CS108 Project-Maze Game

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April 2024

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1 Introduction

The aim of this project is to design and implement a variant of a 2-D maze game using pygame. The essence of the game involves guiding a rabbit through an underground maze. The game can be played in 3 levels: Easy, Medium and Hard.

2 Modules Utilized

1. **pygame** brings animations and graphics to the table.
2. **random** is needed to generate the maze randomly.
3. **time** helps to delay/handle certain events.
4. **sys** handles command line arguments.

3 Files in the project

1. **cell.py** contains the cell class.
2. **wall.py** contains the wall class.
3. **player.py** contains the player class.
4. **constants.py** contains the definition of all constants used in the game.
5. **recursive_backtracking.py** defines a function to generate a maze using recursive backtracking.
6. **binary_tree.py** defines a function to generate a maze using the binary tree algorithm.
7. **prims.py** defines a function to generate a maze using the Prim‘s algorithm.
8. **main_menu.py** defines functions to display the main menu of the game.

9. **end_screen.py** defines functions to display the end screen of the game.
10. **game_mechanics.py** defines the game class which runs the whole game.
11. **game.py** calls actions from most other files in the main game loop.
12. **audio** is a folder that contains all audio files that the game uses.
13. **imgs** is a folder that contains all image files that the game uses.
14. **path.txt** is updated when the program is running. It contains the solution path to the maze.

4 Game Mechanics

4.1 Design

The rabbit spawns at the top left corner of the maze. The goal is to eat the golden carrot at the end of the maze.

The rabbit can be controlled by using the arrow keys, or W(up) , A(left), S(down) and D(right) keys on the keyboard.

Navigating through the maze consumes energy, which is visible on the energy bar. Energy can be replenished by consuming carrots which spawn randomly. Rabbit speed is maximum at full energy, and it decreases with energy. Once the energy bar is empty, there is a limited number of moves that can be made before the rabbit dies.

A timer shows the time left to complete the maze. The color of this timer changes progressively from green to red, as the timer counts down.

After the game ends, the final score is displayed on the end screen. The final score depends primarily on how fast you complete the maze, and on the number of carrots you eat.

4.2 Differentiation between levels

The most significant variation between the levels of the game is the choice of algorithm for maze generation. The amount of food available to the player reduces as the difficulty increases.

To accommodate for increasing difficulty, the amount of time given to complete the maze has been increased.

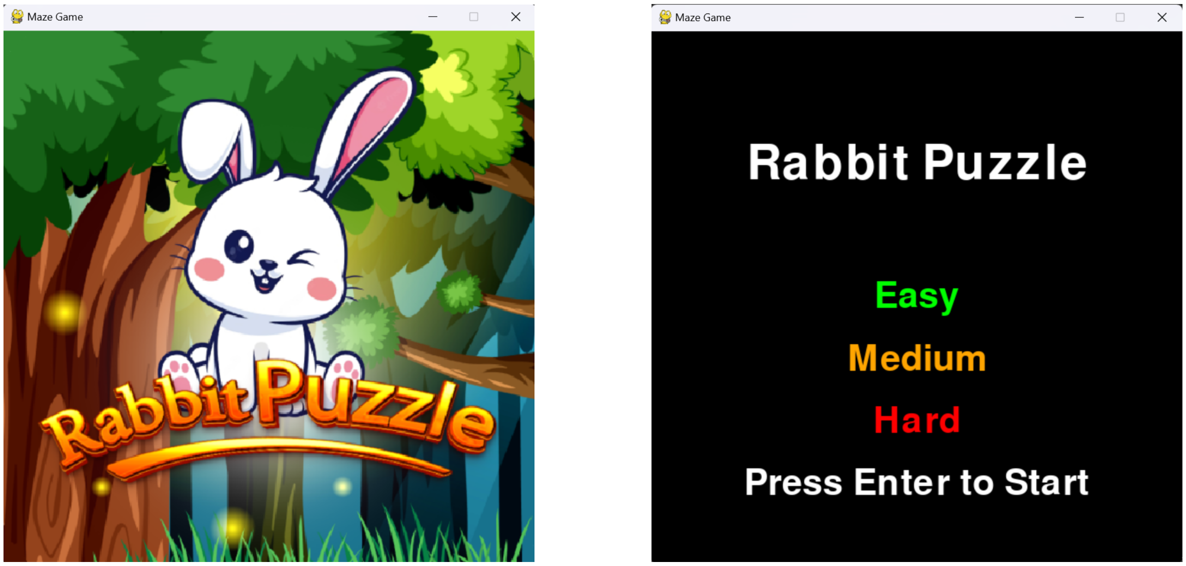
- **Easy:** The maze is generated using the Binary tree algorithm. Time limit to complete this level is 60s.

- **Medium:** A more sophisticated algorithm called the Prim's algorithm is used to generate the maze. The player is given 100s to complete this level.

- **Hard:** A rather simple but elegant algorithm called Recursive backtracking produces mazes with tougher solutions. Time limit for this level is a substantial 150s.

5 Graphics and User Experience

The game starts by displaying a loading screen while it loads important game resources. The main menu has 3 buttons: Easy, Medium and Hard. A level can be selected by clicking it. Pressing Enter on the keyboard starts a game of the selected level.

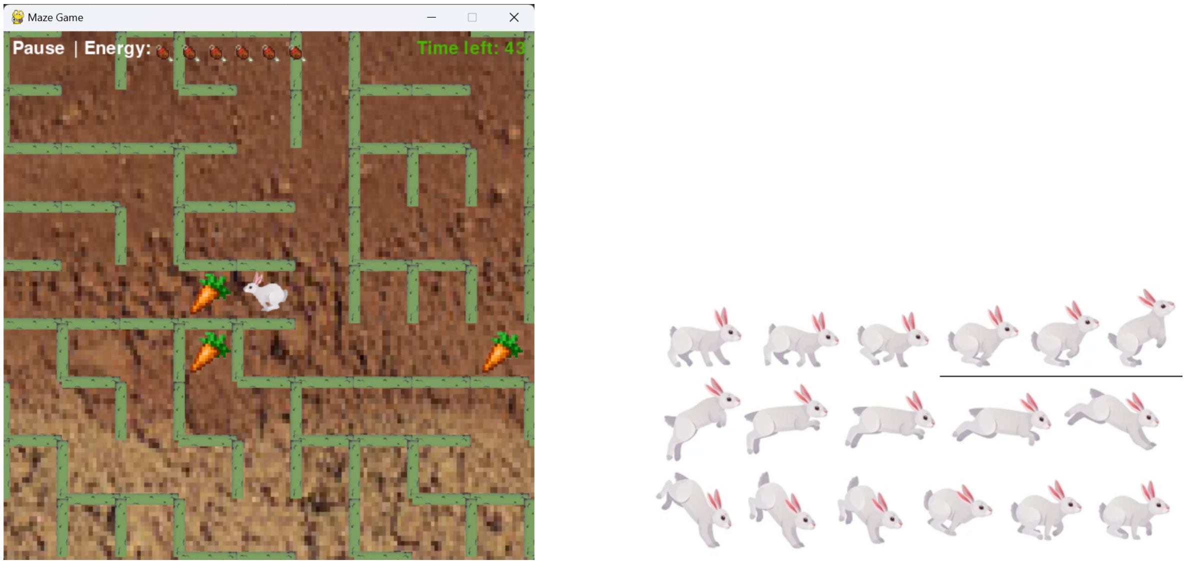


(a) Loading Screen

(b) Main Menu

Figure 1

The view focuses the rabbit at the centre of the screen, regardless of its position in the maze. Jumps from tile to tile consist of about 15 frames, making the transitions appear smooth. Different directions of motion use different sets of images



(a) In-game Photo

(b) Rabbit spritesheet

Figure 2

Throughout the duration of the game, calming music plays in the background. A sound is played everytime the rabbit moves. A sound is also played everytime the rabbit eats a carrot.

6 References

1. Jamis Buck's Blog

2. Pygame documentation

3. ChatGPT and Github copilot