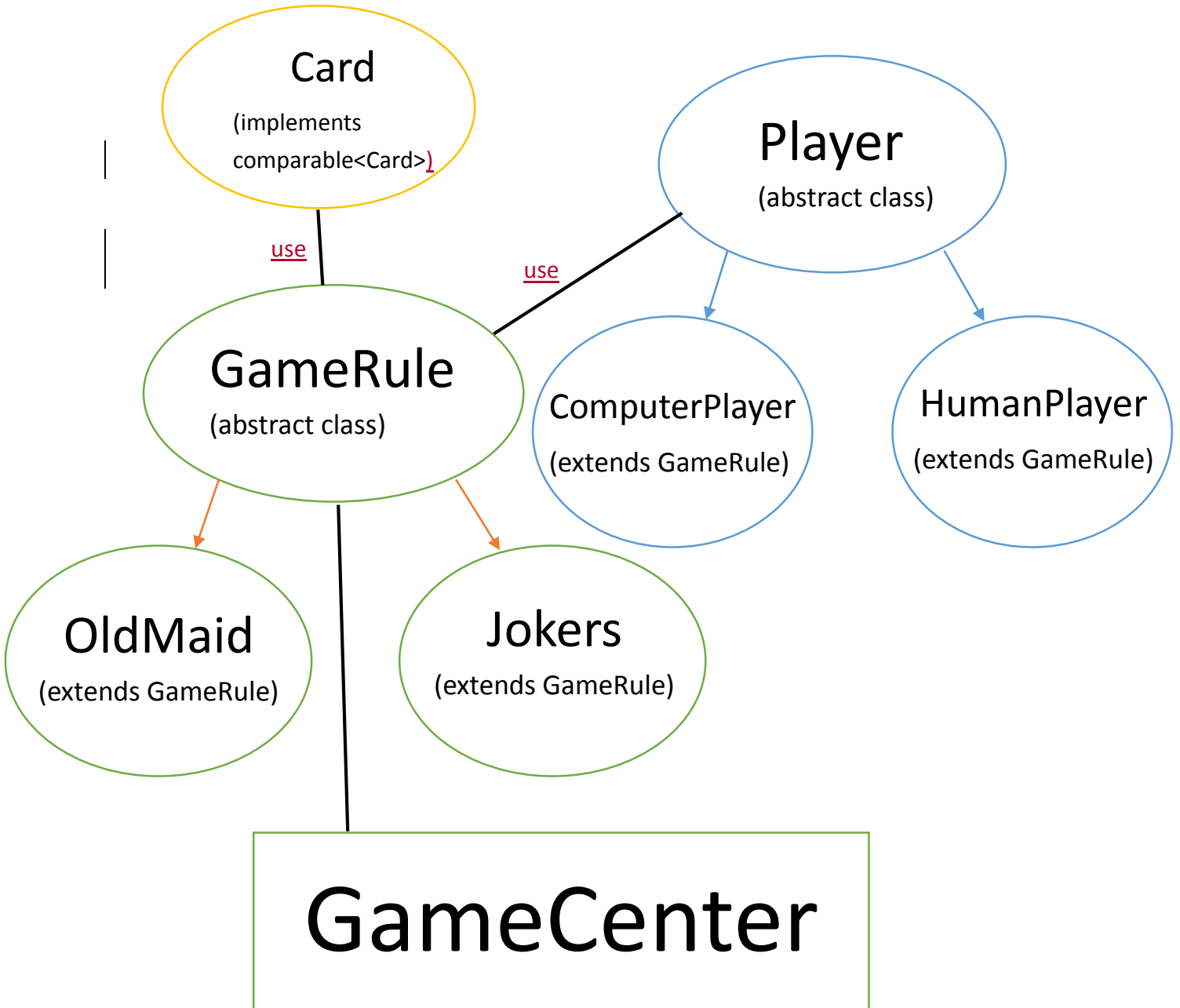資工三　B02902031　李彥霆

1. Design of Class Structure

a. GameRule describes all the basic rules and elements of old-maid, that is, some cards, players, and the game process.

It is abstract because it does not determine which cards to play with, and this is all variants are different with.

Jokers and OldMaid extend GameRule and implement the abstract method to determine which cards to play with and how to deal the cards.

I use this class structure because all variant of the game have much common in game process, number of players, and the reason that I don't use a structure like other variant extends one variant is that I think all variant are at the same level, no variant should be the parent class.

b. Player describes all the actions a player has to do, but leave the "pick" method abstract because this is different from human and computer.

I think it's less reasonable to let HumanPlayer extends ComputerPlayer, so I choose this class structure.

c. GameCenter handles the whole game process because I left GameRule handling the basic rules.

2. type "make" to compile and "make run" to start the game.

In the beginning of the game, enter the player name, and select the variant to play, A or B, other for exit. Each turn for you to pick a card, it will hint for the range to choose. (Any choice out of range is not guarantee for the consequence.) After the end of the game, it will go to the select part, and keep looping if you still choose to play.

3. I test the correctness of my program by playing many times by all computer players, and check for unusual output. Then, I play the game many times to ensure the interaction is correct.

4. sample output

Variant A

```
Welcome to GameCenter, please enter your name.
Ralph
Welcome, Ralph
Please choose which game to play.
(A) Old-Maid -- Two Jokers.
(B) Old-Maid -- Random Pick A Card Out.
(Else) Quit.
A
You are player 1
Deal cards
Player0 :C4 D5 H5 C6 S6 S7 D8 S8 C9 D10 SQ CK DK HK
Ralph :H2 S3 D4 S5 D6 H6 H7 C8 C10 H10 DJ SK HA B0
Player1 :D2 H3 H4 C5 D7 H9 S9 CJ SJ DQ DA SA R0
Player2 :C2 S2 C3 D3 S4 C7 H8 D9 S10 HJ CQ HQ CA
Drop cards
Player0 :C4 S7 C9 D10 SQ HK
Ralph :H2 S3 D4 S5 H7 C8 DJ SK HA B0
Player1 :D2 H3 H4 C5 D7 DQ R0
Player2 :S4 C7 H8 D9 S10 HJ CA
Game Start
Player0 draws D4 from Ralph
Player0 :S7 C9 D10 SQ HK
Ralph :H2 S3 S5 H7 C8 DJ SK HA B0
Which card to pick? 0~6 : 0
Ralph draws D2 from Player1
Ralph :S3 S5 H7 C8 DJ SK HA B0
Player1 :H3 H4 C5 D7 DQ R0
Player1 draws S4 from Player2
Player1 :H3 C5 D7 DQ R0
Player2 :C7 H8 D9 S10 HJ CA
Player2 draws C9 from Player0
```

Variant B

```
Welcome to GameCenter, please enter your name.
Ralph
Welcome, Ralph
Please choose which game to play.
(A) Old-Maid -- Two Jokers.
(B) Old-Maid -- Random Pick A Card Out.
(Else) Quit.
B
You are player 3
Deal cards
Player0 :S4 C5 D6 H8 C9 D9 S9 H10 SJ HQ CK SK CA
Player1 :C2 D2 H2 S2 C3 D5 S5 S7 C10 S10 CQ DQ HA
Player2 :H3 D4 C6 H6 S6 C8 D8 S8 DJ SQ DK DA SA
Ralph :D3 S3 C4 H4 H5 C7 D7 H7 H9 D10 HJ HK
Drop cards
Player0 :S4 C5 D6 H8 S9 H10 SJ HQ CA
Player1 :C3 S7 HA
Player2 :H3 D4 S6 S8 DJ SQ DK
Ralph :H5 H7 H9 D10 HJ HK
Game Start
Player0 draws HA from Player1
Player0 :S4 C5 D6 H8 S9 H10 SJ HQ
Player1 :C3 S7
Player1 draws SQ from Player2
Player1 :C3 S7 SQ
Player2 :H3 D4 S6 S8 DJ DK
Player2 draws HK from Ralph
Player2 :H3 D4 S6 S8 DJ
Ralph :H5 H7 H9 D10 HJ
Which card to pick? 0~7 : 5
Ralph draws H10 from Player0
Ralph :H5 H7 H9 HJ
Player0 :S4 C5 D6 H8 S9 SJ HQ
```