Conway's Game of Life – Python (Pygame) Implementation

Author: s30182
Language: Python 3
Libraries Used: Pygame, NumPy, Pickle, OS, Sys

Overview

This is a graphical implementation of Conway's Game of Life using Pygame. It includes functionality for running the simulation, saving/loading grids, changing settings, and choosing patterns. The program is structured to support user interaction through a graphical interface and a main menu.

File Structure

- main_menu(): Launches the main UI menu with options to start the game, load saved data, choose a pattern, configure settings, or quit.
- run_game(grid=None): Core simulation loop. Allows toggling of cell states while paused and manages simulation updates.
- pause_menu(): In-game menu accessed by pressing P, enabling save, resume, or return to the main menu.
- save_grid(grid): Saves the current grid state to a file using pickle.
- load_grid(): Loads the last saved grid from file, or returns an empty grid if no file exists.
- show_settings(): Allows user to customize colors for alive and dead cells.
- choose_pattern_menu(): Menu to select and load predefined grid patterns from the static_patterns directory.
- Button class: Generic button component for menus and interfaces.

- update_grid(grid): Applies Conway's Game of Life rules to compute the next state of the grid.
- count_neighbors(grid, y, x): Helper to count alive neighbors around a specific cell.
- draw_grid(): Renders the grid cells and their current states.
- quit_game(): Cleans up and exits the application.

Game Features

- **Simulation:** Automatically runs the Game of Life simulation with standard rules.
- **Grid Interaction:** While paused, users can click to toggle cells on/off.
- **Pause Menu:** Accessed with P key, provides options to continue, save, or return to main menu.
- **Color Settings:** Change colors for alive and dead cells through a menu.
- **Pattern Loader:** Load predefined patterns for instant configuration.
- **Save/Load Support:** Automatically saves and retrieves the simulation state from savegame.pkl.

Controls

- SPACE: Start/stop simulation
- P: Pause and show pause menu
- C: Clear the grid
- Mouse click (paused): Toggle cell state
- Mouse drag (paused): Draw/erase cells

Configuration

Constants

- CELL_SIZE = 10: Size of each cell in pixels.
- GRID_WIDTH = 80, GRID_HEIGHT = 60: Dimensions of the grid.

- FPS = 10: Frames per second for simulation.
- SAVE_FILE = "savegame.pkl": Save file name.

Colors

- Configurable via settings menu. Default:
    - ALIVE_COLOR = (0, 255, 0)
    - DEAD_COLOR = (30, 30, 30)

Dependencies

- pygame
- numpy
- pickle

Install using:

bash
CopyEdit
pip install pygame numpy

Directory Notes

- fonts/PressStart2P.ttf: Required font file.
- static_patterns/: Folder for .pkl grid patterns.
- savegame.pkl: File to persist saved grid state.

License

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