Computer Science 101 – Winter 2019

Cribbage Design Document

Version 1.0

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# Introduction

This document was created for CPSC 101 in Winter 2019 by Team Cortado. It was last revised on Feb 5, 2019.

This design document is incomplete, detail method and attribute signatures need to be written out to make sure game play can occur correctly.

This document gives the preliminary design of 2 player cribbage. The design specification from the project handout is provided in Appendix A for reference.

## Work Distribution To Date

|  |  |  |
| --- | --- | --- |
| Persons | Date | What |
| Teigan O’Carroll  Son Chau  Chuhan Shen  Nancy Lin | Jan 31, 2019 | Played game and work out design document |
| Chuhan Shen  Desmound Dumonchelle  Teigan O’Carroll  Nancy Lin  Son Chau | Feb 5, 2019 | Worked on section 3. |
|  |  |  |

# Design Elements

## List of Nouns

1. Board
   1. Pegs
   2. Score
2. Cards
   1. Deck
   2. Face Cards
   3. The cut-card
3. Count Cards
4. Game Phases
   1. Drawing
   2. Round
   3. Pegging
   4. Count the hand
5. Player
   1. Crib
   2. Dealer
   3. Dealing
      1. Shuffle
   4. Hand
   5. Played hand
   6. To cut the card
   7. To peg
   8. Play card
6. Player – computer
7. Player – human
8. Referee

## List of Facts

* The board has 121 pegs
* Each player starts from 0
* When each player plays a card, it is revealed onto the board
* As each player scores from counting their hand, they advance their peg position
* The first player to reach 121 wins
* The position of the player on the board is his score
* A deck of card has 52 cards with 4 suits, within each suit there are 13 cards ranging from Ace to King
* During drawing each card is rank by their face and suit value. For example, King of Spade is worth rank higher than King of Hearts which is rank higher than Queen of Spade
* During the rest of the phases of the game:
  + Each card is worth the point of their numerical value, except for face cards. For example 2 of spade is 2 points.
  + Face cards: Jack, Queen and King are worth 10 points each
* During drawing
  + The player who draws the higher ranked card is the dealer
  + If 2 players both draws a card with the same value, they will redraw until 1 player ends up with a higher rank card
* If the cut card is a Jack the dealer scores 2 point
* During pegging:
  + When 2, 3, 4 or more of the same card is played in sequence, 2, 3, 4 or more points is awarded to the player that played the last card
  + When the total points of the cards played in from the beginning of the sub-round is 15, the player that played the last card gets 1 point
  + When the total points of the sub-round reaches exactly 31, the player that plays the last card gets 1 extra points
  + The player that plays the last card in any sub-round gets 1 point
  + If there is a run of more than 3, then the number of cards involved in the run is awarded to the player that played the last card in the run
* Count hands:
  + When both players have no cards remaining in their hands the count begins
  + They look for unique scoring combination of the cards that were dealt to them and the cut card
  + The dealer also counts the unique scoring combination of the cards in the crib and the cut card
  + Unique scoring combinations includes
    - Any combination of cards that forms 15: 2 points per combination
    - Any pair: 2 points per pair
    - 4 unique pairs: 12 points
    - Any 3 of a kind: 3 points
    - Any 4 of a kind: 4 points
    - Any run of 3 or more: as many points as there are in the run
    - 4 of the same suite: 4 points
    - 5 of the same suite: 5 points
* At the start of the game, players decide who is the dealer by drawing 1 card each. The player that draws the higher rank card is the dealer.
* The dealer goes first in the super-round and has the crib
* The non-dealer player counts his hand first at the end of the round
* Each player then takes turn being the dealer
* Each player is dealt 6 cards at the beginning of a round, each player discards 2 cards into the crib and pegging begins
* During pegging, players taking turn playing 1 card per turn
* The peg is moved as player scores during pegging
* The crib is not revealed until the end of the round
* Drawing
  + Occurs at the very start of the game.
  + Each player draws 1 card from the shuffled deck.
  + The player that draws the card with the higher rank is the dealer for the first round.
* Round
  + Each round begins when each player is dealt 6 cards.
  + Each players toss 2 cards to form the crib, then pegging begins.
  + Each round end when both players finish counting their hands.
  + At the end of each round, if no winner is declared, then the next round begins.
* Pegging
  + During pegging, the non-dealer plays the first card, followed by the dealer.
  + Each player takes turn playing a card until a pegging-round ends.
  + Scoring can happen after each player plays a card.
  + A pegging-round ends when either the total points of all the cards played adds up to 31 or no more cards can be played so that the total points doesn’t add up to more than 31.
  + Pegging ends if a player wins after scoring
  + When a pegging-round ends, another pegging-round will begin. Pegging ends when both players have no cards left. Then each player counts their hands.
* Count the Hand
  + The non-dealing player counts first.
  + Each player counts their hand by examining the unique scoring combination of the cards they were dealt for the round and the cut card.
  + Scoring is done at the end of each player’s count.
  + The dealer also counts the crib and the cut card after both of the players’ hands have been count.

# Per Noun Entries

## Board

The game board is the physical place where the game play happens. It tracks the score, holds the cut-card and the played cards.

### Facts

* The board has 121 pegs
* Each player starts from 0
* When each player plays a card, it is revealed onto the board
* As each player scores from counting their hand, they advance their peg position
* The first player to reach 121 wins
* The position of the player on the board is his score

### Attributes

* Total pegs
* Player score
* Played cards in current
* the Cut-Card

### Behaviours

* Advance Peg
* Get Score
* Receive played card
* Place cut card

### Collaborations

None.

## Cards

This class contains all of the attributes and behaviours of a deck of card.

### Facts

* A deck of card has 52 cards with 4 suits, within each suit there are 13 cards ranging from Ace to King
* During drawing each card is rank by their face and suit value. For example, King of Spade is worth rank higher than King of Hearts which is rank higher than Queen of Spade
* During the rest of the phases of the game:
  + Each card is worth the point of their numerical value, except for face cards. For example 2 of spade is 2 points.
  + Face cards: Jack, Queen and King are worth 10 points each

### Attributes

* remaining Deck

### Behaviours

* Reset Deck
* Deal
* Shuffle

### Collaborations

None.

## Count Cards

This is a class that contains how scoring is performed during the game.

### Facts

* During drawing
  + The player who draws the higher ranked card is the dealer
  + If 2 players both draws a card with the same value, they will redraw until 1 player ends up with a higher rank card
* If the cut card is a Jack the dealer scores 2 point
* During pegging:
  + When 2, 3, 4 or more of the same card is played in sequence, 2, 3, 4 or more points is awarded to the player that played the last card
  + When the total points of the cards played in from the beginning of the sub-round is 15, the player that played the last card gets 1 point
  + When the total points of the sub-round reaches exactly 31, the player that plays the last card gets 1 extra points
  + The player that plays the last card in any sub-round gets 1 point
  + If there is a run of more than 3, then the number of cards involved in the run is awarded to the player that played the last card in the run
* Count hands:
  + When both players have no cards remaining in their hands the count begins
  + They look for unique scoring combination of the cards that were dealt to them and the cut card
  + The dealer also counts the unique scoring combination of the cards in the crib and the cut card
  + Unique scoring combinations includes
    - Any combination of cards that forms 15: 2 points per combination
    - Any pair: 2 points per pair
    - 4 unique pairs: 12 points
    - Any 3 of a kind: 3 points
    - Any 4 of a kind: 4 points
    - Any run of 3 or more: as many points as there are in the run
    - 4 of the same suite: 4 points
    - 5 of the same suite: 5 points

### Attributes

None.

### Behaviours

* Count hand
* Check cut card
* Check pegging

### Collaborations

None.

## Game Phases

The game phases determine the actions of the players and what the referee is facilitating. There are 4 phases of the game:

* Drawing
* Round
* Pegging
* Count the hand

### Facts

* Drawing
  + Occurs at the very start of the game.
  + Each player draws 1 card from the shuffled deck.
  + The player that draws the card with the higher rank is the dealer for the first round.
* Round
  + Each round begins when each player is dealt 6 cards.
  + Each players toss 2 cards to form the crib, then pegging begins.
  + Each round end when both players finish counting their hands.
  + At the end of each round, if no winner is declared, then the next round begins.
* Pegging
  + During pegging, the non-dealer plays the first card, followed by the dealer.
  + Each player takes turn playing a card until a pegging-round ends.
  + Scoring can happen after each player plays a card.
  + A pegging-round ends when either the total points of all the cards played adds up to 31 or no more cards can be played so that the total points doesn’t add up to more than 31.
  + Pegging ends if a player wins after scoring
  + When a pegging-round ends, another pegging-round will begin. Pegging ends when both players have no cards left. Then each player counts their hands.
* Count the Hand
  + The non-dealing player counts first.
  + Each player counts their hand by examining the unique scoring combination of the cards they were dealt for the round and the cut card.
  + Scoring is done at the end of each player’s count.
  + The dealer also counts the crib and the cut card after both of the players’ hands have been count.

## Player

This is the superclass for the human and the computer player.

### Facts

* At the start of the game, players decide who is the dealer by drawing 1 card each. The player that draws the higher rank card is the dealer.
* The dealer goes first in the super-round and has the crib
* The non-dealer player counts his hand first at the end of the round
* Each player then takes turn being the dealer
* Each player is dealt 6 cards at the beginning of a round, each player discards 2 cards into the crib and pegging begins
* During pegging, players taking turn playing 1 card per turn
* The peg is moved as player scores during pegging
* The crib is not revealed until the end of the round

### Attributes

* Am dealer
* hand
* crib
* played hand

### Behaviours

* Deal
* Play Card
* Cut Card
* Draw

### Collaborations

None.

## Player – Computer

The computer player extends from the Player Class. It will have the exact same attributes and behaviours as the Player Class except it will have the additional behaviours decideMove that will allow it to figure out what card to play next.

### Behaviours

* Decide Move

## Plyer – Human

The human player extends from the Player Class. It will have the exact same attributes and behaviours as the Player Class except it will be able to take in inputs on what to do next.

## Referee

The referee allows the game play to happen in the general sense.

The referee can start the game, end the game, and decide who the winner is.

The referee also calls on the correct player to play his turn, decides when the different phases of the game, such as pegging, counting hands, etc., begins and ends.

### Attributes

* Did pegging end
* did turn end

### Behaviours

* decideWinner
* resetGame
* quitGame
* playGame
* start drawing
* start turn
* start pegging
* start count

### Collaborations

* When playGame is called card is shuffled and each player draws 1 card and compare the rank and dealer is decided

# Appendix A – Design Specification

This design specification is copied from Dr. David Casperson’s problem Statement.

1 Problem statement

The goal of this project is to write programs to play the two-person variant of the card game called cribbage. The game itself is described in Section 2 of this documents.

* 1. Programming tasks

Your team needs to write a cribbage program that consists of a “referee”, some kind of user interface, a human player interface, and a computer opponent.

**The Referee** The referee program minimally allows a person to play cribbage against the computer. It keeps track of whether either player has won the current game; lets the human player quit or restart the game at any time (s)he chooses; and draws (or otherwise displays) the board so that the human player can see the current game situation.

**The Display** Ascii-graphics such as those shown in Figure 1 are acceptable for displaying the board. However, a Graphical User Interface (GUI) is preferred.

**The Computer Player** The exact mechanism that the referee program uses for interacting with the computer player is left unspecified for now.

However, a longer term goal is to have the various teams’ computer players play each other in a tournament. In order for this to happen the Computer Player needs to have minimal coupling with its environment, and this should be a design goal.

For the computer player program, correctness is far more important than cleverness. The computer opponent program must work correctly. However, intelligent play by the computer opponent is not necessary, and should not be a priority when completing the team term project.

**The Human User** Human player input and output happens at some level through the User Interface. However, it helps a lot if the human player and the computer player are represented by similar classes.

* 1. General comments

The referee program and the computer opponent program make use of similar concepts, so they should make use of common classes and object files in their construction. Your coding will be graded in part on how much code is shared between the two program; as one of the goals of good object oriented programming is to create classes and objects that can be re-used.