**Project Name: AI-Controlled Player for shapez**

**1. Understanding of the Project and Reflection on Its Development**

For this project, our primary goal is to design an AI capable of autonomously playing the game Shapez, while also providing the strategy execution process and specific evaluation metrics for the AI.

As the project progressed, I initially divided it into two main parts as the team leader: one part focused on game data reading and interaction, and the other on AI design and evaluation.

For the data reading and interaction part, we initially considered two approaches. One approach was to design a specific game and define global variables or shared memory to transmit the data to the AI team. The other approach involved using visual recognition to read the game map, convert it into a 2D matrix, and pass it to the AI team, thereby simulating human gameplay behavior.

However, as the project moved forward, we encountered numerous challenges in visual recognition. To ensure the project stayed on track, we had to abandon this part and fully focus on game design.

As the team leader, I made a significant mistake in tracking project progress. I did not delve deeply into the implementation of the visual recognition algorithm but instead allowed the team member in charge to take full responsibility. By week 6, when I realized they had chosen the wrong algorithm, we had already lost a considerable amount of time.

As a result, we had to revise the project responsibilities. Initially, I was responsible for the AI design part, but as time passed, I realized that game design and data interaction were progressing too slowly. So from week 4, I temporarily shifted away from AI design and focused on game development.

At first, as team leader, I envisioned splitting the project into two parts: one for game data interaction and reading, and the other for AI design and evaluation.

For the data reading part, we initially devised two plans: one involved creating a specific game design with global variables or shared memory to transmit data to the AI team leader, and the other was based on using visual recognition to read the game map, convert it into a 2D matrix, and pass it to the AI team leader to simulate player behavior.

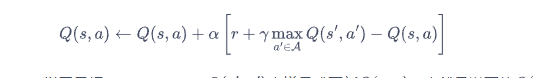
However, as we progressed, numerous challenges emerged in the visual recognition area. To stay on schedule, we decided to drop this part and focus entirely on the game design.

As the team leader, I made a critical error in project tracking by not thoroughly understanding the implementation of the visual algorithm. Instead, I left the task to team members, and by week 6, when I realized the wrong algorithm had been chosen, a significant amount of time had been wasted.

**2. Understanding of My Part of the Project**

Initially, my task was to design the AI module, and the most important part of this is that, since we need real-time decision-making, we must apply reinforcement learning (such as DQN and PPO) to design the agent and use the experience replay function to continuously improve the strategy.

For the DQN algorithm, the most crucial part is actually understanding the following formula:



In summary, we need to properly design the state, action, and reward. Using a greedy strategy, we select an action aaa from the experience pool, execute the action and obtain a reward, then store the next state in the pool RRR and calculate the minimum target loss LLL to update the target network. The algorithm will continuously optimize the chosen strategy based on the fluctuation of Q-values.

Starting from week 4, I have mainly been responsible for the game development. Since most of our team members are not familiar with JavaScript, we are using C++ and Qt for the development of the game.

**3. Progress Made, Blockers Faced, and Ensuring Timely Delivery**

So far, I have mainly been responsible for game development, and we have made significant progress in this area. We fixed the conveyor belt bug, added map scrolling and zooming functions, and introduced the blueprint display feature.

Currently, we are facing the challenge of expanding the game’s functionality and handling data reading. Although I have successfully used extern C and ctypes to read variables, the synchronization of variable changes during runtime remains a huge challenge for me. Additionally, the design of other game modules is a challenge faced by my team members. While I am currently focusing on game development, after resolving the data reading and interaction issues, I will shift to AI design and evaluation to ensure the project is delivered on time.

**4. Impact of My Work Pace on the Project Schedule**

Before week 4, I was mainly focused on researching the PPO algorithm and its implementation methods. However, from week 4 I have realized that we needed to solve the game’s data reading and interaction issues as soon as possible, Otherwise the AI design could not proceed. Therefore, I shifted from working on the AI module to the game design module.

After two to three weeks of effort, although we are slightly behind the project schedule, we have basically completed the data reading and game interaction modules. We expect to start applying AI-related algorithms and models this week (week 7) or at the latest, next week (week 8).

**5.Thoughts on the Ethics, Security, and Privacy Implications of Our Proposed Solution**

Since our game design is largely based on the existing game Shapez, this could potentially lead to intellectual property infringement issues. To avoid such problems, we must adhere to two principles:

1. We cannot profit from the developed game.
2. We need to make certain expansions and extensions based on the original game.

In addition, regarding privacy, we must ensure that during data interactions, no user data is leaked, thereby safeguarding the privacy of user information.

**6. Potential Risks in the Project**

We must acknowledge that our progress is slightly behind the original schedule. We initially planned to complete the basic AI algorithm application by week 8, but we are still working on resolving data reading and interaction issues.

To address this, we have taken relevant measures. We have completely abandoned the use of visual recognition algorithms and related models (such as YOLO) to obtain game data, and instead, we are using a simpler shared memory approach to directly modify game data.

Additionally, the application of AI algorithms and models is another potential risk. We must ensure that the AI model can successfully complete the game. To tackle this, we have had a team member dedicated to researching the DQN algorithm for six consecutive weeks. If the progress of the AI model falls behind schedule, we will devote more time and effort to solving related issues.