Quantum Escape: Entangled Mazes

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Quantum Escape: Entangled Mazes is a Python Pygame-based maze navigation game that integrates quantum mechanics concepts to create unique gameplay dynamics.

- **Game Objective:**
  Navigate through one of two quantum mazes (representing quantum states |0⟩ and |1⟩), collect a key, and reach the exit while avoiding obstacles.

- **Quantum States and Modes:**
  The player exists in one of four quantum states:

    - **|0⟩ and |1⟩:** Classical states representing the bottom and top maze halves.

    - **|+⟩ and |−⟩:** Quantum superposition states where the player is "split" into twin players simultaneously navigating both mazes.

- **Controls and Gates:**

    - **Arrow keys:** Move the player in the maze.

    - **X gate ('X' key):** Flips between classical states |0⟩ and |1⟩, teleporting the player vertically between maze halves.

    - **H gate ('H' key):** Toggles quantum superposition. Activating it splits the player into twins, each in one maze half (|+⟩ or |−⟩). Deactivating collapses back to classical states.

    - **Z gate ('Z' key):** Flips between superposition states |+⟩ and |−⟩ during quantum mode, allowing subtle quantum toggling.

- **Quantum Mode Gameplay:**

    - The player cannot move while in quantum mode (superposition).

    - Obstacles automatically move upward on the screen, simulating quantum fluctuations.

    - The player can move obstacles left or right using arrow keys to avoid collisions.

    - Collision with obstacles triggers a **quantum measurement collapse**, randomly collapsing the player to $|0\rangle$ or $|1\rangle$ and returning to classical mode.

- **Obstacles and Maze:**
    - The game features two separate mazes with walls, keys, obstacles, and exits.
    - Obstacles behave differently based on the mode: in classical mode, they move left horizontally; in quantum mode, they move upward and can be shifted left or right by the player.
    - Players must strategically switch states and navigate both mazes simultaneously in quantum mode.
- **Winning and Losing:**
    - Collecting the key allows access to the exit.
    - Colliding with obstacles in classical mode results in game over.
    - Successfully reaching the exit with the key wins the game.
- **Additional Features:**
    - Random gates are applied occasionally to simulate quantum uncertainty.
    - The game UI clearly displays the current quantum state and key possession.
    - The screen clears upon winning or losing to provide a clean transition.