Computational Intelligence Coursework

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ABSTRACT

This coursework requires the weights of a multi-layer perceptron artifical neural network to be evolved and used to control the landing of spacecraft. To achieve this, an evolutionary algorithm was implemented. Multiple operators were applied and tested to find the best methods for this problem. Parameter tuning was performed to further satisfy our goals of findiong the best combination for safe landing.

ACM Reference format:
40451571. 2022. Computational Intelligence Coursework. In *Proceedings of Coursework, Edinburgh Napier University, April 2022 (SET10107),* 1 pages.
DOI: 10.1145/nnnnnnn.nnnnnnn

1 APPROACH

To solve this problem, we employed an evolutionary algorithm. [1]

An evolutionary algorithm typically uses the following structure: Individuals are initialised and a loop of selection, crossover, mutation and replacement operations occur until a stopping criteria is met. In the paper, we document experiments on the selection, crossover, mutation and replacement operations with the intent of finding the combination of operators that lead to the best fitness value.

EV CHOSEN

NEURAL NETWORK PARAMETERS

2 EXPERIMENTS & ANALYSIS

2.1 Selection

Selection is the process by which the algorithm chooses which individuals will reproduce. A good selection operator will allow the population to trend towards higher fitness without causing a premature convergence. The following selection methods were implemented and tested:

Fitness Proportionate Roulette Selection selects individuals in proportion to their fitness. If an individual has higher fitness, it is more likely to be selected. The formula in is followed to compute the probability of an individual being chosen, where the dividend is the fitness of the individual and the divisor is the sum of the fitness of all individuals in the population.

Tournament Selection selects t individuals from the population and selects the fittest individual. We explore the effect on average fitness by changing t.

3 CONCLUSIONS

4 FUTURE WORK

REFERENCES

[1] Nvidia. 2017. NVIDIA TESLA V100 GPU ARCHITECTURE. https://images.nvidia.com/content/volta-architecture/pdf/volta-architecture-whitepaper.pdf.

SET10107, Edinburgh Napier University

DOI: 10.1145/nnnnnnn.nnnnnnn