We request a bonus for two main additions in this assignment, both of which required a significant amount of time and effort to implement. Our focus was on making these features not only functional but also visually appealing and user-friendly.

1. **Comprehensive Logger Implementation:**

- We have developed a detailed and sophisticated logging mechanism that captures critical aspects of the simulation in real-time. This logging system generates three distinct log files, each providing invaluable insights into the simulation's operations:

  - **simulator.log**: This file consolidates the overall simulation's events, tracking the interaction between multiple houses and algorithms. It logs the start of simulations, the processing of house files, the initiation of threads for each algorithm, and the final results. It is particularly convenient for understanding the overall simulation flow and provides context for each algorithm's decisions. Key events include:

    - Starting simulations with specific houses and algorithms.
    - Processing individual house files and initiating corresponding threads.
    - Recording the number of steps taken, positions, and battery levels.
    - Summarizing the results at the end of the simulation, including score calculations and the closure of libraries.

  - **dfs_algorithm.log**: This log file records the detailed operations of the DFS algorithm as it navigates through the house. It logs the algorithm's initialization, the setting of sensors, and step-by-step decisions such as moving towards dirt, cleaning it, and navigating back to the docking station. The log provides a clear view of how the DFS algorithm explores and cleans the house, with specific entries like:

    - Initialization of the algorithm and sensors.
    - Logging of current positions, dirt levels, and decisions to clean or move.
    - Tracking of internal map updates and exploration directions.

  - **spiral_algorithm.log**: Similar to the DFS log, this file tracks the Spiral Cleaning Algorithm's actions, capturing every step the algorithm takes. It logs the Spiral algorithm's strategy for cleaning and its decisions related to charging, cleaning, and returning to the docking station.

- These log files are essential for debugging, performance analysis, and understanding the algorithms' behavior throughout the simulation. They provide a clear and comprehensive view of the simulation's progression and the algorithms' decision-making processes.

2. **Enhanced Visualization with Dual Algorithm Display:**

- The Pygame-based visualization has been significantly upgraded to support the display of two algorithms running simultaneously on the same house grid. The screen is split to show both the DFS and Spiral algorithms as they operate in parallel, providing a direct visual comparison of their performance.

- Key visualization features include:

  - **Simultaneous Algorithm Display**: Both the DFS and Spiral algorithms are visualized in real-time, with the screen split to show each algorithm's progress on the same house grid. This allows for immediate comparison of their efficiency and behavior.

  - **House Matrix Visualization**: The house layout, including walls, dirt levels, and the docking station, is clearly displayed. The vacuum cleaner's movement and dirt cleaning are animated to show the real-time impact of each algorithm's decisions.

  - **Battery and Steps Status**: The current battery level and the number of steps taken are displayed at the top of each algorithm's screen section. Progress bars visually represent these metrics, updating dynamically as the simulation runs.

  - **Winner Announcement**: At the conclusion of each simulation, the algorithm with the lower score is declared the winner, with the result displayed prominently on the screen. This result considers the efficiency of the cleaning process, the number of steps taken, and whether the robot successfully returned to the docking station.

  - **Interactive Flow**: Users can press the "Continue" button to move to the next house simulation, making it easy to observe and compare algorithm performance across different environments.

All this is a significant upgrade from before, but not to forget the visually appealing things that we did: the golden sign plus in the docking which lights when charging, the rotation of the vacuum, the change in color when cleaning...