AI Walker

Team Members: Adrian Sicaju Ruiz, Omar Suarez, Daniel Maiello

Introduction: For our final project, we have been considering several projects to work on. We have been doing further research for an idea that can be both a fun experience and of use to us further into our careers. One project that has been at the top of our list is on teaching an AI how to walk with reinforcement learning. Existing work that is provided as free to use resources called "OpenAIGym." This is a toolkit for developing and comparing reinforcement learning algorithms that can provide us an OpenAIGym environment of AI's to train and build.

Problem Definition: Essentially we will have an agent and an environment. The Agent will be an AI walker and the environment is the rewards based on moving forward and successfully walking on its two legs after a series of successes and failures. The more the AI learns how to walk, the better rewards it will receive by the environment. To further give this implementation better use, the path the AI will walk on will progressively have added obstacles for it to walk through to record its behavior and see how it can successfully walk through based on the data that will be collected.

Data: We do not have any of our own data to provide as we have just been doing research more than anything. Based on our research, we can confidently say that at the beginning of the AI training, the AI's behavior will be at random because it will have no sense of control and balance of trying to walk on its two legs. The AI will learn that its negative behavior will cost negative rewards (points). So for the next trials, it will begin to have data to learn that whenever the AI falls over, it will start to learn to either crawl on its knees and fall over less and less until it starts to be rewarded with positive points. This sequence will continuously occur until it is able to walk on two legs after as many times it takes to learn. New paths such as going up or down stairs, uneven roads, long hills, will give the AI an opportunity to learn different styles of walking based on its environment.

Methods: Through the Github OpenAI gym repository, it provides a variety of environments for us to implement that involve different kinds of data. Fortunately for our AI walker program, the OpenGym library can provide us with a simple interface written in python and capable of representing our reinforcement learning problem of an AI teaching itself to walk. We would be using the Bipedal walker that is part of the Box2D that can provide us with a simple 2 legged AI to begin learning. In this environment, the reward is given for moving forward but if the robot falls, it gets negative rewards. The AI will stand on the left of the terrain environment with both legs in the same position. Each episode of the AI walking will terminate if the AI gets in contact with the right end of the terrain and then starts over again until it learns to walk properly.