AI Design

Introduction

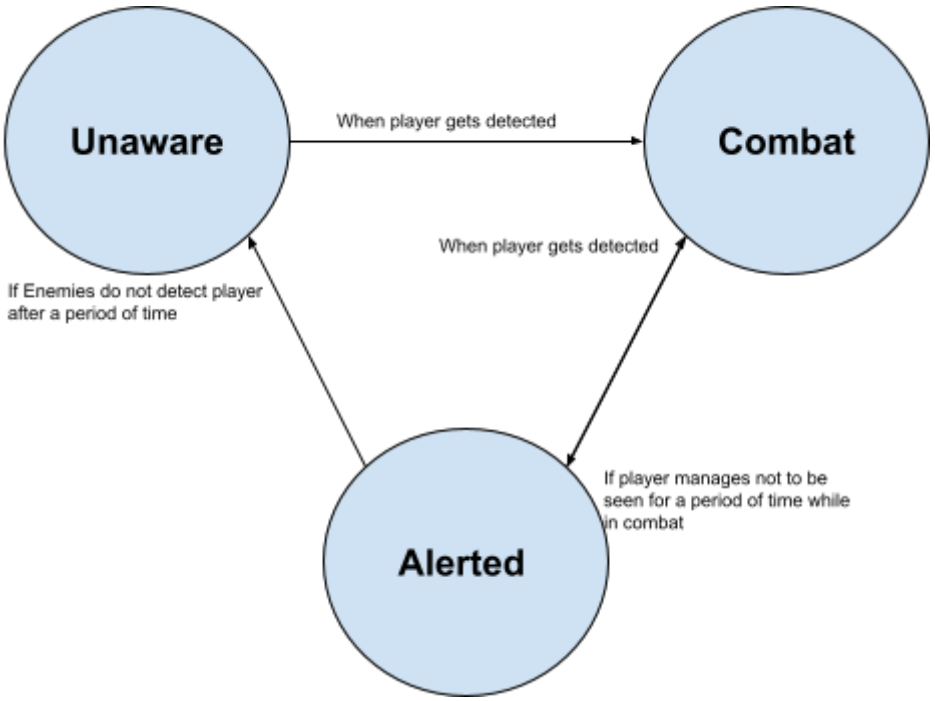
This document will be an overview for the implementation of the generic AI, detailed version for each archetype will after documented

Enemy States

The enemy AI will be described using states, each of the main states will be further described with its own behavior.

The main behavior that can be find are:

- **Unaware,** the enemy does not know that the player is there.
- **Combat,** the enemy has discovered the player and will engage the fight.
- **Alerted,** the player managed to lose tracks of him.



Down here the full description

Unaware

This is the state that an enemy is in until the player is detected.

During the unaware state an enemy perform its routine, this can comprehend one of more of the following behavior:

- Waiting
- Patrolling
- Investigating

Waiting:

The enemy, given a location, will stay on that place without doing any movement.
While in this state the enemy can “perform” an action (e.g. working on something).

Patrolling:

The enemy will follow a path given by a spline. The enemy will be able to:

- Go to the next point of the spline and if the spline finishes go in reverse.
- Go to the next point of the spline and if the spline finishes go directly to first.

Investigating:

If the player makes a sound, following the hearing rules, the enemy will:

- Go to investigate in the exact point of where the sound was made

Combat

When the player gets detected by an enemy, the group of enemies that belong to that specific area will enter in this state.

Once in this state, enemies will know the current location of the player and will behave according to their class.

Player can be spotted because of:

- Enemy sees the player
- The player shot without silencer
- The player hit the enemy without killing it

General behaviors for basic AI in Combat state

- Looking for cover
- Shooting the player, while doing this the enemies should also have the possibility to move

Looking for cover:

While the enemy is moving in the map, they will always tend to attack the player.

The criteria for the enemy to choose a cover are:

- According to the weapon that they are using, check for all the cover in the ideal range (e.g. if an enemy has a rifle with an ideal range between 20~30 meters, they will prefer covers within this range)
- Enemies will always prefer the cover that are closer to them

Enemies will tend to go into cover.
Should there not be a position that meets the criteria above, enemies will move to have the player in the line of fire and shoot

Enemies will abandon a cover when:

- Player gets to close to them
- Enemies needs to change the weapon with another one

Once an enemy will be in the cover the following behaviors can happen:

- Leaning out.
  If the enemy is close to a border of the cover (side or top), it will show part of the head. A parameter for how much time is needed before they can do and a tolerance will be needed

- Shooting.
  For this refer to the Shooting section

Shooting:

Each enemy will follow a specific way to "shoot" to create this the enemy needs to have

- "**Number of hits",** this will determine how many shots sequentially will be shot.
  A tolerance value will also be set. (e.g. pistol 3 hits +- 1)

- "**Waiting time",** this will determine the time needed to elapse between a sequence of shots.
  A tolerance value will also be set. (e.g. pistol 2 sec +- 0.5)

- "**Reload time**", this will determine the time needed to reload the gun, enemies cannot shoot in this moment.
  A tolerance value will also be set. (e.g. pistol 3 sec +- 0.2)

- "**Accuracy**", the percentage of hit for each shot, it will decrease with the distance (e.g shotgun will always miss after 10 meters while rifle will always miss after 40 meters)

Class specific behaviours

Melee:
The melee archetype is an enemy that runs toward the player attacking him with close quarter weapons, such as axes and bats.

- Running toward the enemy

Gunner:
The gunner archetype is an enemy that relies mostly on his ranged weapon, trying not to stay too close to the player.

- Throwing grenade.
  If:
  - The player has no enemies near them
  - The Enemy has a trajectory (if they throw the grenade can reach the player or close to them) toward the player

- A timer (of roughly 20 sec) has passed, it can be resetted if some of the upper criteria fail

One of the gunners in that zone will throw a grenade. Once happened the timer will reset

NetRunner:

The netrunner archetype is an enemy that uses quick hacks as the main offensive.

After a timer has expired, the AI will choose between the quick hacks, each one of this will have a certain probability that will be extracted (cumulative of all the hacks will be 100%).

Alerted

Enemies can enter this state ONLY if they are in Combat before.

If the player manages, for a certain period of time, not to be seen by enemies, they will enter in this state. This involves:

- Enemies will not know anymore actual location of the player
- Enemy will search in specific point, next to their point of idle or patrol

From here, if the enemy found the player, it will go back to the combat state.
If the enemy does not find the player, it will go back to the unaware state but will detect the player easier.

Enemy Detection

The player can be detected in different ways, here there will be a complete list:

- The Enemy sees the player
- The player shot with a gun without silencer
- The player hit an enemy but they do not instantly kill it
- The player use a traceable hack and get traced
- The camera sees the player

AI Sight

In this section will be written a description of how the sight of the enemies will work.

Despite the different archetypes, all of them share the same kind of sight.
Enemies can see 25 meters in distance and with a vision cone of roughly 90 degrees.

Once the player enters the cone, a bar will start to increase(It will be visible to the player via UI).

This bar will increase faster if the player is nearer to the enemy and standing. Crouching will reduce this ratio more than double

Player can always move away from the cone and the bar will start to decrease if it has not already been detected

If the bar reaches its maximum, enemies will enter in combat.

Enemies cannot see the player if:

- Player is behind an object that have no space to see through
- Player is behind a cover and leaning out
- Enemy are in the first 5 seconds of effect of the “Reboot Optics” hack

The camera share the same system but the case in which they cannot see the player are:

- Player is behind an object that have no space to see through
- Player is behind a cover and leaning out
- Camera is “Turned off”
- Camera is set in “Pacific Mode”

AI Hearing

In this section will be written a description of how the hearing of the enemies will work.

The hearing is a much weaker sense than sight.

The radius is small and once they hear a sound:

- if the sound is a locomotion sound (e.g footstep), melee weapon the enemy will move toward the location of the sound. If they see the player go to AI Sight

- if the sound is a weapon sound (e.g. grenade, ranged weapon), two case can happen
    - if the sound is within an AI zone, each enemy in that zone will immediately enter in the combat state (unless they already are)
    - if the sound is in a bordering zone and an enemy will be within a certain radius from the player, all the enemies (that belong to that AI zone) will enter in the combat state.
      If no one is within the radius nothing happen

- if the sound is provoked by the bait hack, the nearest enemy will go to investigate

AI Damage

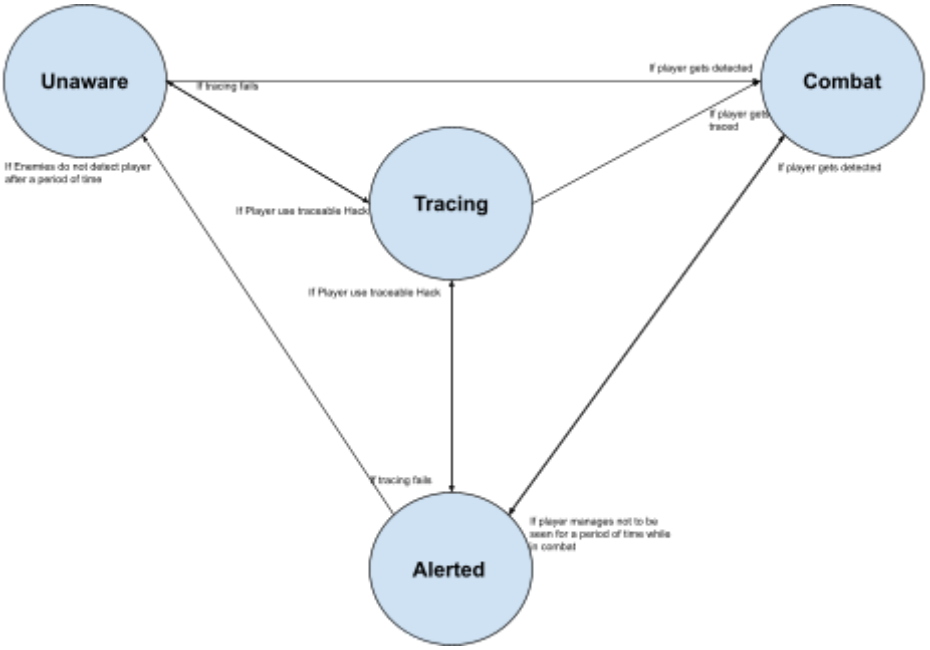
In this section will be written a description of how the sense of touch of the enemies will work.

When an enemy is hit this can happen:

- If the player hit with melee or non silenced weapon, enemy instantly enter in combat state

- If the player hit with a silenced weapon
    - if the enemy instantly die, nothing happens
    - if the enemy do not instantly die, a brief timer will start and if they do not kill him before the timer stop, enemies will enter in combat state

AI zone



In the game can be noticed how, if the player gets detected in an area, not all the enemies within the building will enter in the combat state.
Starting from this it was decide to made a design choice on how organize the enemies within the map

Each enemy will belong to an AI zone, all the enemies within will:

- Enter in the Combat state only if they, or another enemy of the same zone, detected the player
- Go to Alert state if the player will go out from the zone

This mean that to go from an AI zone to another one, the player must go through an intermediate zone, this zone will not be accessible to the AI, but the state logic will remain the same

(e.g. if the player goes in the intermediate zone while the enemy are in combat, they will stay in Combat and only if the player goes in the new area or if the time needed to go in the Alerted state pass)

The AI Zone will have a unique state called "Tracing". To enter this state, the player must use a traceable hack while the enemy is in the Alert or Unaware state.

As soon as the player uses the traceable hack, a bar will start to increase every certain amount of time.

Each hack will have a percentage that will make the bar increase by that value (imagine having a bar with a value of 100 when the player uses a hack that gives +36% of traceability, the bar will increase immediately by 36 points).

Once in this State the possible outcome are:

- When the bar reaches its maximum value, the enemies will enter combat state.
- When the player gets far enough away from enemies, they return to their previous state.