Final Major Project - Project Proposal

# Overview and Background

For this project, I intend to create an AI system, that allows agents to look after themselves based off needs.

The Game surrounding this, will be a very basic settlement builder, where the player can line up jobs that they want doing, either building Houses, storerooms, and farms, or collecting wood, stone, and water. The focus of the project will be the settlers, who will choose a job and then carry it out, while also taking care of their need to eat, drink and sleep.

What I want to achieve from this project is a way to demonstrate my ability to create a system that controls agents based of some input from a player to create seemingly realistic behaviour, as well as demonstrate this in a game-like environment, that I intend to further flesh out in the future.

# Aims

The Aims of this project is to make an AI system that can account for the basic needs of its agents, while also carrying out a given task from an outside source (The player). I would also like to add some very basic settlement building mechanics to add gameplay and intractability

# Initial Objectives

My first objective for this project is to research what the most appropriate algorithms for this project will be. Given some brief research I did for AI for video games I feel Goal Orientated Action planning is what I want to use, but further research into it and other potential algorithms is needed before I commit to this. I would also need to research into what has made similar games successful, such as Banished, Castle Story, Dwarf Fortress and Age of Empires; The original inspirations for this project.

Additionally, I want to look for a game engine that I would want to develop this project in, as well as appropriate formats. Most games of this genre (such as the ones mentioned above) are top down 3D environments, however I feel that to keep the scope of this game tighter, and how I’m not focusing on environments, I intend to be top down 2D instead, reducing unnecessary workload.

Once research is complete the first thing I intend to implement is the needs system, so that agents need food water and sleep to not “die”, I then need to implement actions that the agents can perform to attend to those needs, going to a house to sleep, and a storeroom to eat and drink. Once those two systems are in place, I will then be able to create an AI system that the Agents can use to keep themselves healthy. Finally, I can work on adding all the building and gathering jobs as well as Agents picking them up and adding them to their current Needs.

# Research results

## Villager AI

I decided to widen the scope of my research topics for the villager AI and explored State machines, AI Agents, Goal Orientated action planning, behaviour trees, and decision trees. While GOAP was my original preferred choice, research into alternatives showed that either Goal Based AI Agents or state machines might be the better choice.

## Engine choice

I researched Unity, Unreal engine, as well as Defold, as engines to consider using, but ultimately decided that my experience with Unity being so much higher than any alternatives that it was likely going to be the best choice for me.

# Project Specification

# Work breakdown structure

# Appendices

# Relevant literature and Similar games

<https://banished-wiki.com/wiki/AI>

Here the developers of a game Called Banished, one of the inspirations for this project, talk about how they achieve the behaviour of their settlers, their approach uses state machines to achieve their behaviours

<https://gamedevelopment.tutsplus.com/tutorials/goal-oriented-action-planning-for-a-smarter-ai--cms-20793>

This is an article and tutorial on the benefits of using Goal Orientated Action planning in Unity, which is my initial idea for what algorithm to use and which engine to use.

<http://www.squeakywheel.ph/blog/2017/2/6/goap-for-our-new-game>

An article from developers of a game and how they’re using GOAP

<http://store.steampowered.com/app/242920/Banished/>

Banished, one of the major inspirations for my project

<http://www.bay12games.com/dwarves/>

Dwarf Fortress, another big inspiration for this project

<http://store.steampowered.com/app/233450/Prison_Architect/>

Prison Architect, a game that uses a similar AI system to the one I intend to use, implemented using GOAP

<http://store.steampowered.com/app/227860/Castle_Story/>

Castle Story, a game that uses the concept of assigning a job to no particular agent and it simply being picked up by one and achieved

http://theory.stanford.edu/~amitp/GameProgramming/AStarComparison.html

an in depth look at A\* search, which if I use GOAP I will likely need for traversing and creating action plans.

<http://web.cs.du.edu/~sturtevant/ai-s11/Lecture03.pdf>

Lecture notes on decision trees and FSM’s in games

<https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_agents_and_environments.htm>

Article on the basics of AI agents and their different types

<https://en.wikipedia.org/wiki/Intelligent_agent>

Wikipedia article on AI agents

<https://hackernoon.com/rational-agents-for-artificial-intelligence-caf94af2cec5>

Article on the concept of AI agents

<http://gamedevelopertips.com/finite-state-machine-game-developers/>

Introduction to state machines from the perspective of game development, with brief look at behaviour trees and how they’re an alternative

<https://medium.com/the-unity-developers-handbook/dont-re-invent-finite-state-machines-how-to-repurpose-unity-s-animator-7c6c421e5785>

Using Unity’s in-built FSM

<https://www.pcgamer.com/the-best-2d-game-engines/>

Article on Game engines worth looking into

<https://www.defold.com/>

Game engine