

Agent Design

The design for the agent is fairly simple, as simple is often best in games where entities with artificial intelligence have a limited amount of CPU time to make effective decisions are often more fun given a little bit of weakness and predictability. The primary AI methods used are finite state machines to handle behavior, and minor use of steering behaviors for cannon aiming. The agent is broken down into two separate but closely related state machines, one for the cannon and one for the tank base. The cannon is the dominant state machine and effects the flow of both cannon's state machine for aiming, searching, and firing, as well as the tank base's state machine for movement that compliments the desires of the cannon's state machine. The agent starts in a complementary set of state for the cannon and base, which are rotate scan and wander, and then receives percept data from the server that includes information about its own position and orientations among other things, and information about any other enemy tanks in the game. Enemy information is only updated upon the occurrence of certain events. For example, enemy's positions are primarily updated when an enemy is in sight of the agent's cannon. The agent uses most of the percept data provided by the server to change behaviors in an attempt to kill enemy agents. Below is a brief description of every cannon and tank base state that defines the tank's behavior, as well as a visual aid in the form of a state diagram.

Cannon States

Rotate Scan:

This is the starting state for the cannon of the tank. The cannon chooses to scan counter clockwise or clockwise randomly and does so indefinitely until an enemy tank is determined to be in sight. After a player is in sight, the cannon switches to the aim state.

Aim:

The cannon rotates to aim at the currently most aligned enemy tank that is in sight. Aiming takes into consideration the target's movement and how far the target is to predict the target's future position in order to lead shots on moving targets. The cannon continuously adjusts its aim until it is lined up with the target's predicted position within a few degrees. If the tank is ready to fire, the cannon switches to the fire state, otherwise it continues aiming at the target. If at any point there are no enemy tanks in sight, the cannon switches to the smart scan state.

Fire:

The cannon requests to fire a shot and then switches back to the aim state.

Smart Scan:

The tank constructs a theoretical circular zone that enemy tanks might be in based on where they were last seen, how fast a tank can move, and how much time has passed since they were last seen. If this zone has a reasonably small radius of one fourth the width of the map, the cannon performs a scan of the zone. If at any point the theoretical zone for the current target gets to large, it checks for zones for other enemy tanks and smart scans their zones if still reasonable. If there are no reasonable zones, the tanks switches to its basic rotate scan state. Smart scan moves the cannon back and forth between the left most and right most points of the zone relative the tanks current position in hopes to

move the target back into the cannon's line of sight. If an enemy is in sight at any point, the cannon switches back to the aim state.

Tank Base States:

Wander:

The wander state is directly tied with to the cannon's rotate scan state. The tank base starts in this state. The tank chooses to move to a random position on the map every few seconds in order to search for enemy tanks. If the tank get close to its target wander position, it immediately chooses another random location on the map to wander to.

Hover:

The hover state is directly tied to the cannon's aim and fire states. In the hover state, the tank attempts to stay at the max fire range relative to the enemy to maximize the potential to harm the enemy target but minimize the likeliness of being hit by enemy projectiles directly.

Smart Scan Movement:

The smart scan movement state is directly tied to the cannon's smart scan state. In this state, the tank base attempts to stay double the distance of the theoretical zone's radius away from the targets last known position. This is done to minimize the angle that the cannon has to rotate in order to fully scan the zone and to always stay looking into the zone at a potentially more safe distance.

Avoid Obstacle:

This is the only tank base state not directly tied to a particular cannon state. This state is entered at any point if the tank base is trying to move, but moves at impaired speed of less than 50% full speed for 10 or more frames. If this impaired movement occurs, it most likely means the tank is running into an obstacle or has entered slowing goo. When the tank moves, it always saves the last position on the map it was able to move at its full potential. In this state, it moves towards that last non impaired position for two seconds and then switches back to the tank base state that matches the current cannon state, effectively avoiding obstacles in most circumstances and continuing with normal agent behavior

