Stair Climber

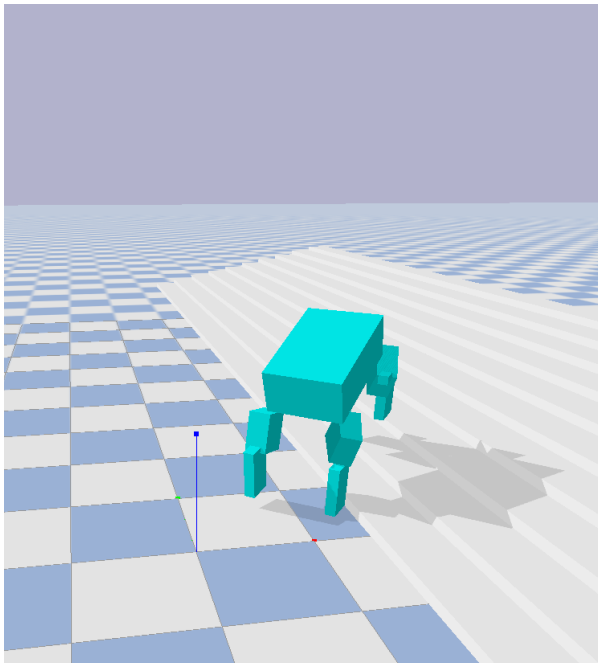
Description

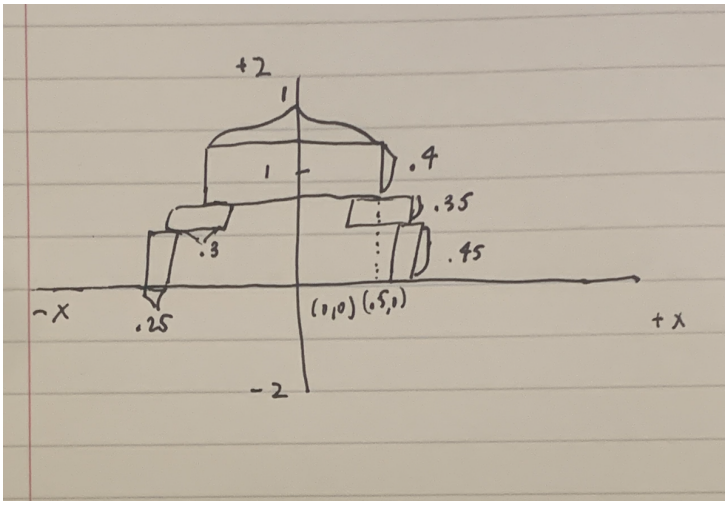
In this assignment, I evolved a robot to climb stairs. The robot, which is in the shape of a four-legged animal similar to a dog, attempts to climb stairs which are placed in the positive x-direction and which steadily increase .1 units in height over a few units. In this evolution, I use a population size of — over — generations. I chose this specific evolution and robot because I was curious as to how robots resembling real-life animals would evolve in a task like climbing. **To run the simulation, run the search.py file.**

World + Robot

As previously stated, the world is made up of **stairs and a robot**. The stairs begin in the positive x-axis a few units apart from the starting position of the robot and increase .1 units in height for every .5 units across. The stairs cannot be moved by the robot. They are pictured below on the left.

The robot is made to resemble **a four-legged creature** such as a dog or cheetah. There is a long torso with big "quadriceps/hamstrings" and smaller "calves." The robot is pictured below. The left shows how it looks in the simulation and the right is a cross-section of the robot on the x-z plane.





Fitness Function

Since the stairs are the in the positive x-direction, the part of the fitness function evaluates how far in the +x axis the robot has moved. Additionally, part of the fitness function will evaluate how far in the +z direction the robot has climbed, since the height of the robot is also important in climbing stairs. Finally,

the last part of the fitness function assigns a very low negative score to robot's the fall over, since such robots have no hope of continuing to climb the stairs – no matter how far it has already gotten.

In sum, the fitness function is **.7 * distance in positive x-axis + .3 * distance in positive z-axis** if the robot has not toppled over and **-10** if it has.