

Research Report

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I would like to Thank the following people who assisted in completing this project below:

- Oisin who kindly taught us about the different behaviours of AI, as well as the different types of AI
- Michael Rainsford Ryan who helped me learn and understand Godot
- Youtube for its small amount of tutorials on how godot works
- Google for its variety of articles helping me understand this topic

Project Abstract

Replace this text with an appropriate Project Abstract.

This section should introduce the problem domain and clearly identify, justify and explain the solution(s) chosen. Care should be taken to ensure that the summary clearly demonstrates the writer's expert understanding of the problem domain.

Project Introduction and/or Research Question

Chosen Idea: Game in Godot Engine

My idea is to make a game in the godot engine. I chose this because it appealed to me. The game I decided to make is a 3D puzzle and horror game with different AI behaviours. This combines two different genres as well as mixing all the different kinds of AI behaviours there could be.

The different kinds of AI behaviours that I chose were: Wandering, flocking/swarming and finally pathfinding. And the Genres i chose was puzzle and horror. **Wandering** AI is an AI that will roam around aimlessly. **Pathfinding** AI is an AI that will find the shortest route to the target(player). And finally the last behaviour is **flocking/swarming**. This AI moves together in a herd or a swarm and if one AI is on its own it will move towards the herd of AI and they will all move in unity.

I chose this project because I decided to challenge myself by figuring out which AI works best with what genre and figuring out how to combine both genres in a way that suits the AI.

Research Question (Gameing): What is the different types of AI behaviours a game can use, and how to incorporate it into a mix of genres ? :

The different types of AI behaviours are Flocking/Swarming, pathfinding, wandering, seeking, avoiding, learning. Each one is different. Flocking and swarming make the AI group together and move together all the time, if an AI is alone and another one is in the AI's range then it will move towards it and stay together, Pathfinding is when an AI will find the shortest way to an object or player, Avoiding is when the AI at all costs will move away from the targeted object, Seeking is where the AI goes towards the object in any path and not looking for the shortest one, wandering is when the AI moves about aimlessly, and learning is where the AI learns how the player acts or how the game is played.

The way to make these behaviours work with a mix of genres is to decide which ones work best with what genre or more. For example, for puzzle and horror a pathfinding AI would suit as it makes for a heart racing feel when trying to complete a puzzle knowing the AI will constantly be following you.

Additionally some AI don't have a great mix of the other genres and example of this is the Avoiding. Although it makes for a great puzzle to try and complete, it doesn't fit in with the horror feel as it isn't trying to hurt you in any way or present any horror aspects.

In order to make some AI that works well with one genre but not the other would be to tie in some aspects of the horror into the avoiding AI by using sound effects and lighting in order to compare the two.

The main contributions to the project was me figuring out how to do the 3 AI I chose (pathfinding, flocking

swarming and wandering) with the 2 genres(horror and puzzle).one of the contributions of the project was the level design. This took a long time to do as I needed to create an atmosphere that works well in both environments.another contribution was the flocking AI. This took a very long time to figure out as it wouldn't work well in 3D rather than in 2D.And my final contribution to the project was the pathfinding AI. This took a long time to figure out in godot, and how to make it use the nav mesh tool so it doesnt fall off the edge of the map when looking for the player.

Literature Review

[AI for Game Developers \[Book\] \(oreilly.com\)](#) is my literature.this book really helped me understand the different types of AI and how they work.i found some elements of this book really interesting.

- This book helps me understand the different types of AI such as flocking and pathfinding. and by letting them use finite state machines in order to change between attack and idle.
- The flocking element briefly and excellently goes over the 3 main things like chose **Cohesion**:Have each unit steer toward the average position of its neighbors.**Alignment**:Have each unit steer so as to align itself to the average heading of its neighbors.**Separation**:Have each unit steer to avoid hitting its neighbours.In chapter 7 it goes over the A* algorithm for the pathfinding to work, and trying to use this in the project was A Challenge.

Evaluation and Discussion

Project Milestones

- A project Milestone for me was doing the first level of my Game before the first Demo and starting the Second game's code before.
- Completing all of my AI before the final code demo was due
- Finishing the 2nd game along with the save and load feature of my game before the 2nd demo.
- Having the layout all finished by the 2nd demo, for the game.
- Another project milestone I have is my first 3D shader on the environment to make it have such a horror aspect to it.
- My last project milestone was finishing my 3 puzzles in time for the final demo all with win/lose conditions.

Major Technical Achievements

- I learned how to use Godot Game Engine in both 2D and 3D engines.
- I learned how to use the type of code GDscript in the engine
- I learned how each of the different kind of nodes work in the engine and their usage in my project
- I learned how to use the grid map in the engine in order to make the different kinds of levels represented in my project.
- I used the Nav Mesh in order to make the AI not fall off the level itself.
- And my final achievement that i feel i learned is the 3D shaders in godot in order to make the environment seem appropriate for my type of game.

Project Review

The project went right and wrong in many aspects. The project went right by the AI standards, each AI was

difficult to code and learn but all the AI worked the way they should. Another thing that I feel went right with the project was the layout of my levels. Each level is different from the other whether it be in a 2D or 3D environment. But there are some aspects of the project that went wrong, an example of this is my time management at the end of the deadline. The time taken to make some of the AI took longer than expected and it caught up in some of the time taken to improve the game's design and feel towards it. There are many things left to do in the game itself that didn't make it into the final demo. One of these things is the Animation of the game, the original plan was to incorporate the animation of the player and the enemies to look like humans and monsters lurking within the castle. Another example that didn't make it into the game was the final boss/ending. The ending didn't make it in the game itself, the boss was supposed to be revealed once the player got all the gems and a fight was meant but with the time management i couldn't put it into the final draft. If I had to start the project again I would have done a few things differently. One of those things would be the level designs. I feel that i could have managed a lot easier if i had done all the levels first, and then go into the AI as i feel that this took a significant amount of time finding/making the correct design for each level and placing them into the project itself. Another thing i would have done different is the Game Sound Effects. The Sound effects in my project are very limited and can not be altered by the player in any way, I would have added way more into this. The advice I would have given to anyone in doing this project is to challenge yourself to new ideas, but don't over complicate the project idea you have chosen. Enhance your technological skill either with a new engine or learning a new AI type. And to place lots of research into your idea before choosing to understand what your skill level is at. My technology Choices i feel were correct and the reason for this is because i work way better using the

windows tool rather than using the linux tool. And I feel godot was a right choice as it enhanced my skills in figuring out other engines if required to be needed for a certain project or idea.

Conclusions

In conclusion of my project idea, I feel like I had a great time learning about different genres and about all the different AI used in video games today. Researching on youtube and on websites as well as reading about the technique used to tie the chosen genre together so that each works in harmony instead of clashing. For example for the puzzle and horror genre, in order to make those work you can include different enemies and sound effects to create that spooky atmosphere, while having the player solve a difficult puzzle.

Future Work

If a student were to take on this project Idea, some future steps to take would be to know what your game will be about before you start coding. Discover the Genre you want to do whether it be combining genres or just the one. Also another future step to try is to spend some time learning how godot is used by watching some tutorials about it first and deciding which is best between 2D or 3D, And my final future step would be to choose 2D as the engine has a wider range of nodes and tools to use for a 2D style game.

References

Appendices

Replace this text with Appendices.

This might include ethics application and other relevant material e.g. copy of any questionnaires used.