

## **Deep Reinforcement Learning Doom AI using ViZDoom**

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Credits: 40

## Description

The 'problem' I am trying to solve is a simple one. Teach an AI to play an FPS, specifically one based in the doom engine. FPSs are a diverse and wide-ranging genre of videogames that share two major components, the First-Person perspective, and the shooter / weapon / combat focused gameplay. Therefore, for my AI to be considered an answer to the problem, it must be able to perform some form of visual analysis on the screen, and able to use the information gleaned by its observation to engage in meaningful decision making beyond random actions.

To achieve these aims I intend to use ViZDoom, a piece of software designed to help with the development of visual based AI in the doom engine, or to put it simply it is a doom-based AI research platform for visual analysis. I will use the python-based version, and I intend to build a deep reinforcement learning neural network-based AI aka. a deep reinforcement learning environment. I will then let the system run and the AI learn for as long as possible.

Given enough time the AI should be able to perform basic operations like looking at an enemy and firing at it, as well as progressing through a level and perhaps even completing it, however this is not guaranteed since machine learning in general is imprecise and can produce unpredictable results based on certain inputs. Even if the environment and reinforcement rules are set up perfectly it might still not have enough time to achieve much in the way of progress.

## Aims and Objectives

### Basic:

The bare minimum standard, just what would be required for the AI to begin learning the level in question.

- An AI capable of performing all the basic actions necessary to complete the level
- An AI capable of learning via deep reinforcement learning

### Intermediate:

The AI has been able to learn individual parts of the level but is not yet capable of completing the whole level.

- An AI capable of consistently tracking an enemy
- An AI capable of consistently killing an enemy
- An AI capable of basic pathing
- An AI capable of not dying

### Advanced:

The AI has completed the level, and now works on optimisation

- An AI capable of completing the level
- An AI capable of completing the level quickly
- An AI capable of completing the level with minimal damage

## Work Plan

Note: I will meet with my supervisor weekly, but certain meetings mentioned below will mark major turning points in my project.

### Week 1:

Create initial Plan and hand in, begin researching required but unfamiliar 'technologies' like deep reinforcement learning and ViZDoom

### Week 2:

Continue and wrap up dedicated researching, further research will be required by it will be sporadic based on what happens later

### Week 3:

Begin working on creating of learning environment, including picking / creating a level and starting to set up controls

### Week 4:

Continue with work from prior week.

### Week 5:

Either continue work or move on to deep reinforcement learning environment (DRLE).

### Week 6:

Should be on (DRLE), hopefully complete this week. Also, a good chance to hold a longer meeting and evaluate how far I've come and where I want to be so, if necessary, I can 'adjust my trajectory'.

### Week 7:

Can move on to reinforcement rules and begin testing to see if whole system is functional.

### Week 8:

Any finishing touches necessary to complete the active section of the project.

### Spring break:

Let my AI learn for as long as possible.

### Week 9:

Begin writing rough draft for final report. Also, a good week for a major meeting with supervisor to help with evaluating the AI's progress and a discussion of my rough final report.

### Week 10:

Complete rough draft and give to supervisor for feedback.

### Week 11:

Discuss with supervisor and begin making appropriate changes.

Week 12:

Finish final report and submit by 23:00 May 13<sup>th</sup>.