2D Game Board with Movement and Event Triggers (Minesweeper Game)

Submitted By: Muneeb Ahmad

Registration No.: 12311550

Acknowledgment I would like to express my sincere gratitude to my respected faculty member for guiding me in the successful completion of this project titled "2D Game Board with Movement and Event Triggers (Minesweeper)". I also thank my peers and family for their continuous support.

Table of Contents

- Flagging option for suspected mines
- Loss on clicking a mine, win on clearing all safe cells

5. Features and Flow

- 2D Grid Setup: Board is dynamically generated using nested arrays and grid layout (web) or nested lists (Python).
- Event Triggers:
    - Left-click: Reveals a cell (web)
    - Right-click: Flags a cell (web)
    - Text input: Reveals or flags a cell (Python)
    - Game ends on mine click
- Movement: Logical movement via recursive reveal of surrounding cells with zero mines.
- Scoring: No score count but victory is detected by revealing all safe cells.

6. Full Code (HTML/CSS/JavaScript) The complete HTML, CSS, and JavaScript code for the Minesweeper game is provided below:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <title>Minesweeper Game</title>
  <style>
    body {
      font-family: Arial;
      text-align: center;
      background: #f2f2f2;
    }
    #game-board {
      display: grid;
      grid-template-columns: repeat(8, 40px);
      margin: 20px auto;
      gap: 2px;
      width: fit-content;
    }
```

```
        .cell {
            width: 40px;
            height: 40px;
            background: #c4c4c4;
            border: 1px solid #888;
            font-size: 18px;
            font-weight: bold;
            cursor: pointer;
            user-select: none;
        }
        .cell.revealed {
            background: #e0e0e0;
            cursor: default;
        }
        .cell.mine {
            background: #d9534f;
            color: white;
        }
        .cell.flagged {
            background: #5bc0de;
            color: white;
        }
        #status {
            font-size: 18px;
            margin-top: 10px;
        }
    </style>
</head>
<body>
    <h2>Minesweeper</h2>
    <div id="game-board"></div>
```

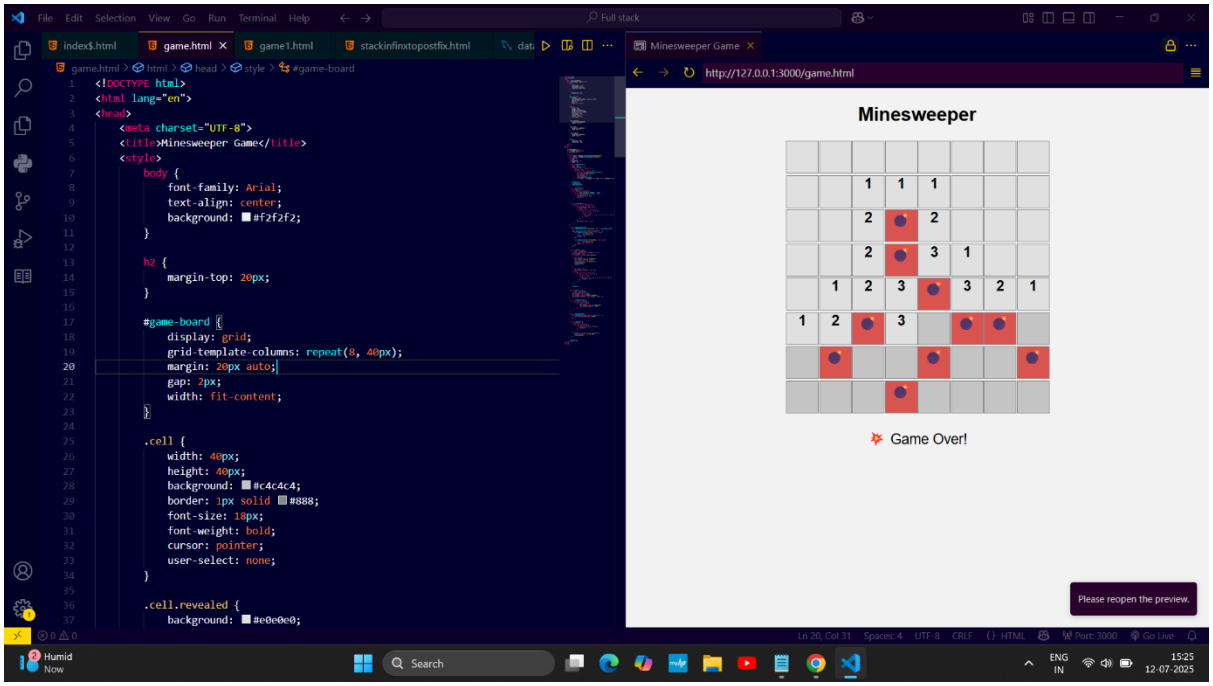
```
<p id="status"></p>
<script>
    const board = document.getElementById("game-board");
    const status = document.getElementById("status");
    let rows = 8;
    let cols = 8;
    let mineCount = 10;
    let cells = [];

    function createBoard() {
        cells = [];
        board.innerHTML = "";
        for (let r = 0; r < rows; r++) {
            cells[r] = [];
            for (let c = 0; c < cols; c++) {
                let cell = document.createElement("div");
                cell.classList.add("cell");
                cell.dataset.row = r;
                cell.dataset.col = c;
                board.appendChild(cell);
                cells[r][c] = { element: cell, mine: false, revealed: false, flagged: false, count: 0 };
            }
        }
        placeMines();
        countNumbers();
        addClickEvents();
    }

    function placeMines() {
        let placed = 0;
        while (placed < mineCount) {
```

```
      let r = Math.floor(Math.random() * rows);
      let c = Math.floor(Math.random() * cols);
      if (!cells[r][c].mine) {
        cells[r][c].mine = true;
        placed++;
      }
    }
  }

  function countNumbers() {
    for (let r = 0; r < rows; r++) {
      for (let c = 0; c < cols; c++) {
        if (cells[r][c].mine) continue;
        let count = 0;
        for (let i = -1; i <= 1; i++) {
          for (let j = -1; j <= 1; j++) {
            let nr = r + i;
            let nc = c + j;
            if (nr >= 0 && nr < rows && nc >= 0 && nc < cols && cells[nr][nc].mine) {
              count++;
            }
          }
        }
        cells[r][c].count = count;
      }
    }
  }

  function addClickEvents() {
    board.addEventListener("contextmenu", (e) => e.preventDefault());
    board.querySelectorAll(".cell").forEach(cell => {
```

```
        cell.addEventListener("click", function () {
            let r = +this.dataset.row;
            let c = +this.dataset.col;
            reveal(r, c);
        });
        cell.addEventListener("contextmenu", function () {
            let r = +this.dataset.row;
            let c = +this.dataset.col;
            flag(r, c);
        });
    });
}

function reveal(r, c) {
    let cell = cells[r][c];
    if (cell.revealed || cell.flagged) return;
    cell.revealed = true;
    cell.element.classList.add("revealed");
    if (cell.mine) {
        cell.element.classList.add("mine");
        cell.element.innerText = "💣";
        status.innerText = "💥 Game Over!";
        revealAllMines();
        disableBoard();
        return;
    }
    if (cell.count > 0) {
        cell.element.innerText = cell.count;
    } else {
        for (let i = -1; i <= 1; i++) {
            for (let j = -1; j <= 1; j++) {
```

```
            let nr = r + i;
            let nc = c + j;
            if (nr >= 0 && nr < rows && nc >= 0 && nc < cols) {
                reveal(nr, nc);
            }
        }
    }
    checkWin();
}

function flag(r, c) {
    let cell = cells[r][c];
    if (cell.revealed) return;
    cell.flagged = !cell.flagged;
    cell.element.classList.toggle("flagged");
    cell.element.innerText = cell.flagged ? "🚩" : "";
}

function revealAllMines() {
    for (let row of cells) {
        for (let cell of row) {
            if (cell.mine) {
                cell.element.classList.add("mine");
                cell.element.innerText = "💣";
            }
        }
    }
}

function disableBoard() {
```

```
        board.querySelectorAll(".cell").forEach(cell => {
            cell.style.pointerEvents = "none";
        });
    }

    function checkWin() {
        let safeCells = 0;
        for (let row of cells) {
            for (let cell of row) {
                if (!cell.mine && cell.revealed) {
                    safeCells++;
                }
            }
        }
        if (safeCells === rows * cols - mineCount) {
            status.innerText = "🎉 You Win!";
            disableBoard();
        }
    }

    createBoard();
  </script>
</body>
</html>
```



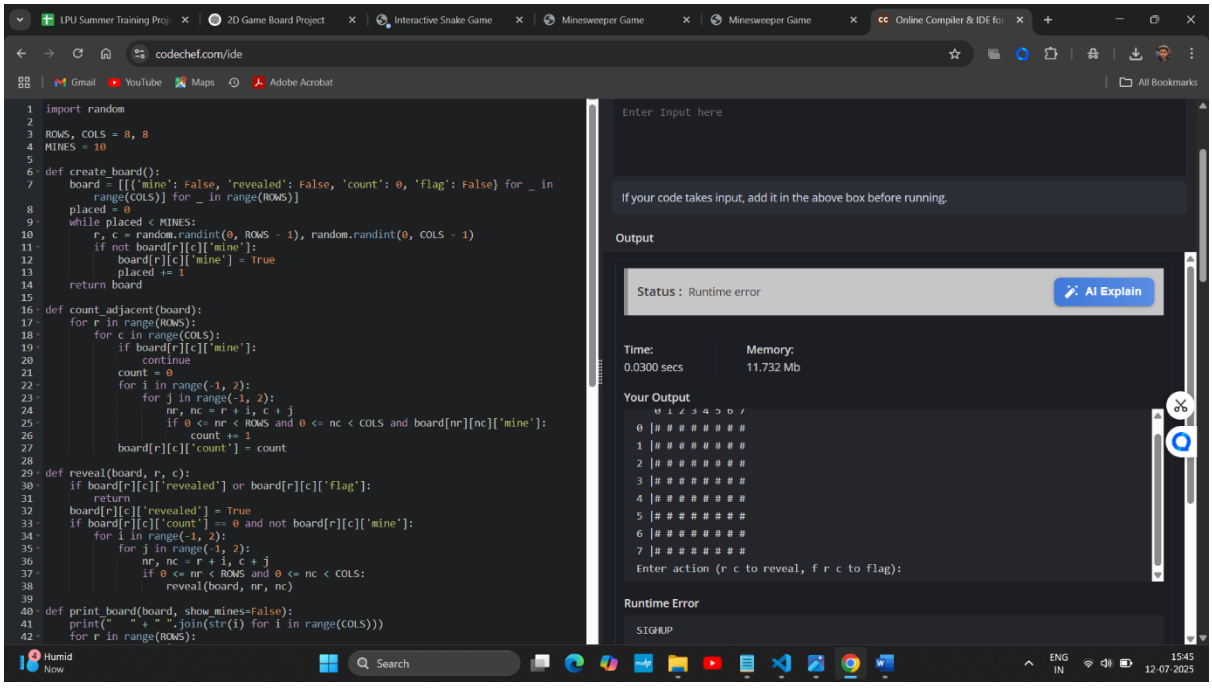
7. Full Code (Python) The complete Python code for the console-based Minesweeper game is provided below:

```
import random


ROWS, COLS = 8, 8

MINES = 10


def create_board():

    board = [[{'mine': False, 'revealed': False, 'count': 0, 'flag': False} for _ in range(COLS)] for _ in range(ROWS)]

    placed = 0

    while placed < MINES:

        r, c = random.randint(0, ROWS - 1), random.randint(0, COLS - 1)

        if not board[r][c]['mine']:

            board[r][c]['mine'] = True

            placed += 1

    return board
```

```
def count_adjacent(board):
    for r in range(ROWS):
        for c in range(COLS):
            if board[r][c]['mine']:
                continue
            count = 0
            for i in range(-1, 2):
                for j in range(-1, 2):
                    nr, nc = r + i, c + j
                    if 0 <= nr < ROWS and 0 <= nc < COLS and board[nr][nc]['mine']:
                        count += 1
            board[r][c]['count'] = count


def reveal(board, r, c):
    if board[r][c]['revealed'] or board[r][c]['flag']:
        return
    board[r][c]['revealed'] = True
    if board[r][c]['count'] == 0 and not board[r][c]['mine']:
        for i in range(-1, 2):
            for j in range(-1, 2):
                nr, nc = r + i, c + j
                if 0 <= nr < ROWS and 0 <= nc < COLS:
                    reveal(board, nr, nc)


def print_board(board, show_mines=False):
    print("   " + " ".join(str(i) for i in range(COLS)))
    for r in range(ROWS):
        row = f"{r} |"
        for c in range(COLS):
            cell = board[r][c]
            if show_mines and cell['mine']:
```

```
            row += "💣 "
        elif cell['flag']:
            row += "🚩 "
        elif not cell['revealed']:
            row += "# "
        elif cell['mine']:
            row += "💣 "
        elif cell['count'] > 0:
            row += f"{cell['count']} "
        else:
            row += ". "
    print(row)

def check_win(board):
    for r in range(ROWS):
        for c in range(COLS):
            cell = board[r][c]
            if not cell['mine'] and not cell['revealed']:
                return False
    return True

def play_game():
    board = create_board()
    count_adjacent(board)
    while True:
        print_board(board)
        action = input("Enter action (r c to reveal, f r c to flag): ").split()
        if len(action) == 2:
            r, c = int(action[0]), int(action[1])
            if board[r][c]['mine']:
                print("\n💥 Game Over!\n")
```

```
            print_board(board, show_mines=True)
            break
        else:
            reveal(board, r, c)
    elif len(action) == 3 and action[0].lower() == 'f':
        r, c = int(action[1]), int(action[2])
        board[r][c]['flag'] = not board[r][c]['flag']

    if check_win(board):
        print_board(board)
        print("\n🎉 You Win!\n")
        break

play_game()
```



10. Conclusion This project helped me explore the use of JavaScript to simulate event handling and recursive logic in a real-world web application, and Python for a console-based implementation. The game successfully demonstrates movement through logic and user-driven event triggers within a 2D interactive grid, showcasing the versatility of different programming paradigms for the same game concept.