AI Game with Reinforcement Learning

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OBJECTIVE

The objective of this project is to develop an intelligent game agent using reinforcement learning techniques that can autonomously learn and adapt to different game scenarios. By implementing and evaluating various reinforcement learning algorithms, the project aims to create a robust AI that can achieve high proficiency in the game environment, demonstrating the potential of AI-driven gameplay.

ABSTRACT

This project focuses on the development of an intelligent game agent utilizing reinforcement learning (RL) techniques to autonomously learn and adapt to dynamic game environments. Reinforcement learning, a branch of machine learning where agents learn optimal behaviors through interactions with their environment, is employed to train the agent to make decisions that maximize cumulative rewards. The project explores various RL algorithms, such as Q-learning and Deep Q-Networks (DQN), to assess their effectiveness in different game scenarios. The agent is designed to navigate and strategize within a custom game environment, progressively improving its performance through trial and error. The outcomes of this project demonstrate the feasibility and efficiency of reinforcement learning in creating adaptive AI agents capable of mastering complex tasks in gaming, highlighting the potential for broader applications in AI-driven game development.

INTRODUCTION

The game environment is a rectangular screen where the player, enemies, and goal state are represented as colored squares. The player, depicted as a green square, can move in four cardinal directions (up, down, left, and right). The enemies, depicted as red squares, move with a constant speed and bounce around the game screen. The goal state, depicted as a blue square, serves as the target for the player to reach.

HARDWARE & SOFTWARE REQUIREMENTS

RAM: 4GB
Hard Disk: At least 1GB of free Hard Disk space
Operating System: Windows 7/8/10
Coding Language: Python
IDE: Visual Studio

EXISTING SYSTEM

The previous system used a rule-based approach where the AI agent's actions were manually defined without any

learning capability. The player could move in four directions, but the agent's behavior was static and unable to adapt to different scenarios. The enemies moved autonomously, and the game lacked a learning mechanism, resulting in predictable and suboptimal gameplay. The reward structure was simplistic

PROPOSED SYSTEM

The proposed system introduces an AI agent trained using Deep Q-Learning (DQL) to enhance the adaptability and intelligence of the player in the game environment. Unlike the static, rule-based previous system, this approach allows the agent to learn optimal strategies through interactions with the environment. The agent continuously updates its action-value function using a deep neural network, enabling it to make more informed decisions over time. The reward structure is more sophisticated, incentivizing the agent to reach the goal while avoiding enemies and penalizing idleness. As a result, the proposed system creates a dynamic and evolving gameplay experience, where the AI can autonomously improve and adapt to different scenarios, leading to more complex and challenging interactions.

CONCLUSION

This project demonstrates the effectiveness of Deep Q-Learning in transforming a static, rule-based game agent into an adaptive and intelligent player. The agent’s ability to learn and improve its performance over time highlights the potential of reinforcement learning in gaming. While challenges remain, the project lays a strong foundation for creating more dynamic and engaging game experiences. Future work can focus on further refining the agent's strategies and performance.

REFERENCES

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