

# Feature engineering

The features are passed as a three dimensional vector (dims: x, y, z). The x and y dimension show the position of an object in space. The z vector describes the object with a fixed number of features. An object can be an enemy, allie, tree, rock, empty ground or anything else.

## Features Vector

Each element of a z vector describes one feature of an object. The features are:

**Relation:** Can be -1 for enemies, 0 for neutral 1 for allies.

**Max Health:** Max amount of health. Zero for not alive objects

**Health:** Amount of health. Zero for not alive objects or dead players.

**Speed:** Two dimensional vector indicating the object speed.

**Orientation:** Two dimensional vector indicating the object orientation.

**Armor:** Armor of the object.

**Weapon range:** Range of the weapon. Small values for melee weapons, high values for range weapons like bows or crossbows.

**Weapon damage:** Damage of the weapon.

**Height:** Height of the object. Indirectly includes the info if its passable for the agent. Water can have a negative height.

**Damage action:** Indicating the damage a Object makes. Positive value by causing damage, negative for healing actions. It is important that the location of the values is the source of the damage. Eg. When a archer shoots an arrow, the damage action value will be high at the position of the archer.

**Special Action:** Same as damage action but for special actions like freezing someone or other special/magic things, that do not cause damage.

## Actions that can be detected using the features

**Movement:** The speed vector shows the movement of an object.

**Attention:** The attention of a player is indicated by the the orientation (what is he looking at).

**Change Weapon:** Changes in weapon range and damage.

**Took damage or healing:** Changes of health.

**Cause damage or healing:** Positive or negative value of the damage action.

**Cause some special effect:** Value of special action feature.

## Action of the Agent.

**Movement Force:** Two dimensional vector which applies a force to the agent. Value range:  $[-1, 1]$

**Torque:** Force to rotate the agent. Value range:  $[-1, 1]$

**Action:** One of  $n$  actions. Actions can be: attack, heal, defence, jump etc..

Attacking an enemy is mostly handled by the game itself, not the agent. The agent simply orientates itself in the direction of the enemy it wants to attack and chooses the attack action. Aiming at a hit box of the enemy and executing the action is done by the game.