1 Solitaire

Solitaire refers to any game of cards that a person can play with themselves. The most popular variant of solitaire is Klondike. It's a classical game that was included as a computer game in Windows 98. If you haven't played it before, you can try it out here[1].

Classical Rules

From this point onwards, we will refer to klondike as simply solitaire, specifically for a particular setting of the computer game.[2]

Setup

1. The bottom part of the game area is where the "piles" are. In dealing the cards, you create seven piles. The first pile will have one card, the second pile will have two, and so on until the seventh pile containing seven cards, for a total of 28 cards. For each pile, the last card is face up (i.e. visible), and all other cards are face down (i.e. hidden).

2. The top-right part of the game area is where the four "foundations" are, and the goal of the game is to build the foundations, one per suit, starting from the ace up until the king.

3. The top-left part of the game area is where the "stock" is. The stock contains the rest of the deck not dealt (for a total of 24 cards). Initially, all cards are face-down.

Once the game has been setup, it's time to play! The rules on moves are as follows:

Playing the game

1. You can choose to move one or more cards from one pile to another, with the following constraints:

   (a) You must choose one or more consecutive face up cards, starting from the last card of the source pile. In other words, you cannot skip cards, and the last card must be included.

   (b) The cards will be moved to right after the last card of the target pile.

   (c) You can place a black card (i.e. clubs or spades) on a red card (i.e. diamonds or hearts) or vice versa, but not a card on another card of the same color (i.e. black-on-black or red-on-red).

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[1]https://www.solitaire-klondike.com/klondike.html
[2]You can also refer to here, for a short summary: https://bicyclecards.com/how-to-play/klondike

(d) You can only place a card on another card with a rank exactly one step up. For example, an ace on a two, a two on a three, a ten on a jack, or a queen on a king.

(e) Only king cards are allowed to be moved to empty piles.

(f) If, after moving cards, the last card of the source pile is face down, it will be flipped face up.

2. For the stock:

(a) Initially, the stock holds 24 cards face-down in a certain order. This order will not change throughout the game.

(b) You can deal cards by revealing them from the stock one-by-one.

(c) You can move the current revealed card in the stock to any pile in the piles area, following the constraints. Doing this will remove this card from the stock and change the current revealed card to the previous card. If the taken card is the first card in the stock, then this will result in all cards of the stock face down until is again dealt.

(d) Once the last card is dealt, dealing it again will reset the stock, hiding the remaining cards until it is dealt again.

3. For the foundations:

(a) A single card can be moved from the stock or from one of the piles to one of the four foundation.

(b) An empty foundation pile can accept any ace card. Afterwards, you can only place a card of the same suit with the next rank. For example, you can place a two of hearts on an ace of hearts, a queen of spades on a jack of spades, or a seven of diamonds on a six of diamonds.

(c) You can also place one of top cards in one of the foundations onto one of the piles, following the constraints.

4. The player wins when all of the cards have been moved to the foundations.

Objective

The goal of this software project is to implement a terminal-based solitaire game.

2 Milestone 1 (55 pts)

The first milestone requires you to implement a basic working game, that is able to do the following. Note that most solitaire configurations are not solvable using only the following features. **In addition to below, we will require that you define and use at least one user-defined class.**

1. (5 pts) Selection of any starting configuration for your solitaire game, i.e. the cards for each of the seven piles and the stock.

2. (20 pts) The terminal-based user interface, which includes printing the game screen, printing the menu, and processing the commands from the users. The menu should include the following options:

(a) Move one card from one pile to another pile or a foundation.

(b) Deal the stock.

The game screen should include the piles, the foundations, and the stock. The face up cards are shown with their suits and then rank (e.g. H3 for three of hearts, sA for ace of spades, and cJ for jack of clubs). To differentiate the red and black suits, use uppercase for the red suits (hearts and diamonds) and lowercase for the black suits (clubs, spades). If the card is face down, it is shown as open and close square brackets: "[]".

For the stock, only the current revealed card should be displayed, or "[]" if the stock is reset. For the foundations, only the top card should be displayed, or "[]" for an empty foundation.

3. (20 pts) Support moving of *only* single cards. The cards can come from either a pile, the stock, or a foundation. The card is denoted by the value (suit + rank, e.g. H4, DA), while the target is denoted by a number from 1-7 (for a pile) or a letter from A-D (for a foundation). The selected card must be visible and moveable (i.e. not covered by another card in a pile), and the target destination must be a valid destination following the constraints. Otherwise, print out an error and ask for input again.

After every move, the last card of each pile should be a face up card.

4. (10 pts) Support dealing of the cards in the stock. If the stock is empty, display "XX" instead.

3 Milestone 2 (45 pts)

The second milestone builds up on the first milestone, and completes the features for a fully working game:

1. (15 pts) Support moving of multiple cards in a pile to another pile. The selected card must be visible (but can be covered by another card in the pile, which will be included in the move).

2. (30 pts) Support the saving and loading of game states to/from a file, following a certain format. Note that the game state loaded may not necessarily be a starting state of a game, but could be after playing some moves. Same with saving a game state, which should be in the same proper format. Given the above, you should be able to load a game state you have saved as well.

4 Milestone 3 (Bonus 20 pts)

The third milestone includes the ability to undo moves, up to 5 steps behind. This move could be the movement of cards or the dealing of the stock. Note that it should follow the known "undo" functionality, in that doing an action after an undo should not reset the number of undos available (e.g. move 1 → move 2 → move 3 → undo (back to move 2) → move 4 → undo (back to move 2) → undo (back to move 1)).