

Initial Project Overview

SOC10101 Honours Project (40 Credits)

Title of Project:

A graphical application to simplify the use of NEAT to evolve video game characters.

Overview of Project Content and Milestones

The aim of this project is to develop an easy-to-use graphical application that allow the user to evolve neural network characters for different Atari games.

Objectives:

1. Produce a literature review of research on the evolution of neural network characters for video games with a focus on the NEAT library.
2. Design the front-end (graphical user interface) for the application.
3. Design the software architecture i.e., how the application will connect with NEAT and the video game.
4. Implement the application.
5. Test the application on a variety of Atari video games.
6. Produce the dissertation document detailing the above work.

The Main Deliverable(s):

An easy-to-use application that evolves video game characters using the NEAT neural network library.

The Target Audience for the Deliverable(s):

Researchers that would like to evolve a neural network without any using any code.
Members of the public interested in a demonstration in AI for video games.

The Work to be Undertaken:

- Investigate implementation of NEAT in evolving video game characters.
- Write a literature review.
- Specification of the requirements
- Produce the design for front-end and back-end of the application.
- Implementation of the design in a suitable programming language

- Evaluate it with user studies to find out whether the application is easy to use.

Additional Information / Knowledge Required:

- New knowledge –Python Neat library, working with Neural networks, theoretical knowledge of neural networks and evolutionary algorithms.
- Extending current skills – building a software and writing a report
- Technologies - Stella (for Arcade Games)

Information Sources that Provide a Context for the Project:

Risi, S., & Togelius, J. (2015, November 11). *Neuroevolution in Games: State of the Art and Open Challenges*. <https://arxiv.org/>.

<https://arxiv.org/pdf/1410.7326.pdf#page=18&zoom=100,416,102>

M. Hausknecht, J. Lehman, R. Miikkulainen, and P. Stone. *A neuroevolution approach to general Atari game playing*. In IEEE Transactions on Computational Intelligence and AI in Games, 2013. <https://ieeexplore-ieee.org.ezproxy.napier.ac.uk/stamp/stamp.jsp?tp=&arnumber=6756960>

Omelianenko, I. (2019). *Hands-On Neuroevolution with Python*. Packt Publishing Ltd. <https://learning.oreilly.com/library/view/hands-on-neuroevolution-with/9781838824914/cover.xhtml>

D. Levy, S. (2020, November 15). *NEAT-Gym*. Retrieved February 4, 2021, from <https://github.com/simondlevy/neat-gym>

The Importance of the Project:

The importance of the project is that it would be implemented in an easy-to-use design without writing any code in order to train a neural network to play the game. A similar project is already accessible in GitHub, but this that software you still need to write code to use it. This project aims to fill this gap and hence greatly increase the accessibility of NEAT to people who are not comfortable with coding and the command line.

The Key Challenge(s) to be Overcome:

Get all the components to work together.

