C++ Project Manual

Organization of Programming Languages

Professor Kumar

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Salil Maharjan

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1 Bug Report

The program does not have any known bugs. Previous bugs that were fixed after the second demo include:

- Game ends after one of the player's hand becomes empty when loaded from a configuration file. (Bug Fixed)
- Program was unable to handle configuration files that did not have hyphened stacks (For e.g. 5D 2D 5H). This caused problem in deciding the round scores. It can now handle both hyphenated (For e.g. 5D-5H) and non-hyphenated stacks in configuration files. (Bug Fixed)

2 Feature Report

2.1 Missing Features

All features reported on the project description and grading rubric from the website has been successfully implemented.

2.2 Extra Features

The capture pile is sorted as mentioned in the grading rubric and it is extended so that the hand pile is also sorted for ease of readability. Stacks are easily distinguishable as they are aligned on the same line separated with the pipe symbol '|'.

The computer strategy and user help mode, considers the stacks on the player's capture pile to give recommendation for the next move.

As mentioned in Section 1: Bug Report, the program is able to read and handle hyphenated/non-hyphenated configuration files.

The program also incorporates a simple sleep function to add effect to drawing a card from the stock pile for all players.

3 Data structure/Classes Description

The program extensively uses data structures from the STL library like vectors and maps. No separate implementation of any data structure was done for the project. There are seven classes used in the program: Game, Round, Player, User, Computer, Card, Deck.

Game is the main class to start the game. It creates Round class objects as requested by the user and stores information like the round number, total player scores, and the Player class objects. It includes a method to load a saved game from a configuration file.

The Round class holds all necessary methods to start a round of the game. It stores information about the cards on the deck and the layout during each round. It also includes a method to save file which can be used on any round to save the game to a configuration file. As Game and Round class are highly coupled, the Round class is made a friend of Game class so that it can access and update member variables like total score for each player and the round counter. This also gives access for the Round class to access the Player objects who are playing in the game. The Round class also uses the Deck class for creating a stock pile and to distribute cards.

Player is an abstract class and has virtual methods. User and Computer inherit Player and provide separate implementations of virtual methods declared in Player class. Methods that are common for both User and Computer player are defined in the Player class like sorting and arranging cards on hand and in the capture pile. Separate implementations for other methods which differ for the two players are defined in their respective classes.

The Deck class uses the Card class to create a standard deck of 52 cards. The Card class holds information about the card face and suit.

4 Log

January 22, 2020:
- Listed out main classes to use for go stop game. (30 min)
- Read the description and rules of the game. (30 min)
- Made a design for the C++ project (30 min)
- Wrote and tested Card and Deck class (1 hour)
- Wrote function to shuffle deck and incorporated feature to create Deck objects with multiple deck of cards. (30 min)
- Tested functions and the new deck class. (1 hour)

January 23, 2020:
- Wrote skeleton for classes according to yesterday's design with member variables. (1 hour)
- Wrote constructors Game, Round, Player- User and computer classes (1 hour)
- Implemented the beginning of the game to distribute cards to players (1 hour)
- Removed inheritance of Round class to Game because Game constructor was being called every time Round is constructed. (1 hour) Tried making them friends but finally replaced it by passing the required variables through the constructor (1 hour)
- Tested card dealing function. (1 hour)
- Replaced random shuffle function with shuffle function because it is deprecated in c++11 (30 min)

January 24, 2020:
- Had to pass too many parameters between Game-Round classes. Redeclared Round as friends of Game to avoid parameter overloading. (30 min)
- Wrote function to determine first player according to the game rule. (1 hour)
- Wrote the main game loop for the rounds. (1 hour)
- Made Round and Game constructors stronger by initializing required variables for the game. (30 min)

January 25, 2020:
- Wrote function to deal cards. (1 hour)
- Changed vector for layout into vector of vectors as cards can be stacked. (1 hour)
- Completed dealing to players and layout function. (1 hour)

January 26, 2020:
- Wrote function to display board in the command line (1 hour).
- Wrote function to process the turns in the round according to the determined first player (1 hour)
- Wrote overloaded play function for user. Finished the card picking code. (1 hour)
- Wrote function to check picked card with matching cards in the layout. (1 hour)

January 27, 2020:
- Wrote function to complete card selection and processing it on the layout. (1 hour)
- Debugging to find and process triple stacks: H3 (1 hour)

Total: 20.5 hours

January 29, 2020:
- Complete function to process user hand moves. Cases h1-h3. (1 hour)
- Completed function to deal cards from stock pile. (1 hour)
- Completed function to handle cases after drawing from stock pile (1 hour)
- Added input validation (30 min)

February 1, 2020:

- Completed play function for computer player. (1 hour)
- Completed strategy function and capture function. (1 hour)
- Introduced game score and round score. (30 min)
- Worked on the GUI (30 min)
- Worked on helper option for user (30 min)

February 2, 2020:
- Completed function to save game (30 min)
- Completed function to read from serialization file and load game. (1 hour)
- Formatting serialization file and debugging (30 min)

Total: 9 hours

February 5, 2020:
- Added feature to display selected card and layout matches. (30 min)
- Refactoring code. (30 min)
- Rewrote score loader to save score as total and recalculate round score. Debugging and completion. (30 min)

February 10, 2020:
- Checking grading rubric and refactoring code. (30 min)
- Displaying board in between hand move and stock pile move (30 min)
- Wrote function to sort player's capture pile and tested it (30 min)
- Code refactoring and put unused methods as "Trash methods" (30 min)
- Rechecked documentation (1 hour)

February 11, 2020:
- Rechecking program and some test cases. (1 hour)
- Writing manual for demo. (1 hour)

February, 12, 2020:
- Made input validation stronger. (30 min)
- Function to process configuration files without hyphens for stacks to behave as usual. (30 min)
- Function to sort hand pile. (30 min)
- Debug and testing (30 min)
- Fixed bug of round ending early without both player's hand being empty. (10 min)
- Updating Manual. (30 min)

February 16, 2020:
- Updating manual and screenshots for final submission (1 hour)

Total: 10 hours
FULL TOTAL: 39.5 hours

5 Compiling Instructions

A MakeFile is included in the submission. The program is compiled using C++11 compiler. Once in the folder directory, enter "make" to build the project using the command line. The executable named "goStop", builds on the same directory. The game can be initialized from a previous configurations file or as a new game.

6 Program Screenshots:

```
User Turn                                                          3H|3D|
Menu:                                                              5D|5C|
1. Save the game                                                   7S|7H|
2. Make a move                                                     8D|8C|8S|8S|
3. Ask for help                                                    9H|9D|
4. Quit the game                                                   XD|XS|
:3                                                                 ------------------------------
You can chose to play X of Hearts because it can capture a stacked pair and build a captured pair to earn a point.   Menu:
Picked card: XH                                                    1: Draw card from stock pile
Recommended layout captures: XS                                    :1
Number of matches: 1                                               Drawing top card from stock pile...............
Which card from your hand do you want to add to the layout?        ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
(Pick a card position number written below the card detail)        You drew: 3 of Clubs from the stock pile!
Your Hand:                                                         ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
XH QD                                                              Picked card: 3C
1  2                                                               Recommended layout captures: NA
:1                                                                 Number of matches: 0
--------------------------------                                   --------------------------------
Computer Score: 2                                                  Computer Score: 2
Computer Hand:                                                     Computer Hand:
XC                                                                 XC
Computer Capture:                                                  Computer Capture:
4C|4H|                                                             4C|4H|
5C|5S|                                                             5C|5S|
6D|6S|6C|6S|                                                       6D|6S|6C|6S|
7D|7D|                                                             7D|7D|
XS|XD|                                                             XS|XD|
JD|JC|JS|JS|                                                       JD|JC|JS|JS|
QS|QH|                                                             QS|QH|
KH|KH|                                                             KH|KH|
--------------------------------                                   --------------------------------
Layout:                                                            Layout:
2C|2S|2D|                                                          2C|2S|2D|
1H|                                                                1H|
XS|XH|                                                             6C|
6C|                                                                3C|
Stock pile: 3C|||||.......                                         Stock pile: KC|||||.......
--------------------------------                                   --------------------------------
User Score: 1                                                      User Score: 2
User Hand:                                                         User Hand:
QD                                                                 QD
User Capture:                                                      User Capture:
1C|1D|                                                             1C|1D|
2D|2H|                                                             2D|2H|
3H|3D|                                                             3H|3D|
5D|5C|                                                             5D|5C|
7S|7H|                                                             7S|7H|
8D|8C|8S|8S|                                                       8D|8C|8S|8S|
9H|9D|                                                             9H|9D|
XD|XS|                                                             XD|XS|XS|XH|
--------------------------------                                   --------------------------------
Menu:
1: Draw card from stock pile                                       Round: 5
:1                                                                 Turn: 2
Drawing top card from stock pile...............                    --------
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~                    Computer Turn
You drew: 3 of Clubs from the stock pile!                          Menu:
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~                    1. Save the game
Picked card: 3C                                                    2. Make a move
Recommended layout captures: NA                                    3. Quit the game
Number of matches: 0                                               :
```

Screenshot 1: User Turn with help mode with each user input. Picks card from hand according to recommendation and adds to layout to create a stacked pair. Then draws a card from the stock pile, which does not have any match so it is added to the layout. The capture is made and added to capture pile to make a complete set of 4.

```
Round: 5                                              QD
Turn: 2                                               User Capture:
--------                                              1C|1D|
Computer Turn                                         2D|2H|
Menu:                                                 3H|3D|
1. Save the game                                      5D|5C|
2. Make a move                                        7S|7H|
3. Quit the game                                      8D|8C|8S|8S|
:2                                                    9H|9D|
The computer chose to play X of Clubs because no card matches a card on the layout.   XD|XS|XS|XH|
Picked card: XC                                       --------------------------------
Layout matches: NA                                    Drawing top card from stock pile...............
Number of matches: 0                                  ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
--------------------------------                      You drew: KING of Clubs from the stock pile!
Computer Score: 2                                     ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Computer Hand:                                        Picked card: KC
                                                      Layout matches: NA
Computer Capture:                                     Number of matches: 0
4C|4H|                                                --------------------------------
5C|5S|                                                Computer Score: 2
6D|6S|6C|6S|                                          Computer Hand:
7D|7D|
XS|XD|                                                Computer Capture:
JD|JC|JS|JS|                                          4C|4H|
QS|QH|                                                5C|5S|
KH|KH|                                                6D|6S|6C|6S|
--------------------------------                      7D|7D|
Layout:                                               XS|XD|
2C|2S|2D|                                             JD|JC|JS|JS|
1H|                                                   QS|QH|
6C|                                                   KH|KH|
3C|                                                   --------------------------------
XC|                                                   Layout:
Stock pile: KC|||||.......                            2C|2S|2D|
--------------------------------                      1H|
User Score: 2                                         6C|
User Hand:                                            3C|
QD                                                    XC|
User Capture:                                         KC|
1C|1D|                                                Stock pile: 9C|||||.......
2D|2H|                                                --------------------------------
3H|3D|                                                User Score: 2
5D|5C|                                                User Hand:
7S|7H|                                                QD
8D|8C|8S|8S|                                          User Capture:
9H|9D|                                                1C|1D|
XD|XS|XS|XH|                                          2D|2H|
--------------------------------                      3H|3D|
Drawing top card from stock pile...............       5D|5C|
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~              7S|7H|
You drew: KING of Clubs from the stock pile!          8D|8C|8S|8S|
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~              9H|9D|
Picked card: KC                                       XD|XS|XS|XH|
Layout matches: NA                                    --------------------------------
Number of matches: 0                                  User Turn
--------------------------------                      Menu:
Computer Score: 2                                     1. Save the game
Computer Hand:                                        2. Make a move
                                                      3. Ask for help
Computer Capture:                                     4. Quit the game
4C|4H|                                                :
```

Screenshot 2: Game setup and computer's play turn.

```
Computer Capture:
4C|4H|
5C|5S|
6D|6S|6C|6S|
7D|7D|
XS|XD|
JD|JC|JS|JS|
QS|QH|
KH|KH|
--------------------------------
Layout:
2C|2S|2D|
1H|
6C|
3C|
XC|
KC|
QD|
9C|
Stock pile: 9S|||.......
--------------------------------
User Score: 2
User Hand:

User Capture:
1C|1D|
2D|2H|
3H|3D|
5D|5C|
7S|7H|
8D|8C|8S|8S|
9H|9D|
XD|XS|XS|XH|
--------------------------------
Game Summary:
On this round...
User score: 2
Computer score: 2
-------------------------
Total User score: 10
Total Computer score: 11
Do you want to play another round of Go Stop?
1: Play another game.
2: End Go Stop.
:2
************************************************
  COMPUTER WINS! BETTER LUCK NEXT TIME.
************************************************
Game Summary:
On this round...
User score: 2
Computer score: 2
-------------------------
Total User score: 10
Total Computer score: 11


--------------Thank you for playing Go Stop--------------
Salils-MacBook-Pro:goStop salilmaharjan$
```

Screenshot 3: End game results.

```
Salils-MacBook-Pro:goStop salilmaharjan$ ./goStop
GO STOP
Main menu options:
1: Load a saved game.
2: Load a new game.
---------------------
:1
Please enter the name of file to load from
save_file.txt
Details loaded from previous game:
Round: 2
Computer Total Score: 1
User Total Score: 5
-------------------------------
Computer Score: 0
Computer Hand:
2C 2H 5C 7S 7D 9D QH QH QD KD
Computer Capture:
-------------------------------
Layout:
3D|
8S|
8H|
6S|
8C|
KC|
5S|
4D|
Stock pile: 1H||||.......
-------------------------------
User Score: 0
User Hand:
5H 5C 6S 6H 7C 7S 8D XD JD QD
User Capture:
-------------------------------

Round: 2
Turn: 1
--------
User Turn
Menu:
1. Save the game
2. Make a move
3. Ask for help
4. Quit the game
:1
Do you want to enter a custom file name? (Default save file is: save_file.txt)
1: Create custom file name.
2: Use default file name.
:2
Game saved successfully.
Game Summary:
On this round...
User score: 0
Computer score: 0
-------------------------
Total User score: 5
Total Computer score: 1
Salils-MacBook-Pro:goStop salilmaharjan$
```

Screenshot 4: Loading and saving the game.

Thank you