Random Walk Documentation

1. User Manual

Objective

The Random Walk program provides an interactive experience of simulating random walks in 1D, 2D, and 8D grids. The user can set parameters such as grid size, number of steps, whether revisiting locations is allowed, and whether the walk should wrap around the grid. The walk is visually represented within Excel, and the user can observe how the walk progresses.

Features

OneD (1D Random Walk): The random walk occurs on a single axis, and the movement is either up or down. The grid size is limited to vertical movement.

TwoD (2D Random Walk): The random walk happens on a 2D grid where movement can be up, down, left, or right. The grid can be configured for wrap-around or fixed boundaries.

EightD (8D Random Walk): The random walk happens on an 8-directional grid where movement can occur in multiple directions including diagonals.

Steps: The number of steps the random walk will take.

Grid Size: Defines the size of the grid for the random walk.

Allow Revisit: Allows or disallows revisiting previous positions.

Wrap Option: Specifies if the grid should wrap around when moving beyond its boundaries.

How to Use

Start a New Walk:

Select the grid size and number of steps.

Choose the type of walk (1D, 2D, or 8D).

Decide if revisiting positions is allowed.

Choose if the grid should wrap around.

Click the button to start the walk.

Observe the Walk:

The walk will proceed step by step, and the current position will be updated in the grid.

The path will be displayed using "X" markers on the grid.

Grid Boundaries:

The walk will respect the grid boundaries as per the settings chosen (wrap-around or fixed boundaries).

Stopping the Walk:

The walk will end after the specified number of steps have been completed.

2. Detailed Code Analysis

1D Random Walk

The OneD walk function limits movement to vertical steps, where the position changes either up or down based on random direction.

The walk updates the currentRow position and uses the grid size to determine boundary conditions.

2D Random Walk

The TwoD walk allows movement in four cardinal directions: up, down, left, and right.

The movement logic randomly chooses a direction and updates the currentRow and currentCol position accordingly.

If wrapOption is enabled, the walk wraps around when it goes out of bounds.

8D Random Walk

The EightD walk introduces diagonal movement along with up/down and left/right movements.

A total of eight possible directions can be chosen at random, updating both currentRow and currentCol based on the direction chosen.

Boundary checks are applied similarly to the 2D random walk, with wrap-around options available.

Step-by-Step Progress

Each step of the walk is displayed by marking the corresponding grid cell with an "X".

After each move, the position is updated visually.

Grid Handling

The grid size is dynamically calculated based on the input provided by the user.

A wrap-around option is available for both vertical and horizontal movement to simulate an infinite grid, depending on the user's preference.

3. References

VBA Documentation - MSDN: For all basic Excel VBA functionalities.

Random Number Generation in VBA: Resources for understanding how random numbers are generated and used in VBA.

Hangman Game Logic Inspiration: Provides an understanding of how random movements are similar to concepts used in games like Hangman for simulation of user inputs and randomization.

4. Troubleshooting Record / Known Bugs / Future Development

Troubleshooting Record

Error: "Method or Data Member Not Found"

Cause: The program attempts to reference a label that is missing or incorrectly named.

Solution: Added the missing labels in the UserForm.

Display Not Updating Properly

Cause: The cell where the walk is displayed wasn't updating in real-time.

Solution: A temporary string (tempDisplay) was introduced to gradually build the visual display.

Error with Overlapping Frames

Cause: Another frame was added in the user form, causing UI overlap and discomfort.

Solution: Refactored the layout using the MultiPage control to better organize and separate the interface.

Compile Error: Procedure Declaration Mismatch

Cause: Mismatch in the signature of an event procedure.

Solution: Corrected the event handler signature to include the correct parameters.

Visibility Issues with Placeholder (lblUsername)

Cause: The placeholder label remained visible even after the user started typing.

Solution: Implemented Enter and Exit event handlers to manage label visibility dynamically.

Known Bugs

Case Sensitivity: The program differentiates between uppercase and lowercase letters. This can be addressed by normalizing input to a common case.

Input Validation: The game allows invalid inputs such as numbers or multiple characters in the random walk configuration.

Future Enhancement: Add validation to ensure that only valid inputs are accepted.

Future Development

Multi-Player Support: Allow multiple players to engage in a shared random walk or take turns.

Word Bank Expansion: Implement dynamic loading of word lists from external files for added variety.

Difficulty Levels: Introduce difficulty settings that vary the grid size, number of steps, or constraints based on user-selected levels.

Feature Enhancements:

Implement a "Hint" button to provide the user with a random hint or guide during the walk.

Allow users to create their own custom grid sizes or walk types.