar with and will ease the development of this project.

Areas for investigation

For this project I will be researching ai pathfinding and decision making for the gameplay. This is because the ai will need to pathfind to go to their destinations. They will also need decision making as with nearby points of interest they will need to figure out if points are important enough to break their appointed position to go to.

I will also be researching crowd simulation as when there are lots of units on the field at once they will have to try to avoid colliding with each other. I will be looking into tutorials and documentation for unity to see if there are functionalities i can use to further assist the production of this project. For example if i find out how to use unity's in built pathfinding i can use it as pathfinding isn't the main focus of the project.

Background research

I know that unity has in built pathfinding and raycasting, I will use this to set up the base rts level that will use the ai. The raycasting can be used to select units and give them a point to move to and they will use the pathfinding to navigate to the chosen point.

Literature review

Matthews et al. (Matthews, Charles, Porteous and Mendas, 2017) demonstrates a system where actors go towards points of interest. This sets up narrative actions within a crowd. I am adapting the points of interest to work in this system that I am developing for the ai.

Sizer (Sizer, 2018) discusses various applications of ai. I am mainly focusing on the decision making and awareness of the ai. I will be implementing a state machine to test if the ai is idle before conducting any tests for the nearby surroundings. This article also features influence maps which gives a rating on areas surrounding the actor which displays how safe the area is. This article also links some useful books that I intend to check out.

Methodology

I will be implementing a point of interest system which the ai will use in decision making on where to go and what to do. The points of interest will be things like enemies and friendlies as well as useful objects like cover that will provide a defensive buff to the unit. The points of interest will have a base rating which will be affected by various factors with the main two being if there is an engagement going on and distance from the unit.

The units will have a radius around its set position set by the player and will also only act on its own when not getting orders from the player. This way the player doesn't lose control and can still keep track of where the unit is and what they are doing. This also allows the player to set orders they feel are more important than what they see the ai is doing. The units will use unity's in built pathfinding to move around and raycasting will be used to allow the player to select units and tell them to move somewhere.

The ai will use a state machine to test if the unit is idle. If the unit is idle then they will continue to test all the nearby points of interest to decide whether or not to perform actions by themselves and what actions they will be doing. If the point of interest is no longer as important the unit will move back to its original position.

I have decided to use the iterative methodology over waterfall as this isn't the biggest project and I am working on this on my own. Since I'm not in a team even though the project isn't the biggest i would still need to consider that parts of development can go wrong. With the possibility of getting unwanted results during development I plan on using the iterative

development to appropriately plan and implement the different aspects of the project without too much issues blocking the development.

I feel that if I went for the waterfall methodology I would be constrained to my planning when implementing which would be good if i had a set plan that isn't going to change at all. I feel i would want more freedom to plan actions when issues arise as especially since i'm not in a team I believe issues are more likely to arise which I would want to take a step back and plan out how to conquer said issues.

Research ethics

Since units will be shooting at units on an opposing team if i get model's in for the project i will try to use robots. That way the project will not be displaying any ethical groups as "the bad guys" and will also not display shooting at people. With this addition, the game will not be promoting real life violence.

During my research and development of the project I want to make sure that I don't copy code. I can adapt code that i find so that i'm still doing what the code in question is doing but not straight up copy it. This way the project coder will still be my work and i would also be able to gain an understanding of how said code would work which also helps if I do debugging.

Project plan

Week 1 I will finalise the initial planning and start implementation of the project in unity. I will also set up the GitHub repository to use as source control. By the end of the week I will have a small scene ready to sta5rt the main development in.

Week 2 I will start implementing the basic rts functions of selecting a unit and telling them to move somewhere. I will also add in game objects to act as cover to be implemented later on.

Week 3-5 I will implement the points of interest system which will keep track of the points of interest around the map. I will also implement the weighting checks and assignment of points to be used by the ai.

Week 6-8 I will implement the idle decision making of the ai to judge the points of interest and decide whether it is worth acting upon any of the points.

Week 9-12 Will be for testing and improvement of the project. Based on time remaining at the end i may add more features and behaviours of the ai.

Project deliverables

The aim of this project is to make a program displaying that units could be a bit more dynamic in rts titles. It will be a unity standalone executable file that can be run and played. In the program, I will have a player team of units and an enemy team of units. I will also have cover that the units can decide to use for a defensive boost.

The project will be a unity standalone executable so users can just run the project and play a simple rts level that would be able to demonstrate the ai's capabilities.

References

Matthews, J., Charles, F., Porteous, J. and Mendes, A., 2017. MISER: Mise-en-scène region support for staging narrative actions in interactive storytelling.

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Sizer, B. (2018). *The Total Beginner's Guide to Game AI*. [online] gamedev.net. Available at: https://www.gamedev.net/articles/programming/artificial-intelligence/the-total-beginners-guide-to-game-ai-r4942/ [Accessed 30 Jan. 2020].