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Neural Network-Based AI for Game Completion

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Introduction

Artificial intelligence (AI) has made significant strides in various fields, including game development. Integrating AI into games not only enhances player experience but also introduces new levels of interactivity and complexity. This engineering thesis, titled "Neural Network-Based AI for Game Completion," investigates the use of neural networks in game development with Python, focusing on the NEAT (NeuroEvolution of Augmenting Topologies) algorithm to create an AI capable of completing a game developed with Pygame.

The project involves creating a game where an AI controls a bird navigating through pipes, inspired by the popular Flappy Bird game. The AI, implemented with NEAT, evolves over generations to enhance its performance, showcasing the power and potential of neural networks in game AI. NEAT is particularly suited for this task as it evolves both the topology and the weights of the neural network, allowing for complex behaviors to emerge without manual programming.

The implementation covers various aspects of game development, such as graphics, physics, and collision detection, all managed by Pygame, a widely-used Python library for game creation. The bird's movement and its interaction with the environment are carefully programmed to present a challenging scenario for the AI to master.

The objective of this thesis is to develop an AI that can autonomously play the game, improving its strategies and techniques through the evolutionary process. This not only demonstrates NEAT's capabilities but also provides insights into developing intelligent systems for gaming. The project's outcomes could be applied to more complex games and AI applications, showcasing the versatility and effectiveness of neural networks in practical scenarios.

The following sections will detail the methodology, game and AI structure, and the results achieved from this approach to game development. The Python code used for this project is included, offering a comprehensive view of the technical aspects and challenges encountered during the development process.