**Spike:** Agent Markmanship

**Title:** Agent Markmanship

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**Goals / deliverables:**

Create an agent targeting simulation with:

* an attacking agent
* a moving target agent
* a selection of weapons

Be able to demonstrate that the attacking agent that can successfully target (hit) with different weapon properties:

* Rifle
* Rocket
* Hand Gun
* Hand grenade

**Technologies, Tools, and Resources used:**

List of information needed by someone trying to reproduce this work

* Python 3+
* Built in Python libraries.
* IDE or Code Editor (Visual Studio Code)

**Tasks undertaken:**

* Install Python: Download and Install Python 3+ via https://www.python.org/downloads/
* Set up a code editor or IDE: Download and install a python compatible ide or code editor such as Visual Studio Code, PyCharm
* Open and familiarize with the code by reading through, paying attention to the comments that had been made.
* Run the code: Execute the code and observing the output.

**What we found out:**

1. Projectile Class represents a projectile object in the simulation, and it has the following properties and methods:

* Properties:

world: the world in which the projectile exists

weapon: the weapon that fires the projectile

target\_enemy: the enemy targeted by the projectile

pos: the position of the projectile, represented by a Vector2D object

vel: the velocity of the projectile, represented by a Vector2D object

max\_speed: the maximum speed of the projectile

damage: the damage inflicted by the projectile

hit: a boolean representing if the projectile has hit its target

* Methods:

update(delta): updates the position and state of the projectile based on the given delta

render(): renders the projectile as a circle on the screen

detect\_hit(): checks if the projectile has hit any enemy, and returns the hit enemy or False otherwise

calculate(): calculates the initial position, velocity, and maximum speed of the projectile

1. Weapon Class represents a weapon object in the simulation and it has the following properties and methods:

* Properties:

proj\_speed: the speed of the projectiles fired by the weapon

accuracy: the accuracy of the weapon

fire\_rate: the fire rate of the weapon

color: the color of the weapon

fire\_rate\_tmr: a timer for the fire rate of the weapon

damage: the damage inflicted by the weapon's projectiles

projectiles: a list of projectiles fired by the weapon

agent: the agent holding the weapon

world: the world in which the weapon exists

* Methods:

update(delta): updates the position of all projectiles in the simulation based on the given delta

render(): renders the weapon as a circle on the screen, along with its projectiles

shoot(target\_enemy): creates a new Projectile object targeting a specific enemy and adds it to the list of projectiles

These classes form the basis of a projectile and weapon simulation, allowing for the creation, rendering, and management of projectiles and weapons within a given world.

1. Agent class contains properties and methods related to its agent's weapons as well as its behavior and actions.

* Properties:

weapon: the current weapon object of the agent

weapons: a dictionary containing multiple weapon objects with different characteristics

current\_weapon: the name of the agent's currently equipped weapon

shooting\_distance: the distance at which the agent is capable of shooting

* Methods:

calculate(delta): calculates the current steering force based on the agent's mode (attack or wander) and separation from other objects

update(delta): updates the agent's state, weapon, and shooting actions based on the given delta

update\_weapons(delta): updates all the weapons in the agent's inventory

switch\_weapon(weapon\_name): switches the agent's current weapon to the specified weapon\_name if it exists in the weapons dictionary

attack(): determines the agent's attack behavior based on the closest enemy and the distance and angle to that enemy; returns the force needed to arrive at the target position

The Agent class uses the Weapon class to manage different weapons and their properties, allowing the agent to switch between weapons and control its actions depending on the current mode and target enemy.

Overall, the agent marksmanship simulation demonstrates the ability of an attacking agent to target and hit moving objects with different weapon properties. This project aimed to showcase the agent's capability to use a variety of weapons, including:

Fast moving accurate projectile (Rifle)

Slow moving accurate projectile (Rocket)

Fast moving low accuracy projectile (Hand Gun)

Slow moving low accuracy projectile (Handgrenade)