Individual Assignment

ECSE 321 – Introduction to Software Engineering
Professor Muthucumaru Maheswaran

Submission Deadline: See WebCT

Introduction

This assignment is primarily about GUI programming in Java. You are to develop a single computer multiplayer Blackjack/21 game. The basic functionality and requirements are described first, followed by guidelines and a list of deliverable materials. The document ends with a detailed description of the Blackjack rules.

Multiplayer Blackjack

Blackjack (also known as Twenty-one) is the most widely played casino banking game in the world. Much of blackjack's popularity is due to the mix of chance with elements of skill, and the publicity that surrounds card counting (calculating the probability of advantages based on the ratio of high cards to low cards).

1. The game selects a card for each player according to a standard 52-card playing deck. Selection is to be implemented using Java's built pseudo-random number generator (see java.number.Random)

2. In order to have repeatable (non-random, testable) behavior, the game includes a mechanism to optionally seed the pseudo-random number generator.

3. The game keeps track of how many rounds have been played, and the cash amount held by all players.

4. After the first 2 cards are dealt, the user can select from several options: hit, stand, split, double.

5. The game keeps track of which cards have already been dealt in previous rounds and only deals out whatever cards remain. When all cards have been dealt, the cards not in play are reshuffled, and the game continues.

6. (*Optional Extra*) **Cheat Mode** - The game provides statistical information regarding chance of dealt hands versus dealer's possible cards. This is similar to a strategy used by a card counter.

7. At the start of the game, each player is requested a name for play and given a bank total of 100$.

8. At the start of each round, each player's bank total is deducted 10$.

9. The game will automatically remove players from the table when their cash amount becomes zero or too low to continue onto the next round.

10. At the end of each round players with winning hands will receive the cash amounts dictated by the rules of the game (see Rules section).

11. The game will handle all of the dealer's operations automatically (see Rules section for details).

12. The winner is decided when only one player remains (dealer excluded).

13. After finishing the game, the user can reset the game and play again.

14. (*Optional Extra*) The game keeps track of a "High Score" list with the name, date, and score of each record holder.

15. (*Optional Extra*) At the start of each round each player can decide to change the default bet from the minimum 10$ to any amount up to the current bank total.

Guidelines

In this assignment you will complete the following tasks:

1. Conduct a preliminary analysis of the requirements to determine how you will implement the application step-by-step. Define the functionalities and features of your system. Identify the objects of the system and the interactions between them, and consider how they will be implemented. Consider the logic, algorithms, and programming that are needed for this system. Determine working factors such as time, schedule, tasks, information, resources, etc.

2. Design the user interface of your application. Determine which elements you are going to use and how you will arrange them inside a frame. Identify how the system responds to user inputs and program it.

The programming requirements for this assignment are as follows:

1. You are to implement this computer game using Java. Program the user interface using Swing.
2. You must use at least one popup window. You can choose the purpose of this window.
3. Use the coding conventions learned in class.

This assignment is to be completed **individually** and **independently**.

Note: The game graphics are not a priority for this project. You will be graded on the design and functionality of your interface (Does it work? Is it easy to use? Etc.), and not on how fancy or flashy it is. Detailed card pictures or animations are certainly not required, but will be considered as part of a maximum 5% bonus.

Deliverables

You are expected to submit the following items via WebCT (in the Assignments section):

1. A soft copy of all related project files. This includes:
   a. Your source code.
   b. A readme file with any specific instructions needed to compile and run the program. Usually it is a good idea to include information like the version of Java and platform on which you developed your software, in case we have problems executing your code.
   c. A sample run with results. This is a description of what should happen given that we follow certain instructions, and should either include screenshots or a list of actions to perform and responses to observe.
2. A softcopy of your report that contains 3-5 pages + 1 page of references + a title page, written in 11pt font. The report should include:
   a. A short description of the system.
   b. A list of requirements.
   c. A general explanation of the system architecture and design. Describe the main classes, the interface between classes, etc.
   d. Outline how the requirements are fulfilled by your design and implementation.

Note: You may scavenge every resource you can find online. However, you *must* specify any resources used on a separate additional (sixth) page of the hardcopy report.

Optional Extras

You are free to add any enhancements beyond the basic requirements outlined above. All extra features are optional and for extra credit. Some suggested "optional extras" are suggested above. Note that any enhancements should not replace the basic functionality outlined above. If you choose to include any enhancements or additional features, please clearly state these in your report.

Blackjack Rules (taken from http://en.wikipedia.org/wiki/Blackjack)

In casino blackjack, the dealer faces one to seven players from behind a kidney-shaped table. Each player plays his hand independently against the dealer. At the beginning of each round, the player places a bet in the "betting box" and receives an initial hand of two cards. The object of the game is to get a higher card total than the dealer, but without going over 21 which is called "busting" or "too many." (The spot cards count 2 to 9; the 10, jack, queen, and king count as ten; an ace can be either 1 or 11.)

The player goes first and plays his hand by taking additional cards if he desires. If he busts, he loses. Then the dealer plays her hand. If the dealer busts, she loses to all remaining players. If neither busts, the higher hand total wins. In case of a tie, no one wins - the hand is a "push." It is possible for the dealer to lose to some players but still beat other players in the same round.

Game Start

The number of players is decided (2 to 7) with each supplying a name (if none provided, called Player#, with # the number 1-7). Each player is given 100$ to play with.

Round Start

Each player's bank total is subtracted 10$, if any player cannot supply this amount, he is kicked from the table. The first card is dealt face up to each player in order. The dealer's first card is dealt face up. The second card is dealt face up to each player, excluding the dealer, whose card is dealt face down. Play begins with the first available player.

Player Options

With the goal of reaching 21 without busting, the player is given up to 5 options: *Hit, Stand, Double Down, Split*, & *Insurance*

1. **Hit**: The player is dealt one extra card, whose value is added to the player's current card total. The player can continue to hit so long as his total does not exceed 21. If he busts, play switches to the next available player.
2. **Stand**: The player decides to keep his current card. Play switches to the next available player.
3. **Double Down**: The player is dealt only one extra card before play is passed to the next player. Additionally, the player supplies again the amount of his original bet (i.e. if originally 10$, then new bet is doubled to 20$). This option is only available if the player has the funds to supply the additional bet.
4. **Split**: This option is only available when a player is dealt a pair of cards. The cards are split into two hands, and the player must supply a bet equal to the original. Play continues with the player now having two hands. This option is only available if the player has the funds to supply the additional bet.
    Note: Split can only be used once per round, per player.
5. **Insurance**: This option is available only when the dealer's face up card is an Ace. The player can opt to purchase insurance in case the face down card is a K, Q, J or 10, and he does not have blackjack. Insurance costs 50% of the original bet (i.e. 5$ for a 10$ bet). The point of this is if the dealer gets blackjack the initial bet can be won back, since the payout on insurance is 2:1 (i.e. the initial bet).

However insurance money is forfeit if the dealer does not have blackjack. This option is only available if the player has the funds to supply the additional bet.

Dealer

The dealer's moves are played automatically at the end of the round. First the face down card is revealed, and the total calculated. The dealer hits on 16, and stands on 17. If the dealer busts, all non-busted players win their bet. In the event of a tie, all players equaling the dealer get their bet back (a net-zero loss). It is possible for the dealer to beat some players and lose to others.

Blackjack

Blackjack is a hand wherein the two initial cards add up to 21. The only way of doing this is with a K, Q, J, or 10 with an Ace. Provided the dealer does not get a blackjack as well, the payout is 3:2, versus the typical 1:1. For example, in a normal situation, putting down 10$, and winning a normal hand will net you 20$, i.e. a 10$ surplus. However if you get a blackjack on a 10$ bet, you get 25$ back, i.e. a 15$ surplus. A user with a card total of 21 achieved with more than two cards gets the normal payout. *It is possible to get blackjack twice when splitting.*

Game Over

A winner is designated when only one player and the dealer remain.