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Project specification

Introduction

We plan to investigate if we can produce biological and evolutionary traits using a simulation based on genetic algorithms. We plan to create a kind of predator-prey simulation with organisms which evolve and thereby hope to see some of the hallmarks of evolution after letting the simulation run for a while. We hope to see signs of adaptation, speciation and co-evolution and we believe that a simulation with these specific goals has not been done before. This is interesting to observe due to the complex dynamics which arise when several species begin competing against each other.

Problem statement

Is it possible to simulate common evolutionary mechanisms using basic neural networks in combination with genetic algorithms? What is the least possible complexity needed to enforce these mechanisms? Can we make our organisms adapt differently to different environments, given similar starting conditions, and what will be the result when a species begins to adapt?

The phenomena we hope to simulate include:

- Adaptation - Change in environment leads to changed behaviours/characteristics of organisms
- Mimicry - One species imitates another by some means to get an advantage
- Speciation - One species diverges into two species due to different locations, environments or niches

Our primary goal is to achieve the first of these phenomena and add others if we have enough time. By focusing on two simple properties of these organisms, color and size, we hope to reduce the complexity of this problem and thereby make it possible to simulate. Should we not be able to make the simulation work using neural networks we will attempt a simpler representation. This could for example be a simple AI with changeable parameters, or based on a mathematical model.

Approach

We plan to create a model of an ecosystem in Python and populate it with organisms. Initially, there will only be one kind of organism with a limited feature set and we will try to force them into adapting to new environments. These creatures will have very limited inputs and only perceive the color and size of objects they encounter in the world. The reason behind this is amongst other things that it will be easy to force mimicry later on. We are planning to use PyGame for graphics as well as Python libraries for neural networks (Pybrain) and genetic algorithms

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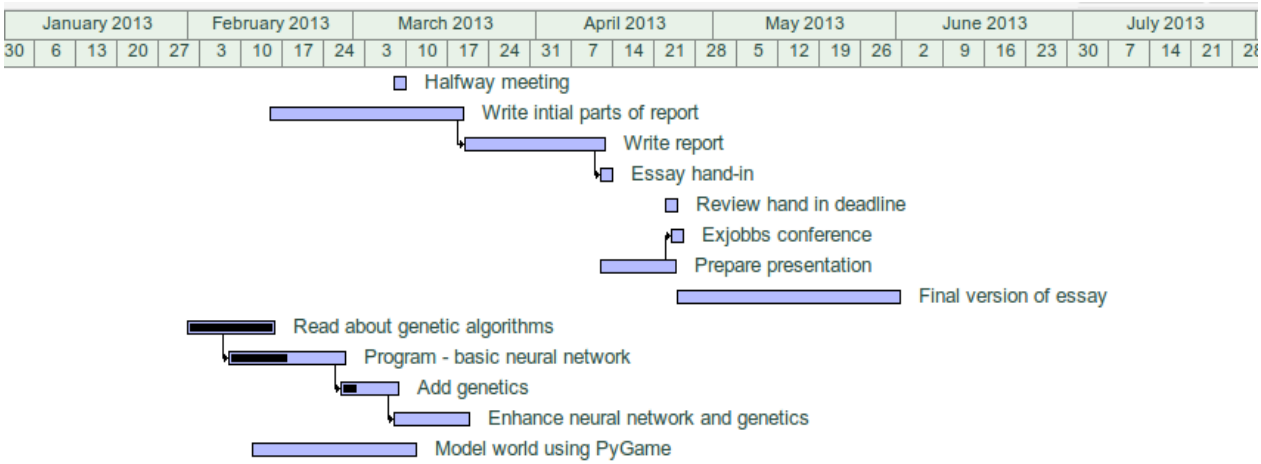
(DEAP) to speed up the programming process.

Project schedule



References

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