Project Proposal

Group 10
Jiecheng Deng
Michael William Robertson
Can D. Nguyen

Summary of the Project

The goal of our project, which will be on the Malmo platform, is to train an agent to be proficient with Minecraft's bow and arrow. The basic setup/ input will be to place the agent in a level environment with a bow and several arrows in their inventory, and the only other actor being a moving pig. The agent will be trained to kill the pig with the bow and arrow, which is to say that action will serve as the output.

- Input:
    - The input of the first task: the distance between the agent and the target. The strength, angle, and direction of the bow that the agent uses to shoot the target. Recording the moving behavior of the target.
- Output:

    Each shot will be given a reward that may be calculated based on how far between the arrow and the target. However, the reward may be hard to determine after the agent learned that the target will only move in the same area in the same way again and again if the target move on the specific path.. We are still looking for a more intelligent way to calculate the reward.

Evaluation Plan

- **Quantitative evaluation** :

For quantitative evaluation, we will focus on measuring the bow's angle, direction, and power. We will divide the environment into a number of cells, and train our agent to know how much of each of those it needs to shoot to a specific point in a specific cell. We expect our training will accelerate the process of locating the target's area and reducing the number of shots that significantly miss the target. Our baseline will be the number of shots that are inside the target's cell and how much time the agent needs to locate the target's cell, as well as how many shots the agent misses.

- **Qualitative analysis:**

Since the target will be surrounded by a rectangular fence, our sanity test will be to check whether the agent can shoot arrows into the fenced area. We will run the game around 100 times and see if the agent improves at locating the target cells, and similarly we will check if its speed improves after ten runs. If our algorithm works, we should see improvement with each run. At the very least, the agent should quickly filter out useless cells and successive shots should get closer to the target.

Goals

Our three goals have to do with the movement pattern of the pig. For our minimum goal, we want to train the agent to effectively shoot a pig that is standing still. The agent will have to learn to hit a stationary target in a timely manner. For our realistic goal, we would like to train the agent to shoot a pig moving along a predetermined path. The agent will have to learn how to hit a moving, but predictable target. Finally, our ambitious goal will be to train the agent to hit a pig moving along a random path. Now, the agent will have to be proficient at hitting a moving and unpredictable target.

Five milestones list:·

- Milestones 1: Train the agent to identify the fenced area and try to shoot to that area.
- Milestones 2: Inside the fenced area Identifythe area contains the pig and try to shoot to that area.
- Milestones 3: Learn how to recognize the general path the pig is following and shoot that area.·
- Milestones 4: Identify the path the pig is following well enough to shoot the pig itself·
- Milestones 5: Become proficient enough to hit the pig even when its movement is random.

Appointment with the Instructor

15 Minute Meeting with Roy Fox at 09:30am (Pacific Time - US & Canada) on Friday, January 31, 2020 is scheduled.