AIN - Battle Royale Agent Design

A PROJECT REPORT

submitted by

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Abstract

The goal of this project is creating an agent that interacts with other agents in a multi-agent system. Its goal is to be the last survivor in a free-for-all battle royale in a *pygomas* environment. The following is a description of the strategy implemented using ASL and Python.

The general concept of the agent is a state-based fight-or-flight survivalist. Its main goal is to survive in a hostile environment. We will use an agent framework to implement a way to perceive the environment, some kind of deliberative decision-making, and the resulting actions taken by the agent.

1 Strategy

In order to describe the strategy we want our agent to follow, we must first specify the environment in which it will interact. Based on a set of core assumptions, we will develop the strategy in detail.

1.1 Environment

The environment consists of a roughly 250x250 arena with a central walled-off area with an entrance point in every corner. This central area has 4 passive and immortal agents, 3 fieldops and 1 medic. All hostile agents are evenly spread around the map simultaneously. These agents have 100 health, 100 ammunition, and deal two damage per shot with a 10% chance to miss.

1.2 Behaviour

The general intention of our agent is to try to reach the center and dominate it in a way that isn't self-destructive. It will back off if it feels threatened and try to find ways around threats. We are effectively implementing a fight-or-flight system.

1.2.1 States

Centralizing. The agent attempts to reach the central area. While doing so, it looks around itself to keep track of potential threats.
Fleeing. The agent uses its mental image of the environment to try to get as far away as possible from threats.
Fetching. The agent attempts to reach a health or ammo pack.
Attacking. The agent aggressively pursues a target until killing it, running out of ammunition, losing track of it, or reverting to another state due to survival

priorities.

Reset. The agent has failed a previous objective or has been idle for too long, it reassesses the situation and transitions to another state.

In general, the priority of states is the following:

Reset < Centralizing < Fetching(ammo) < Attacking < Fleeing < Fetching(health)

The transitions between these states are complicated, but we can generally use the priorities above to say that the agent will try to follow the highest-priority target that is possible and useful. For example, if the agent knows of a health pack and isn't full health, it will try to seek a health pack.

1.3 Memory

In order to effectively implement certain systems like optimal flight, we need to have a representation of objects outside our field of view. In order to achieve this, our agent has persistent memory controlled by its PERSISTENCE constant.

A tool to dynamically visualize this memory was created as well using *pygame*, the following is an example of the agent's memory in the middle of a battle.

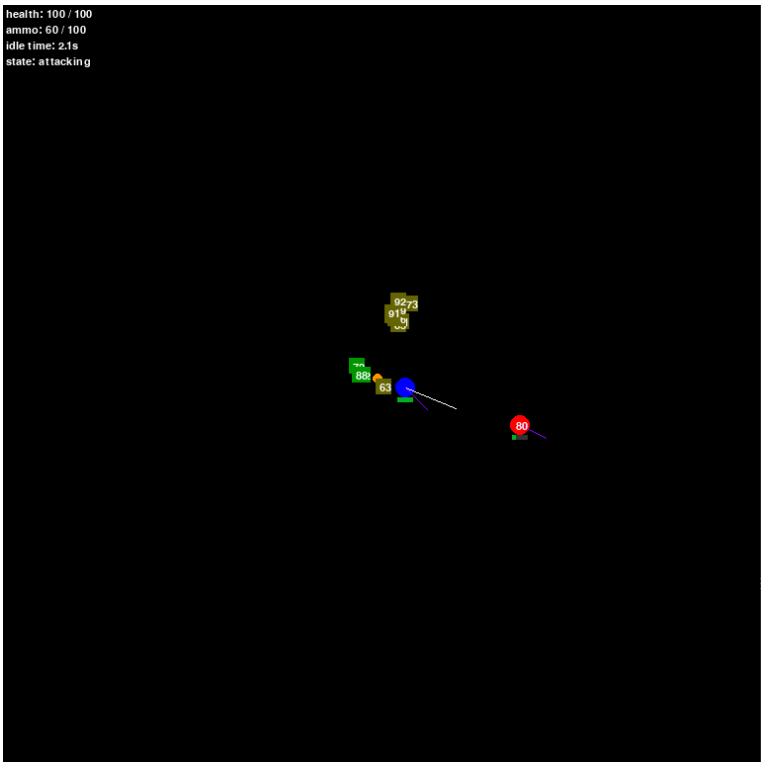

Figure 1: A representation of the *survivalist*'s memory state.

2 Conclusions

After repeated testing, this agent seems to do considerably better than the random agents that simply patrol and shoot all targets. If it manages to survive the first few seconds of combat (where it can be immediately killed off with no chance to flee) it is almost guaranteed to reach the center, where it fetches health packs and ammo until its resources are completely restored.

The only remaining issue is if an agent has a very good line of sight into the center and enough ammunition, it might kill the agent before it manages to reach a health pack. We could mitigate this by forcing the centralization to stay close to health packs if possible, but this hasn't been implemented.

We must also underline that this agent is a *survivalist* and not genocidal. It won't actively pursue targets that are not a threat to it or patrol the map once it has taken control of the center. It is happy to stay where all health packs and ammo packs are.