Doom-Self Defender Algorithm

Ege Berkay
İbrahim Taha Aksu
Onur Kulaksızoğlu
Erdem Ünal
Burak Gök

Problem Description

- Small map, no movement except turning
- Agent learns self-defense, by killing
- Monsters respawn
- Limited ammo ~26
- Allowed actions: Turn left, Turn right, shoot

- Ends when: Player dies or time limit is reached

- Success 10+ kills

Reinforcement Learning

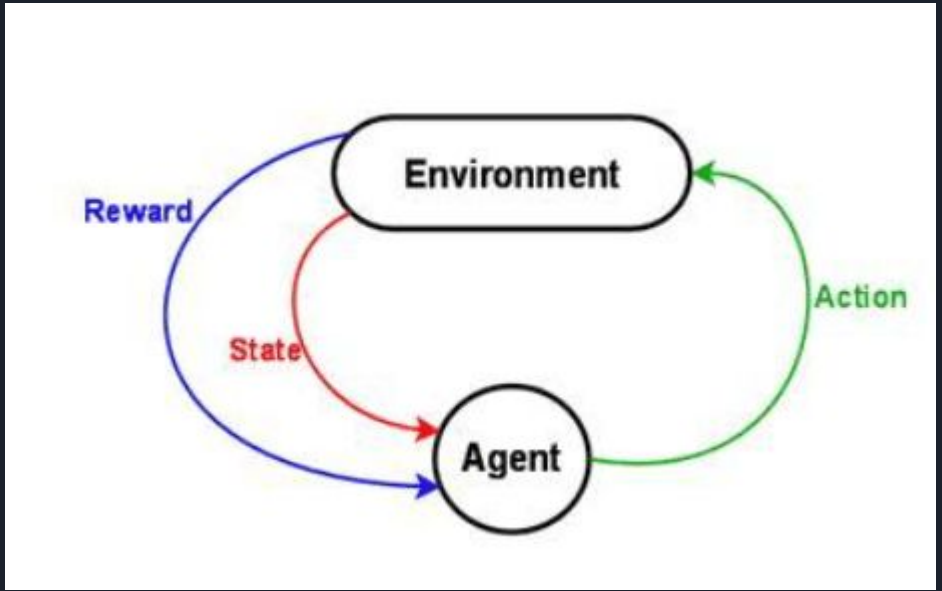
The approach we will inherit will be reinforcement learning.

Reinforcement learning allows machines to follow some behaviours given a feedback on their past experience.

Convolutional Neural Networks algorithm will be used trained with a variance of Q learning.

Reward example for DOOM:

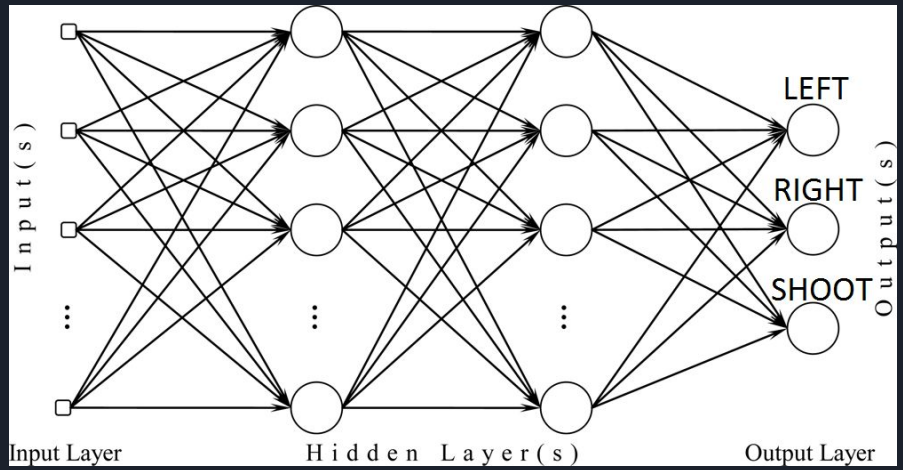
+2 points for killing a monster, -1 for dying, -10/26 points for not finishing a monster - wasting ammo



Convolutional Neural Network-CNN

CNN is a class of neural networks that has successfully been applied to analyzing visual imagery.

The algorithm , given the input from the frames of the game and the rewards will make a decision on 3 possible action choices.



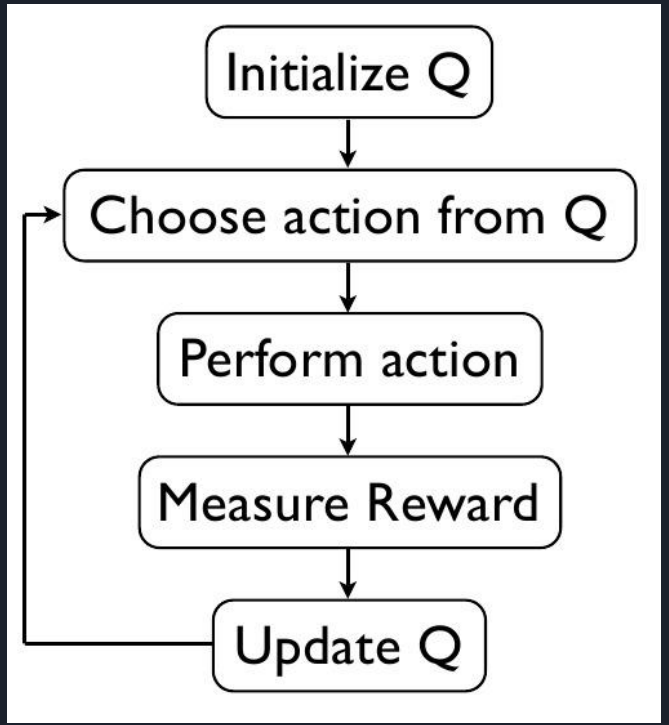
Q-Learning

Q- Learning is a model-free reinforcement learning technique which can be used to find any optimal action- selection policy.

A policy is a rule that the agent follows in selecting actions given the state it is in.

The policy could be chosen according to the trade of choice between exploration and exploitation.

CNN combined with Q learning: Deep Q Networks(DQN)



Training Data

- OpenAI gym environments will be used for obtaining training data.
- The data will be extracted from randomized games played with DoomDefendCenter-v0 environment.

Evaluation

- 10 points on average of 100 consecutive trials
- Comparisons with other solutions
- Same deep learning algorithm with other harder/unsolved problems

Work Statement

- Experiments with OpenAI environments/library and I/O:

  5~ hours: Berkay, Onur

- Researching algorithms, reading papers:

  5~ hours: Taha, Burak, Erdem

- Programming / Testing iteratively:

  10~hours: Altogether

- Total of 75~ man-hours

END