Improved AI FreeCell Project

Implementation and E2E Testing of Empty-to-Empty Moves

Implementation and end-to-end testing of a feature allowing activation or deactivation of empty-to-empty cascade moves for algorithm testing purposes. When enabled, this feature eliminates unnecessary moves between empty cascades.

Results:

- Significantly reduces the number of moves for the 12-card problem (e.g., 12-game2.txt) in both DFS and IDS algorithms
- Primarily beneficial in small game setups
- Full results available in README.md, appendix slide 29, and the Excel spreadsheet

Implementation and Testing of New Meta-Heuristic

A new multi-factor scoring system was implemented with the following design:

- Rewards cards in foundations (-10 points per card)
- Penalizes occupied free cells (+5 points per cell)
- Penalizes unordered cards in cascades (+1 point per disorder)

Results of Meta-Heuristic 2:

- Very effective for easy setups: fastest on average, with solutions surpassing A* Heuristic 3 yet still below A* Heuristic 2
- Better than Meta-Heuristic 1 on hard setups, solving 2 of 4 challenging deals
- Low time and memory consumption for solved cases, though did not successfully solve all hard cases

Additional Important Improvements

- Created detailed video tutorial of the entire program with voice narration
- Enhanced README.md with detailed description of algorithm results in section 6 (AI algorithms) and implementation of empty-to-empty moves removal
- Updated presentation slides with new information (slide 17 – metaheuristic2 and appendix slides 27, 28, 29)
- Made minor improvements to the user interface
- Updated Results_Freecell_algorithms.xlsx with new results