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Hist 221

Research Paper

Can a computer beat the Phalanx?

Introduction:

Around the 7th century B.C. in ancient Greece, warfare evolved from heavily infantry formations “dominated by … warriors who reveled in individual duels with their adversaries”(1), to the tactical masterpiece known as the phalanx. The phalanx is a military strategy which groups of infantry stood side by side in an highly organized square divided into ranks and files. Each member in the phalanx would hold a 15 pound hoplon shield with a diameter of about 3 feet in their left hand, while holding a 3-5 meter spear in the right hand. Because of the size of the shield, as well as it being held in the left arm, the shield could only protect the left side of warrior. This loss of protection on the right side, led to incentivizing a tightly packed formation where the person on ones right could give them their missing protection. Finally, due to the length of their weapon, they were able to handle frontal warfare exceptionally well, as it would prohibit opposing soldiers from reaching the lines. This military structure was incredible successful, and was adopted by many Greek city states during its time. While few city-states actually experimented with the tactical design of the phalanx, most of the experimentation only focused on the depth of the files, while not focusing on weaponry and ranks. Widespread success and acceptance of the Phalanx structure during this period motivated me in attempting to figure out how to beat it.

Genetic learning, or evolutionary learning, is a subset of the study of artificial intelligence which has been used by scientists to model the evolutionary process of a system in order to discover hidden optimizations to a skill. The algorithmic structure of genetic learning is similar to Charles Darwin’s process of natural selection. First, the algorithm randomly creates an initial generation of possible solutions, the key being randomization of characteristics in order to mimic random genes. Secondly, a process is modeled to calculate a fitness score for each possible solution within a generation. An example of a fitness score could be the completion percentage of a video game that the randomly generated solution achieved. After the fitness score is generated, each solution in the generation is ranked in order by their fitness score. Natural selection then occurs, by removing or “killing” about 50% of the population, prioritizing the killing the least fit solutions, while also randomly killing successful solutions and saving unsuccessful solutions. After the killing occurs, those solutions left alive “mate” with each other by sharing, or combining, their solution with other solutions, creating the next generation of solutions. This process is then repeated, creating as many generations as it takes until the solution achieves an optimal fitness score.

The goal of this project is to use genetic learning on a sample of warfare technologies available to societies around the 7th century B.C in order to create a solution to beat the phalanx structure. The result will be shown in a basic simulation on a web interface to be viewed by anyone.

Implementation:

1 http://eds.a.ebscohost.com.ezproxy.lib.calpoly.edu/ehost/delivery?sid=6c6aa1fd-87ef-4bb0-9c12-b2c941d796cc%40sessionmgr4010&vid=1&ReturnUrl=http%3a%2f%2feds.a.ebscohost.com%2fehost%2fdetail%2fdetail%3fvid%3d0%26sid%3d6c6aa1fd-87ef-4bb0-9c12-b2c941d796cc%2540sessionmgr4010%26bdata%3dJnNpdGU9ZWhvc3QtbGl2ZQ%253d%253d