Maze Game

Assignment Brief by Mollie Fairclough and Paul Kirwan

For System on a Chip Design 1

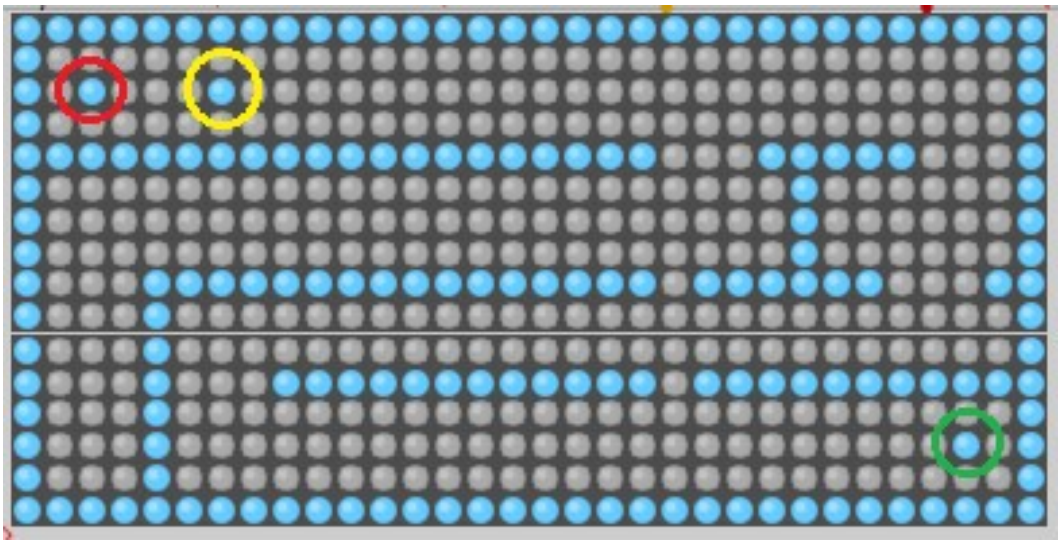

Fig 1. Image of the maze with the start (red), the player (yellow), and the end (green)

Design

- Paths are ‘0’s. Walls are ‘1’s
- To complete the maze, the user starts at the top left, and must progress to the bottom right
- If at any point the user runs into a wall, they will immediately lose and must start again

Controls

There are four user inputs

- Up
- Down
- Left, and
- Right

- Up, down, left and right are controlled by the user input 0b1000, 0b100, 0b10 and 0b1 respectively.
- The player will move based on the clock in the selected direction continuously until the input is changed, or if they win/lose. This means that keeping 0b1 selected while the game is running will move the player to the right until they hit a wall or reach the end.
- Changing the input to something other than the four options keep the player still, allowing the player to avoid hitting a wall. This is useful as it will prevent a player from losing while they are trying to change direction. If a player is moving left and wants to move down, they must go to an in between state between 0b010 (left) and 0b100 (down)

e.g.: 0b110 (undefined). They cannot accidentally lose while in this undefined state as player will stay still.

Movement

- The game keeps track of the player's position in terms of x and y coordinates. When attempting to move, the current position and next position of the user are noted.
- If the 'next' position will involve a collision with a wall, the player loses the game.
- If not, the current position of the player is updated to the new position. In memory, the light representing the user is turned off in the current position and turned on in the next position.

Winning

To win the game, the player needs to move to the area surrounding the end point, without hitting a wall along the way. Once the player reaches this point, the game ends, and the WIN screen appears.

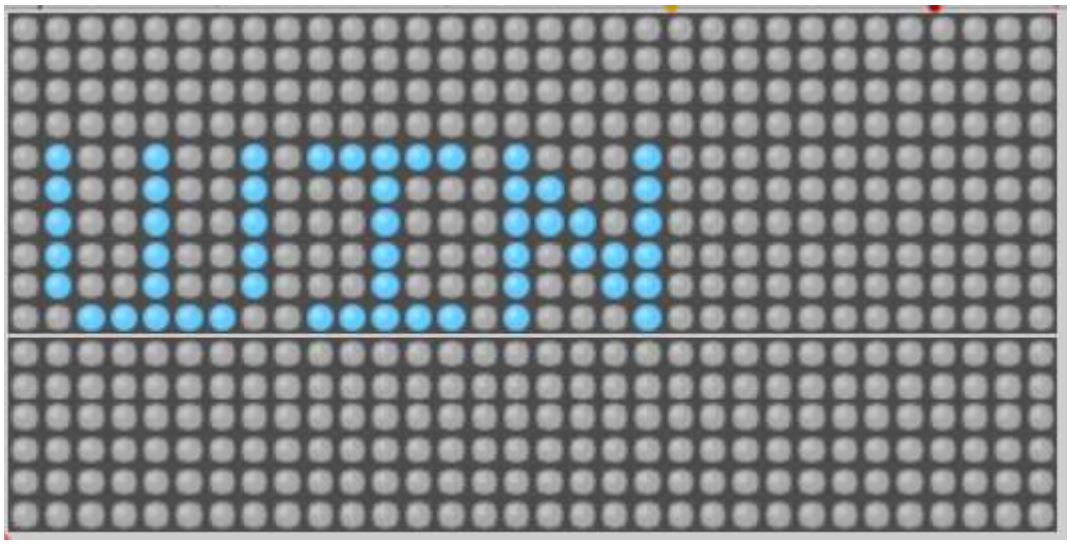

Fig 2. WIN displayed

Losing

The player can lose the game by hitting a wall. This means that they must be next to it (above, below, or beside) and they must attempt to move towards it. The player can move alongside walls but trying to move into them ends the game and a frown appears.

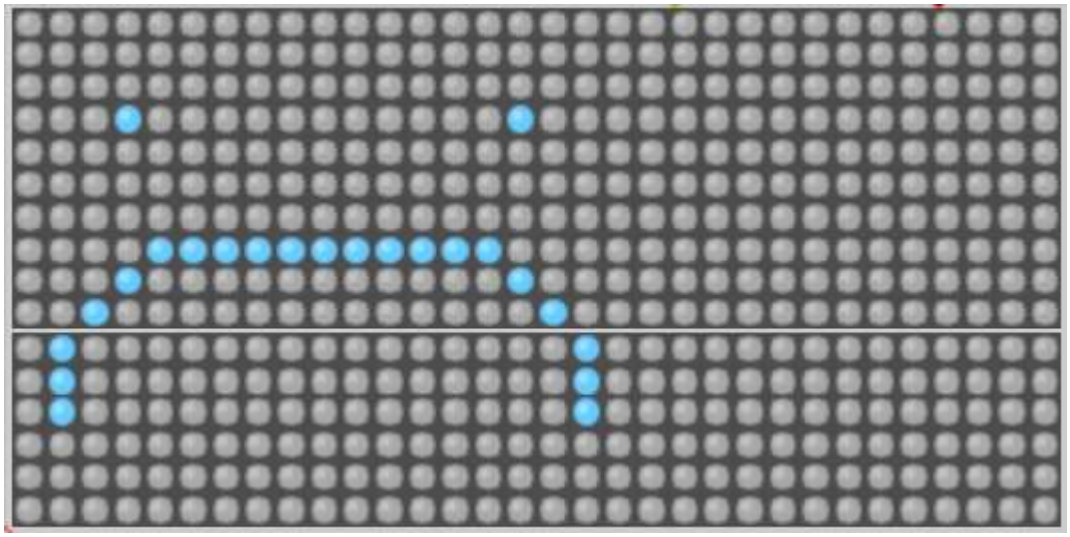

Fig 3. A frown is displayed to show a loss

Status

What Worked:

- Directional movement
- Storing and loading the maze from memory
- Win and Lose states

Future Improvements:

- Blinking User Icon slowed the gameplay (added more clk cycles to go through)
- Adding multiple levels. The game finished with about 200 instructions, so this was not possible. If more instruction memory is added, this could be expanded upon.