棋牌类面向对象设计

文泰来 老师

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课程大纲

- 棋牌类OOD题型
- 棋牌类OOD解题思路
- Tic Tac Toe
- Chinese chess
- Black jack
- Design pattern总结

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棋牌类

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棋牌类题型

- 棋类

- 象棋，国际象棋，围棋，军旗，跳棋，五子棋...

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棋牌类题型

- 棋类

- 象棋，国际象棋，围棋，军旗，跳棋，五子棋 ...

- 类棋类

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- Tic Tac Toe, 扫雷

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棋牌类题型

- 棋类

- 象棋，国际象棋，围棋，军旗，跳棋，五子棋 ...

- 类棋类

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- Tic Tac Toe, 扫雷

- 牌类

- Black jack, 德州扑克, 斗地主, 狼人杀

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棋牌类题型

- 频率：中高

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棋牌类题型

- 频率：中高
- 难度：高

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棋牌类题型

- 频率：中高
- 难度：高
- 题目比较多变，不同的棋牌，玩法不同

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棋牌类解题思路

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棋牌类解题思路

- 棋牌类的特点：跟Hotel reservation / Elevator / Vending Machine 有什么区别？

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棋牌类解题思路

- 棋牌类的特点：

- 玩家

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棋牌类解题思路

- 棋牌类的特点：

- 玩家
- 规则

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棋牌类解题思路

- 棋牌类的特点：

- 玩家
- 规则
- 胜负

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棋牌类解题思路

- 棋牌类的特点：

- 玩家
- 规则
- 胜负
- 积分

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棋牌类解题思路

- 棋牌类的特点：

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- 胜负
- 积分

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针对棋牌类的特点来做Clarification

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棋牌类解题思路

- 棋牌类术语

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棋牌类解题思路

- 棋牌类术语

Board

Suit

Hand

…

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棋牌类解题思路

- 棋牌类术语

Board

Suit

Hand

…

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针对棋牌类的术语，可以在Core Object的时候进行考虑

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棋牌类解题思路

- 棋牌类的状态：一局棋牌，分为哪些状态（State）？

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棋牌类解题思路

- 棋牌类的状态：一局棋牌，分为哪些状态（State）？

- Initialization (摆盘，洗牌…)

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棋牌类解题思路

- 棋牌类的状态：一局棋牌，分为哪些状态（State）？

- Initialization (摆盘，洗牌…)
- Play (下棋，出牌…)

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棋牌类解题思路

- 棋牌类的状态：一局棋牌，分为哪些阶段?

- Initialization (摆盘，洗牌…)
- Play (下棋，出牌…)
- Win/Lose check (胜负结算)

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棋牌类解题思路

- 棋牌类的状态：一局棋牌，分为哪些状态（State）？

- Initialization (摆盘，洗牌…)
- Play (下棋，出牌…)
- Win/Lose check (胜负结算) + Tie (流局)

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棋牌类解题思路

- 棋牌类的状态：一局棋牌，分为哪些状态（State）？

- Initialization (摆盘，洗牌…)
- Play (下棋，出牌…)
- Win/Lose check (胜负结算) + Tie (流局)

针对棋牌类的状态，来做Use cases

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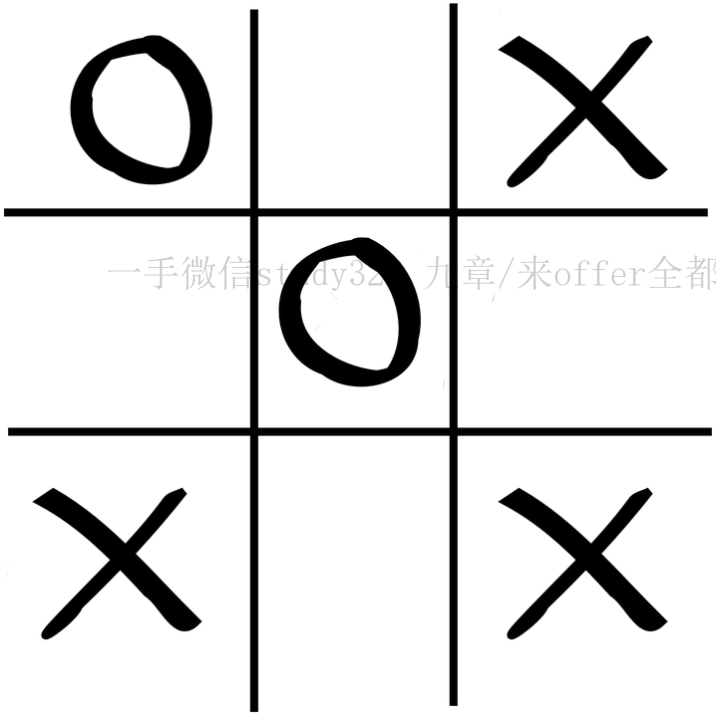
Tic Tac Toe



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Tic Tac Toe

Can you design a Tic-Tac-Toe game, so that it can support two player play against each other?

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Clarify

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Clarify

- 玩家
- 规则
- 胜负
- 积分

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Clarify

- 玩家

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Clarify

- 玩家： 是否需要专门的Player类？

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Clarify

- 玩家： Player之间有什么区别

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Clarify

- 玩家： Player之间有什么区别

玩家A： X

玩家B： O

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Clarify

- 玩家： Player之间有什么区别

玩家A： X
玩家B： O

currentPlayer = “X”;

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```
changePlayer()
{
    if(currentPlayer.equals(“X”)) currentPlayer = “O”;
    else currentPlayer = “X”;
}
```

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Clarify

- 扩展性不好？

玩家A： X
玩家B： O

currentPlayer = “X”;

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```
changePlayer()
{
    if(currentPlayer.equals(“X”)) currentPlayer = “O”;
    else currentPlayer = “X”;
}
```

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Clarify

- 什么时候需要Player类？（Player之间还会有什么区别？）

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Clarify

- 什么时候需要Player类？（Player之间还会有什么区别？）

积分

Player
- Int score

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Clarify

- 规则

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Clarify

- 规则

If you don’t understand how to play this game, this is the time to ask.

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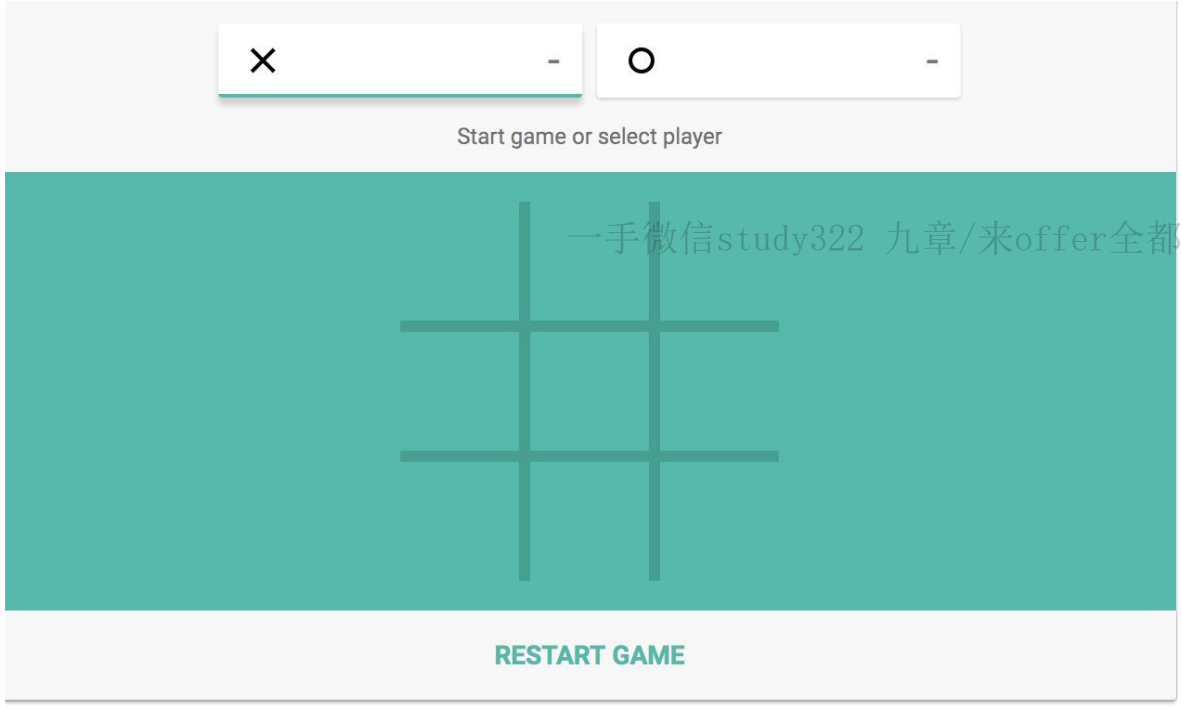
Clarify

- 规则



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Who takes the first move?

- X?
- O?
- Take turns?
- Random?

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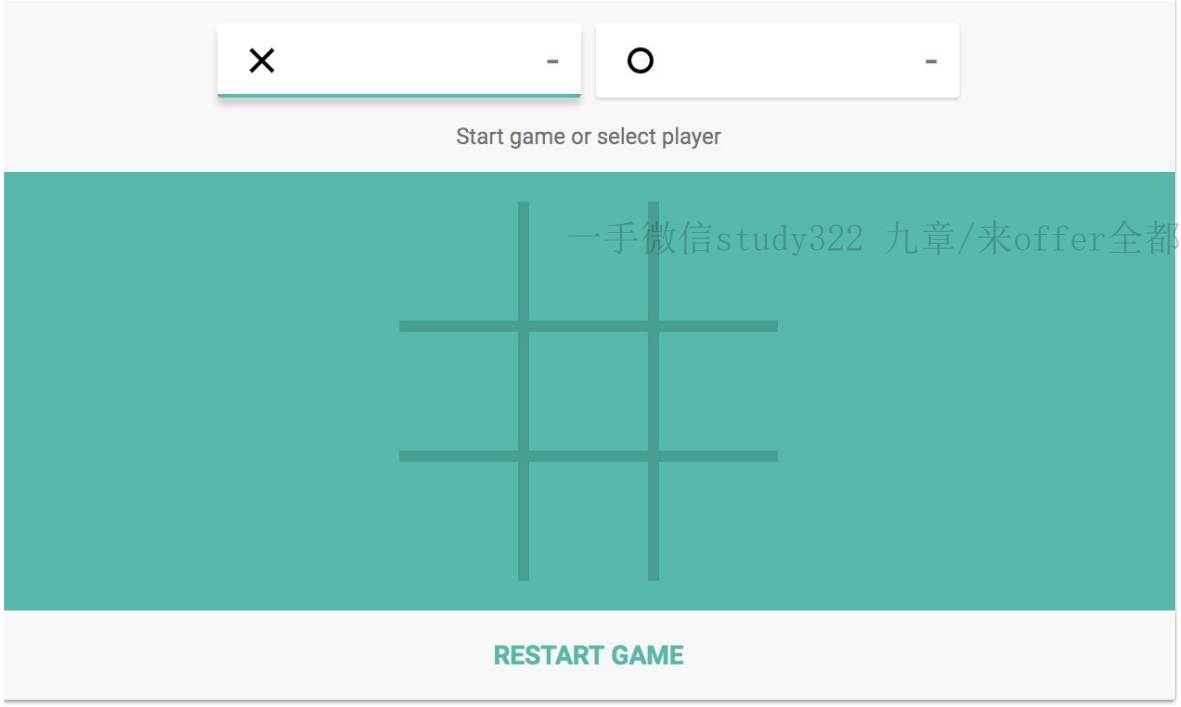
Clarify

- 规则



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What's the size of the board?

- 3 X 3?
- Larger?

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Clarify

- 规则

对于本题：X always takes the first move

对于本题：3 X 3

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Clarify

- 胜负

确认胜负规则

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Clarify

- 积分

对于本题，不需要考虑积分

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Core Object

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Core Object

- 参考棋牌类的专业名词来考虑

- Board
- Suit
- Hand
- Move
- …

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Core Object

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TicTacToe

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Core Object

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TicTacToe

Board

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Core Object

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Use case

棋牌类游戏的三种状态

- Initialization (摆盘，洗牌…)
- Play (下棋，出牌…)
- Win/Lose check (胜负结算) + Tie (流局)

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Use case

- Initialization (摆盘，入座，洗牌..)

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Use case

- Initialization (摆盘，入座，洗牌..)

- Initialize the board

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Use case

- Play (下棋，出牌…)

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Use case

- Play (下棋，出牌…)

- Make move

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Use case

- Play (下棋，出牌…)

- Make move
- Change player

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Use case

- Win/Lose check (胜负结算) + Tie (流局)

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Use case

- Win/Lose check (胜负结算) + Tie (流局)

- Check if X win / Check if O win / Check if board full

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Classes

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Initialize the board

- Clear the board an set everything to be empty

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Classes

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Classes

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Classes

TicTacToe
- Board board

Board
- char[][] board
+ void initializeBoard()

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Make move

- Check current move is for ‘X’ or ‘O’
- Place move at a pointed location

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Classes

TicTacToe
- Board board - Char currentMove

Board
- char[][] board
+ void initializeBoard()

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Classes

TicTacToe
- Board board - Char currentMove

Board
- char[][] board
+ void initializeBoard() + void makeMove(int row, int col, char currentMove)

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Classes

九章算法

TicTacToe
- Board board - Char currentMove
+ void makeMove(int row, int col)

Board
- char[][] board
+ void initializeBoard() + void makeMove(int row, int col, char currentMove)

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Change player

- Change current move from X to O or O to X

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Classes

TicTacToe
- Board board - Char currentMove
+ void makeMove(int row, int col) - void changePlayer()

Board
- char[][] board
+ void initializeBoard() + void makeMove(int row, int col, char currentMove)

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Check Win / Lose / Tie

- Check if there is a winner
- Check if the board is full if there is no winner

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Classes

九章算法

TicTacToe
- Board board - Char currentMove
+ void makeMove(int row, int col) - void changePlayer()

Board
- char[][] board
+ void initializeBoard() + void makeMove(int row, int col, char currentMove) + boolean checkWin()

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Classes

九章算法

TicTacToe
- Board board - Char currentMove
+ void makeMove(int row, int col) - void changePlayer()

Board
- char[][] board
+ void initializeBoard() + void makeMove(int row, int col, char currentMove) + boolean checkWin() + boolean isBoardFull()

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Classes


```
Simulator.java

makeMove(1,1);
```

```
TicTacToe.java

public void makeMove(int row, int col)
{
    board.makeMove(row, col, currentMove);
    if(board.checkWin())
    {
        print(currentMove + " win !");
    }
    else if(board.isBoardFull())
    {
        print("It's a tie");
    }
    changePlayer();
}
```

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Chinese Chess

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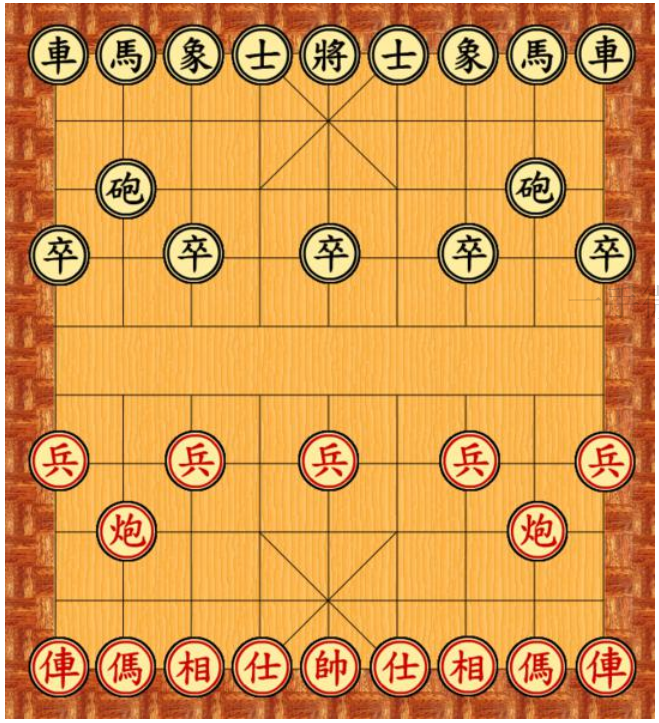
Chinese Chess



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Chinese Chess

- 对于本题：腾讯象棋大厅

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Clarify

- 玩家
- 规则
- 胜负
- 积分

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Clarify

- 玩家

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Clarify

- 玩家：每位玩家有什么区别？

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Clarify

- 玩家：每位玩家有什么区别？

- 积分

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Clarify

- 玩家：每位玩家有什么区别？

- 积分
- 执红或执黑

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Clarify

- 玩家：每位玩家有什么区别？

- 积分
- 执红或执黑

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对于本题：

- 每位玩家有自己的积分
- 每局游戏随机分配红黑

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Clarify

- 规则

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Clarify

- 规则

- 象棋走法的规则

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Clarify

- 规则

- 象棋走法的规则
- 时间规则

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Clarify

- 规则

- 象棋走法的规则
- 时间规则

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对于本题：

常规象棋规则
无时间限制

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Clarify

- 胜负

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Clarify

- 胜负

- 如何判定平局？

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Clarify

- 胜负

- 如何判定平局？

Solution 1: 如果下的步数超过一定数量，判定平局

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Clarify

- 胜负

- 如何判定平局？

Solution 1: 如果下的步数超过一定数量，判定平局
Solution 2: 电脑判定，如果双方一直在走重复的步子，判定平局

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Clarify

- 胜负

- 如何判定平局？

Solution 1: 如果下的步数超过一定数量，判定平局
Solution 2: 电脑判定，如果双方一直在走重复的步子，判定平局
Solution 3: 如果双方选手都要求平局，判断平局

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Clarify

- 胜负

- 如何判定平局？

Solution 1: 如果下的步数超过一定数量，判定平局
Solution 2: 电脑判定，如果双方一直在走重复的步子，判定平局
Solution 3: 如果双方选手都要求平局，判断平局

对于本题：采用solution 1

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Clarify

- 积分

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Clarify

- 积分

对于本题：胜+1， 负-1，平局+0

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Core Object

ChineseChess

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Core Object

Player

ChineseChess

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Core Object

Player	ChineseChess	Game

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Core Object

Player

ChineseChess

Game

Piece

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Core Object

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Use case

棋牌类游戏的三种状态

- Initialization (摆盘，洗牌…)
- Play (下棋，出牌…)
- Win/Lose check (胜负结算) + Tie / Draw (平局)

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Use case

- Initialization (摆盘，洗牌…)

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Use case

- Initialization (摆盘，洗牌…)

- Join game

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Use case

- Initialization (摆盘，洗牌…)

- Join game
- Set up game

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Use case

- Play (下棋，出牌…)

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Use case

- Play (下棋，出牌…)

- Make move

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Use case

- Play (下棋，出牌…)

- Make move
- Change player

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Use case

- Win/Lose check (胜负结算) + Tie / Draw (平局)

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Use case

- Win/Lose check (胜负结算) + Tie / Draw (平局)

- Check for win

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Use case

- Win/Lose check (胜负结算) + Tie / Draw (平局)

- Check for win
- Increase steps

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Use case

- Win/Lose check (胜负结算) + Tie / Draw (平局)

- Check for win
- Increase steps
- Calculate points

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Classes

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Classes

- Join game

A player joins a game to play

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Classes

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Classes

- Set up game

Initialize the board with all pieces placed at the right place.

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Classes

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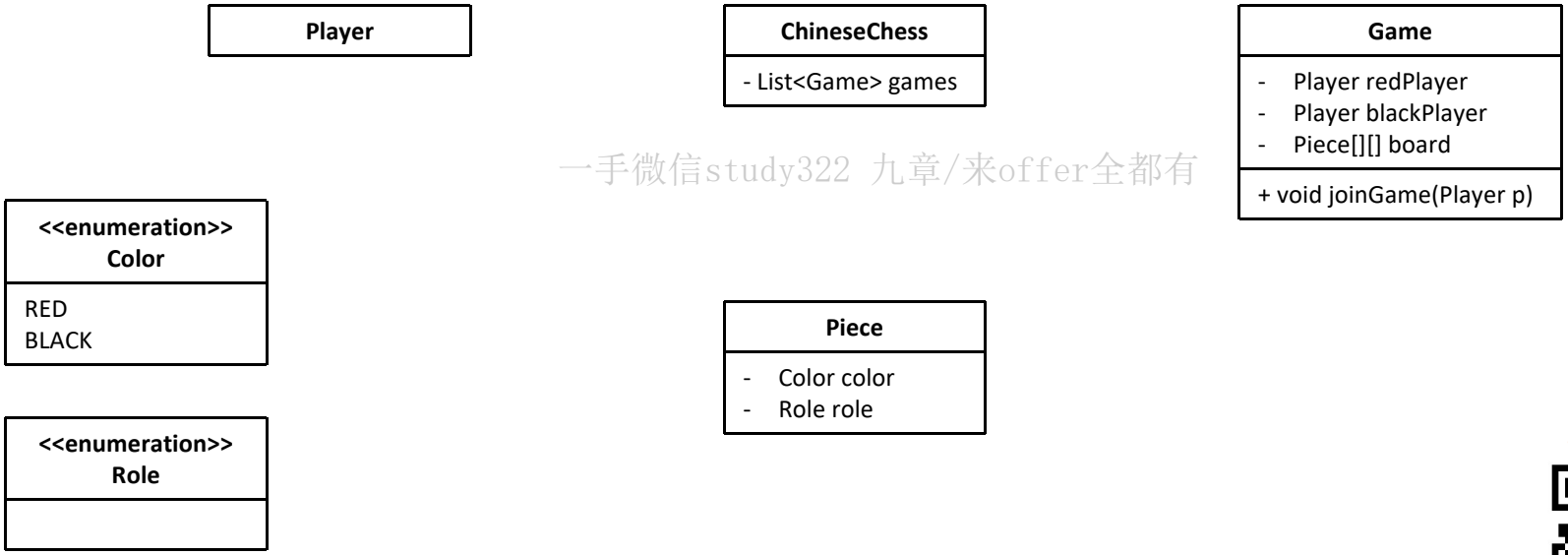

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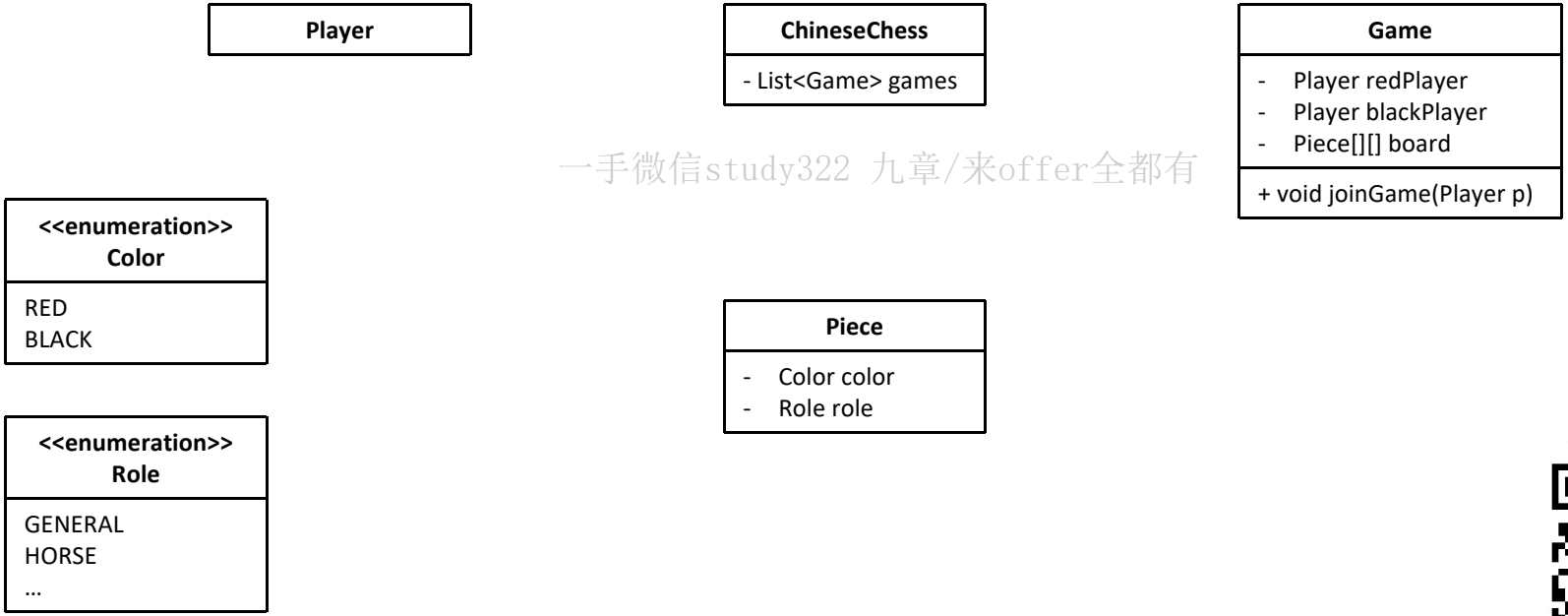

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Classes

- Enum: https://crunchify.com/why-and-for-what-should-i-use-enum-java-enum-examples/

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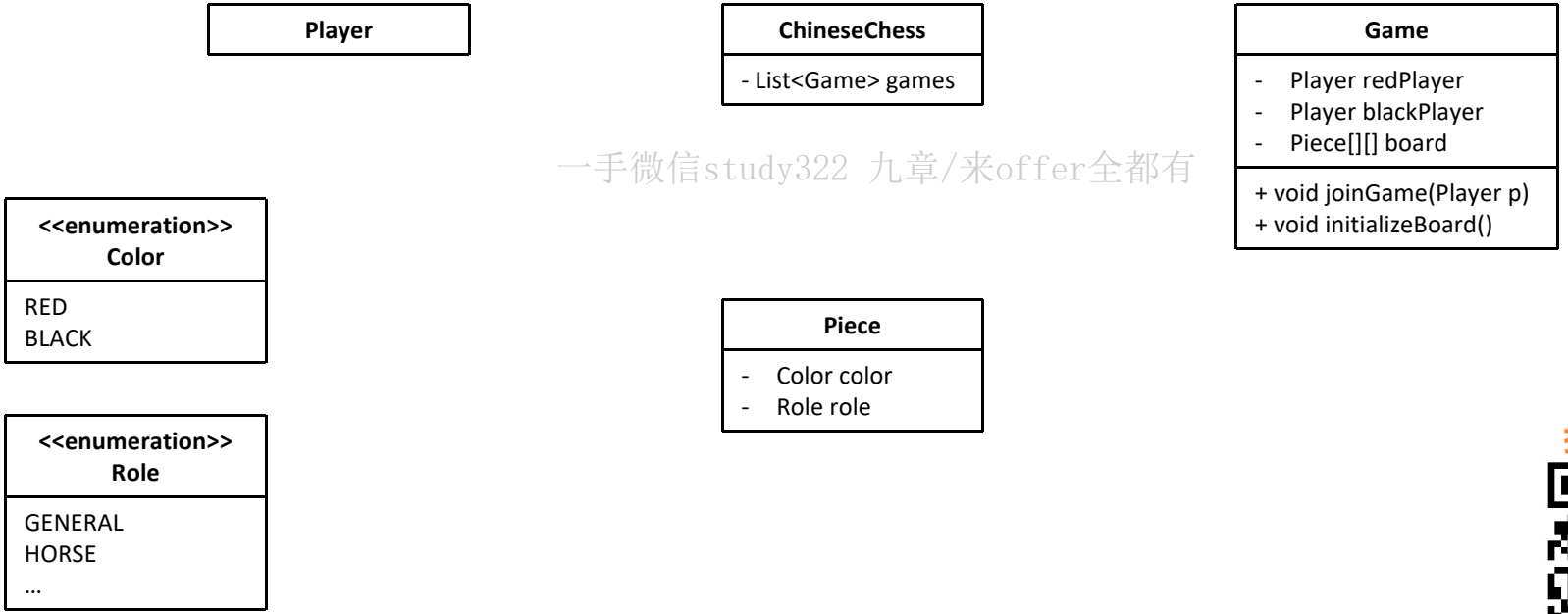

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Classes

- Make move

- Determine which player should take the move
- Check if the move if valid, if yes, return true and make the move, if not return false

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Classes

Player

ChineseChess

- List<Game> games

Game

- Player redPlayer
- Player blackPlayer
- Player currentPlayer
- Piece[][] board

+ void joinGame(Player p)
+ void initializeBoard()

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<<enumeration>>
Color

RED
BLACK

Piece

- Color color
- Role role

<<enumeration>>
Role

GENERAL
HORSE
...

Use cases

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Classes

Player

ChineseChess

- List<Game> games

Game

- Player redPlayer
- Player blackPlayer
- Player currentPlayer
- Piece[][] board

+ void joinGame(Player p)
+ void initializeBoard()
+ boolean move(Piece piece, int row, int col)

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<<enumeration>>
Color

RED
BLACK

<<enumeration>>
Role

GENERAL
HORSE
...

Piece

- Color color
- Role role

Use cases

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Classes

- Change player

- Switch player

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Classes

Player

ChineseChess

- List<Game> games

Game

- Player redPlayer
- Player blackPlayer
- Player currentPlayer
- Piece[][] board

+ void joinGame(Player p)
+ void initializeBoard()
+ boolean move(Piece piece, int row, int col)
- void changePlayer()

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<<enumeration>>
Color

RED
BLACK

<<enumeration>>
Role

GENERAL
HORSE
…

Piece

- Color color
- Role role

Use cases

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Classes

- Check for win

- Check if the current player wins

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Classes

Player

ChineseChess

- List<Game> games

Game

- Player redPlayer
- Player blackPlayer
- Player currentPlayer
- Piece[][] board

+ void joinGame(Player p)
+ void initializeBoard()
+ boolean move(Piece piece, int row, int col)
- void changePlayer()
- boolean ifCurrentPlayerWin()

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<<enumeration>>
Color

RED
BLACK

<<enumeration>>
Role

GENERAL
HORSE
…

Piece

- Color color
- Role role

Use cases

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Classes

- Increase steps

- Increase steps
- If reach a MAX step, call it a draw

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Classes

Player

ChineseChess

- List<Game> games

Game

- Player redPlayer
- Player blackPlayer
- Player currentPlayer
- Piece[][] board
- Int steps

+ void joinGame(Player p)
+ void initializeBoard()
+ boolean move(Piece piece, int row, int col)
- void changePlayer()
- boolean ifCurrentPlayerWin()

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<<enumeration>>
Color

RED
BLACK

<<enumeration>>
Role

GENERAL
HORSE
…

Piece

- Color color
- Role role

Use cases

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Classes

九章算法

Player

ChineseChess

- List<Game> games

Game

- Player redPlayer
- Player blackPlayer
- Player currentPlayer
- Piece[][] board
- Int steps

+ void joinGame(Player p)
+ void initializeBoard()
+ boolean move(Piece piece, int row, int col)
- void changePlayer()
- boolean ifCurrentPlayerWin()
- Boolean gameDraw()

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<<enumeration>>
Color

RED
BLACK

<<enumeration>>
Role

GENERAL
HORSE
…

Piece

- Color color
- Role role

Use cases

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Classes

- Calculate points

If current player wins, reward current player and take one point off from other one.

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Classes

九章算法

Player

ChineseChess

- List<Game> games

Game

- Player redPlayer
- Player blackPlayer
- Player currentPlayer
- Piece[][] board
- Int steps

+ void joinGame(Player p)
+ void initializeBoard()
+ boolean move(Piece piece, int row, int col)
- void changePlayer()
- boolean ifCurrentPlayerWin()
- boolean gameDraw()
- Void rewardCurrentPlayer ()

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<<enumeration>>
Color

RED
BLACK

<<enumeration>>
Role

GENERAL
HORSE
…

Piece

- Color color
- Role role

Use cases

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Classes

九章算法

Player
- Int points

ChineseChess
- List<Game> games

Game
- Player redPlayer - Player blackPlayer - Player currentPlayer - Piece[][] board - Int steps
+ void joinGame(Player p) + void initializeBoard() + boolean move(Piece piece, int row, int col) - void changePlayer() - boolean ifCurrentPlayerWin() - boolean gameDraw() - Void rewardCurrentPlayer ()

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<<enumeration>> Color
RED BLACK

<<enumeration>> Role
GENERAL HORSE …

Piece
- Color color - Role role

Use cases

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Classes

九章算法

Player
- Int points
+ void updatePointsBy(int diff)

ChineseChess
- List<Game> games

Game
- Player redPlayer - Player blackPlayer - Player currentPlayer - Piece[][] board - Int steps
+ void joinGame(Player p) + void initializeBoard() + boolean move(Piece piece, int row, int col) - void changePlayer() - boolean ifCurrentPlayerWin() - boolean gameDraw() - Void rewardCurrentPlayer ()

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<<enumeration>> Color
RED BLACK

<<enumeration>> Role
GENERAL HORSE …

Piece
- Color color - Role role

Use cases

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Blackjack

- Can you design blackjack?

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All you need to know about Blackjack

5 Player
1 Dealer

Initialize 2 cards

Initialize bets

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All you need to know about Blackjack

2 – 10 worth 2– 10

Jack/Queen/King = 10

A = 1 or 11

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All you need to know about Blackjack

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All you need to know about Blackjack

Player 1 call deal -> stop

Now he got 11 + 2 + 6 = 19

Or 1 + 2 + 6 = 9

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All you need to know about Blackjack

Player 2 call deal

Now he got 10 + 5 + 8 = 23

Exceeds 21, he lost

Dealer took his chips

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All you need to know about Blackjack

Dealer shows his cards

He has to keeping dealing until
Reaches 17 or more

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All you need to know about Blackjack

Dealer can stop or continue.

If dealer == player, dealer wins

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Clarify

- 玩家
- 规则
- 胜负
- 积分

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Clarify

- 玩家： How many player can we support in a table?

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Clarify

- 玩家： Is there a fixed dealer or players take turn to become dealer?

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Clarify

- 规则

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Clarify

- 规则： What if we run out of cards?

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Clarify

- 规则： Can dealer run out of bets?

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Clarify

- 胜负

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Clarify

- 积分

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Clarify

- 积分：How many initial bets does a player have?

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Clarify

- 对于本题：

- 无人数上限
- 每桌有Fixed dealer
- 牌永远够用
- Dealer的筹码永远够用
- 每个人有同样的初始筹码

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Deck

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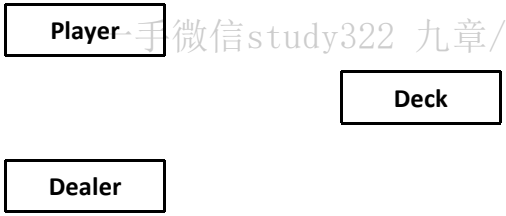

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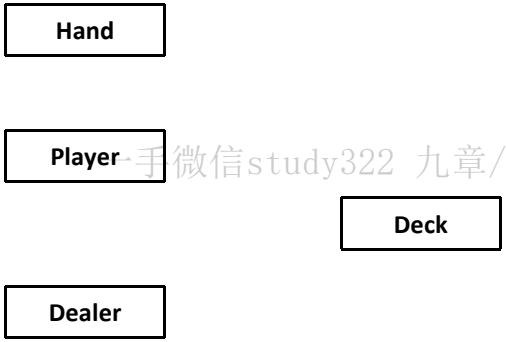

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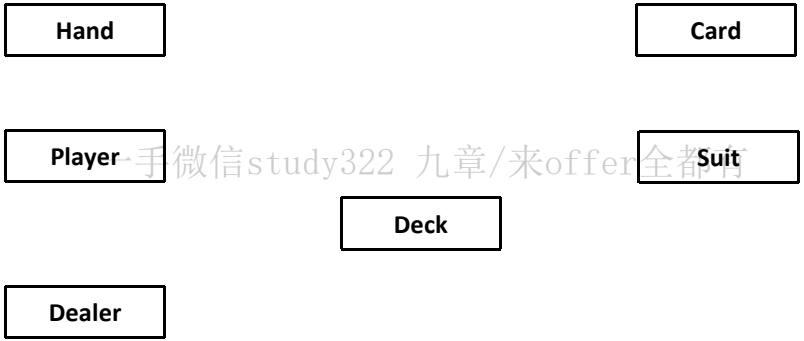

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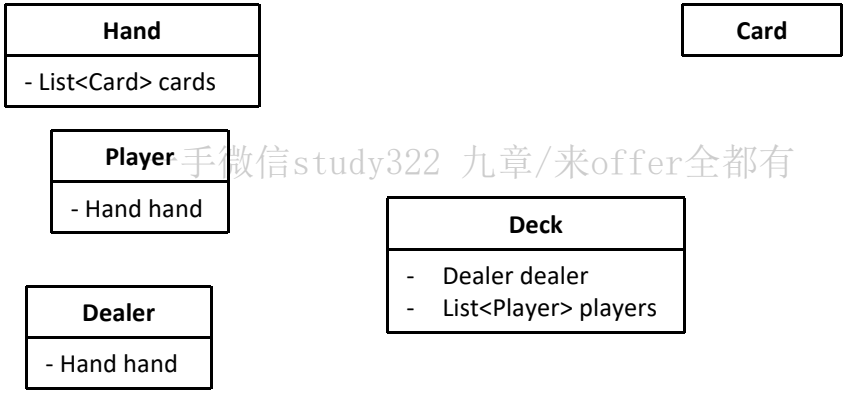

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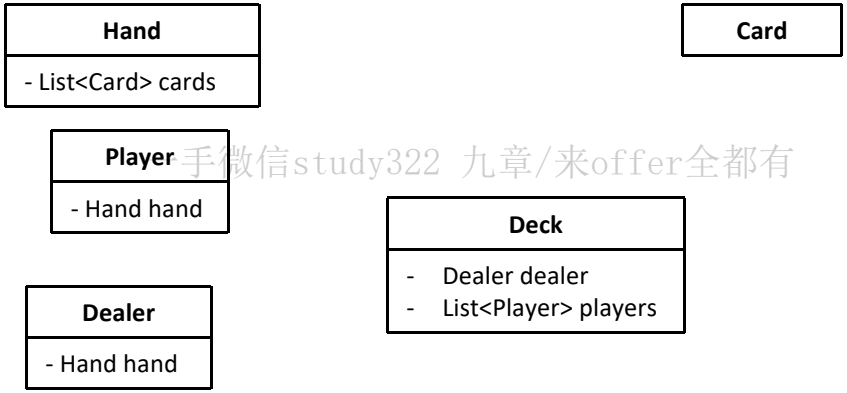

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Use case

棋牌类游戏的三种状态

- Initialization (摆盘，洗牌…)
- Play (下棋，出牌…)
- Win/Lose check (胜负结算) + Tie / Draw (平局)

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Use case

- Initialization (摆盘，洗牌…)

- Join table

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Use case

- Initialization (摆盘，洗牌…)

- Join table
- Place bet

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Use case

- Initialization (摆盘，洗牌…)

- Join table
- Place bet
- Get initial cards

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Use case

- Play (下棋，出牌…)

- Deal

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Use case

- Play (下棋，出牌…)

- Deal
- Increase bet

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Use case

- Play (下棋，出牌…)

- Deal
- Increase bet
- Stop dealing

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Use case

- Play (下棋，出牌…)

- Deal
- Increase bet
- Stop dealing

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Use case

- Win/Lose check (胜负结算) + Tie / Draw (平局)

- Compare score
- Take/Lose bets

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Classes

Deck
- Dealer dealer - List<Player> players

Hand
- List<Card> cards

Player
- Hand hand

Dealer
- Hand hand

Card

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Use cases
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Join table

- Player join the deck

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Classes

Deck
- Dealer dealer - List<Player> players
+ void addPlayer(Player p)

Hand
- List<Card> cards

Player
- Hand hand

Dealer
- Hand hand

Card

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Use cases
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Classes

九章算法

Deck
- Dealer dealer - List<Player> players
+ void addPlayer(Player p)

Hand
- List<Card> cards

Player
- Hand hand
+ void joinGame(Deck d)

Dealer
- Hand hand

Card

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Use cases

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Place bets

- Player place bets

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players
+ void addPlayer(Player p)

Hand
- List<Card> cards

Player
- Hand hand - int totalBets
+ void joinGame(Deck d)

Dealer
- Hand hand

Card

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players
+ void addPlayer(Player p)

Hand
- List<Card> cards

Player
- Hand hand - int totalBets - Int currentBets
+ void joinGame(Deck d) + void placeBets(int amount)

Dealer
- Hand hand

Card

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Use cases

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Get initial hands

- Each player and dealer get 2 initial cards

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle()

Hand
- List<Card> cards

Player
- Hand hand - int totalBets - Int bets
+ void joinGame(Deck d) + void placeBets(int amount)

Dealer
- Hand hand

Card

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Shuffle cards

- http://massivealgorithms.blogspot.com/2015/07/shuffle-cards-cracking-coding-interview.html

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Classes

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards(Player p)

Hand
- List<Card> cards

Player
- Hand hand - int totalBets - Int bets
+ void joinGame(Deck d) + void placeBets(int amount)

Dealer
- Hand hand

Card

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Use cases
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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards()

Hand
- List<Card> cards

Player
- Hand hand - int totalBets - Int bets
+ void joinGame(Deck d) + void placeBets(int amount)

Dealer
- Hand hand

Card

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Use cases

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Classes

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards()

Hand
- List<Card> cards

Player
- Hand hand - int totalBets - Int bets
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard (Card c)

Dealer
- Hand hand
+ void insertCard (Card c)

Card

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Use cases

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards()

Player
- Hand hand - int totalBets - Int bets
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard (Card c)

Dealer
- Hand hand
+ void insertCard (Card c)

Card

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Hand
- List<Card> cards
+ void insertCard(Card c)

Use cases

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Deal

- Player decides whether they want to get another card

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Classes

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards() + Card dealNextCard()

Player
- Hand hand - int totalBets - Int bets
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard (Card c)

Dealer
- Hand hand
+ void insertCard (Card c)

Card

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Hand
- List<Card> cards
+ void insertCard(Card c)

Use cases

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards() + Card dealNextCard()

Player
- Hand hand - Int bets - int totalBets - Deck d
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard (Card c)

Dealer
- Hand hand
+ void insertCard (Card c)

Card

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Hand
- List<Card> cards
+ void insertCard(Card c)

Use cases

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards() + Card dealNextCard()

Player
- Hand hand - int totalBets - Int bets - Deck d
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard(Card c) + void dealNextCard()

Dealer
- Hand hand
+ void insertCard (Card c)

Card

Hand
- List<Card> cards
+ void insertCard(Card c)

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Use cases

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards() + Card dealNextCard()

Player
- Hand hand - int totalBets - Int bets - Deck d
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard(Card c) + void dealNextCard()

Dealer
- Hand hand - Deck d
+ void insertCard (Card c) + void dealNextCard()

Card

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Hand
- List<Card> cards
+ void insertCard(Card c)

Use cases

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Classes

九章算法

```
Simulator.java

Player player_1 = new Player();

player_1.dealNextCard();



public void dealNextCard()
{
    Card nextCard = deck.dealNextCard();
    insertCard(nextCard);
}
```

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Stop dealing

- A player calls stop and not get any new cards

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards() + Card dealNextCard()

Player
- Hand hand - int totalBets - Int bets - Deck d
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard(Card c) + void dealNextCard() + void stopDealing()

Dealer
- Hand hand - Deck d
+ void insertCard (Card c) + void dealNextCard()

Card

Hand
- List<Card> cards
+ void insertCard(Card c)

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Use cases

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Classes

Deck

- Dealer dealer
- List<Player> players
- List<Card> cards

+ void addPlayer(Player p)
+ void shuffle()
+ void dealInitialCards()
+ Card dealNextCard()

Player

- Hand hand
- int totalBets
- Int bets
- Deck d
- Boolean stopDealing

+ void joinGame(Deck d)
+ void placeBets(int amount)
+ void insertCard(Card c)
+ void dealNextCard()
+ void stopDealing()

Dealer

- Hand hand
- Deck d

+ void insertCard (Card c)
+ void dealNextCard()

Card

Hand

- List<Card> cards

+ void insertCard(Card c)

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Use cases

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Compare results

- Player compare results with Dealer

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Classes

Deck

- Dealer dealer
- List<Player> players
- List<Card> cards

+ void addPlayer(Player p)
+ void shuffle()
+ void dealInitialCards()
+ Card dealNextCard()
+ void compareResults()

Player

- Hand hand
- int totalBets
- Int bets
- Deck d
- Boolean stopDealing

+ void joinGame(Deck d)
+ void placeBets(int amount)
+ void insertCard(Card c)
+ void dealNextCard()
+ void stopDealing()

Dealer

- Hand hand
- Deck d

+ void insertCard (Card c)
+ void dealNextCard()

Card

- Int value

Hand

- List<Card> cards

+ void insertCard(Card c)

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Use cases

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards() + Card dealNextCard() + void compareResults()

Player
- Hand hand - int totalBets - Int bets - Deck d - Boolean stopDealing
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard(Card c) + void dealNextCard() + void stopDealing()

Dealer
- Hand hand - Deck d
+ void insertCard (Card c) + void dealNextCard()

Card
- Int value

Hand
- List<Card> cards
+ void insertCard(Card c)

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Use cases

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Classes

Deck

- Dealer dealer
- List<Player> players
- List<Card> cards

+ void addPlayer(Player p)
+ void shuffle()
+ void dealInitialCards()
+ Card dealNextCard()
+ void compareResults()

Player

- Hand hand
- int totalBets
- Int bets
- Deck d
- Boolean stopDealing

+ void joinGame(Deck d)
+ void placeBets(int amount)
+ void insertCard(Card c)
+ void dealNextCard()
+ void stopDealing()

Dealer

- Hand hand
- Deck d

+ void insertCard (Card c)
+ void dealNextCard()
+ boolean largerThan(Player p)

Card

- Int value

Hand

- List<Card> cards

+ void insertCard(Card c)

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Use cases

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Win/Lose bets

- Update player's bets

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Classes

Deck

- Dealer dealer
- List<Player> players
- List<Card> cards

+ void addPlayer(Player p)
+ void shuffle()
+ void dealInitialCards()
+ Card dealNextCard()
+ void compareResults()

Player

- Hand hand
- int totalBets
- Int bets
- Deck d
- Boolean stopDealing

+ void joinGame(Deck d)
+ void placeBets(int amount)
+ void insertCard(Card c)
+ void dealNextCard()
+ void stopDealing()
+ void updateBets(int amount)

Dealer

- Hand hand
- Deck d

+ void insertCard (Card c)
+ void dealNextCard()
+ boolean largerThan(Player p)

Card

- Int value

Hand

- List<Card> cards

+ void insertCard(Card c)

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Use cases

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Classes

九章算法

Deck
- Dealer dealer - List<Player> players - List<Card> cards
+ void addPlayer(Player p) + void shuffle() + void dealInitialCards() + Card dealNextCard() + void compareResults()

Player
- Hand hand - int totalBets - Int bets - Deck d - Boolean stopDealing
+ void joinGame(Deck d) + void placeBets(int amount) + void insertCard(Card c) + void dealNextCard() + void stopDealing() + void updateBets(int amount)

Dealer
- Hand hand - Deck d - Int bets
+ void insertCard (Card c) + void dealNextCard() + boolean largerThan(Player p)

Card
- Int value

Hand
- List<Card> cards
+ void insertCard(Card c)

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Use cases

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Classes

Deck

- Dealer dealer
- List<Player> players
- List<Card> cards

+ void addPlayer(Player p)
+ void shuffle()
+ void dealInitialCards()
+ Card dealNextCard()
+ void compareResults()

Player

- Hand hand
- int totalBets
- Int bets
- Deck d
- Boolean stopDealing

+ void joinGame(Deck d)
+ void placeBets(int amount)
+ void insertCard(Card c)
+ void dealNextCard()
+ void stopDealing()
+ void updateBets(int amount)

Dealer

- Hand hand
- Deck d
- Int bets

+ void insertCard (Card c)
+ void dealNextCard()
+ boolean largerThan(Player p)
+ void updateBets(int amount)

Card

- Int value

Hand

- List<Card> cards

+ void insertCard(Card c)

Use cases

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Classes

Deck

- Dealer dealer
- List<Player> players
- List<Card> cards

+ void addPlayer(Player p)
+ void shuffle()
+ void dealInitialCards()
+ Card dealNextCard()
+ void compareResults()

Player

- Hand hand
- int totalBets
- Int bets
- Deck d
- Boolean stopDealing

+ void joinGame(Deck d)
+ void placeBets(int amount)
+ void insertCard(Card c)
+ void dealNextCard()
+ void updateBets(int amount)
+ void stopDealing()
+ int getCurrentBets()

Hand

- List<Card> cards

+ void insertCard(Card c)

Dealer

- Hand hand
- Deck d
- Int bets

+ void insertCard (Card c)
+ void dealNextCard()
+ booleanlargerThan(Player p)
+ void updateBets(int amount)

Card

- Int value

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Use cases

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Classes


```
Deck.compareResult();

for(Player player : players)
{
    int currentBets = player.getCurrentBets();
    if(dealer.largerThan(player))
    {
        dealer.updateBets(currentBets);
        player.updateBets(-currentBets);
    }
    else{
        dealer.updateBets(-currentBets);
        player.updateBets(currentBets);
    }
}
```

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棋牌类总结

- Clarify：玩家，规则，胜负，积分

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棋牌类总结

- Clarify：玩家，规则，胜负，积分
- Core object: Hand, Board, Deck/Table, Suit, …

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棋牌类总结

- Clarify：玩家，规则，胜负，积分
- Core object: Hand, Board, Deck/Table, Suit, …
- Use cases: Initialization / Play / Checkout

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棋牌类总结

- Clarify：玩家，规则，胜负，积分
- Core object: Hand, Board, Deck/Table, Suit, …
- Use cases: Initialization / Play / Checkout

- 对于牌类，需要从Player的角度出发

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Exception

- https://www.geeksforgeeks.org/exceptions-in-java/

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Design pattern 总结

- Singleton
- Strategy
- Adapter
- State
- Decorator
- Factory

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Singleton

- 常见的Design pattern
- 三种常见写法

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- Singleton – 基本式

```
public class ParkingLot
{
    private static ParkingLot _instance = null;

    private List<Level> levels;

    private ParkingLot()
    {
        levels = new ArrayList<Level>();
    }

    public static ParkingLot getInstance()
    {
        if(_instance == null)
        {
            _instance = new ParkingLot();
        }
        return _instance;
    }
}
```

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- Singleton – 线程安全式

```
public class ParkingLot
{
    private static ParkingLot _instance = null;

    private List<Level> levels;

    private ParkingLot()
    {
        levels = new ArrayList<Level>();
    }

    public static synchronized ParkingLot getInstance()
    {
        if(_instance == null)
        {
            _instance = new ParkingLot();
        }
        return _instance;
    }
}
```

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- Singleton – 静态内部类式

```
public class ParkingLot
{
    private ParkingLot(){}

    private static class LazyParkingLot
    {
        static final ParkingLot _instance = new ParkingLot();
    }

    public static ParkingLot getInstance()
    {
        return LazyParkingLot._instance;
    }
}
```

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Singleton

- 用途：

考虑你设计的东西，是否应该只有一个实例

- ElevatorSystem vs. Elevator

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Singleton

- 用途：

考虑你设计的东西，是否应该只有一个实例

- ElevatorSystem vs. Elevator
- 象棋大厅 vs. 象棋 / Deck / Table

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Singleton

- 用途：

考虑你设计的东西，是否应该只有一个实例

- ElevatorSystem vs. Elevator
- 象棋大厅 vs. 象棋 / Deck / Table
- Kindle 内部的 ReaderFactory

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Singleton

面试中：

不需要一上来就考虑Singleton.

做完class diagram之后：

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- So I was thinking maybe we can apply singleton pattern to this ReaderFactory as well, because…
- Do you think there should be only one instance of the Elevator

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State

- 出现频率不高
- 特别适合于特殊类型的题目

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State

- 出现频率不高
- 特别适合于特殊类型的题目

e.g. Management类型 -> Parking Lot

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State

- 出现频率不高
- 特别适合于特殊类型的题目

e.g. Management类型 -> Parking Lot

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State: OPEN v.s. CLOSE

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State

- 出现频率不高
- 特别适合于特殊类型的题目

e.g. Management类型 -> Parking Lot

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State: OPEN v.s. CLOSE

24Hr Parking Lot?

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State

- 出现频率不高
- 特别适合于特殊类型的题目

e.g. Management类型 -> Parking Lot

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State: OPEN v.s. CLOSE

Park vehicle

Get available counts

Free spot

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State

- 出现频率不高
- 特别适合于特殊类型的题目

e.g. Management类型 -> Parking Lot

State: OPEN v.s. CLOSE

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Park vehicle
Get available counts
Free spot

以上use case，的确受Open/Close的影响

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State

- 出现频率不高
- 特别适合于特殊类型的题目

e.g. Management类型 -> Parking Lot

State: OPEN v.s. CLOSE

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Park vehicle
Get available counts
Free spot

以上use case，的确受Open/Close的影响
但是以上的use case，并不会导致State的转换

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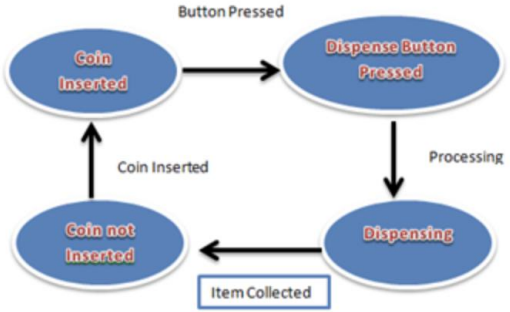
- 出现频率不高
- 特别适合于特殊类型的题目

e.g. 实物类 -> Vending Machine

http://ydtech.blogspot.com/2010/06/state-design-pattern-by-example.html



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State Pattern思考示例

1. 有哪些State?
2. 有哪些function会受到上诉State的影响
3. 写State class以及所有子类
4. 在主体（vending machine）加上必要的函数和变量

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Adapter

- 面试中频率低
- 现实Coding中很实用

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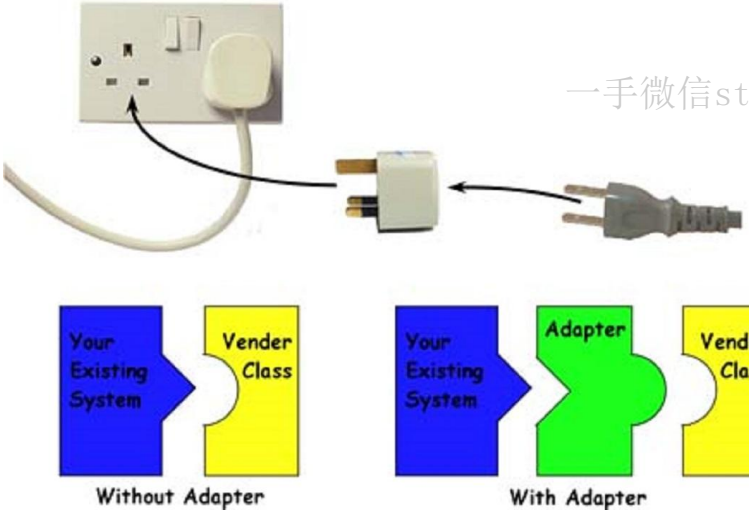

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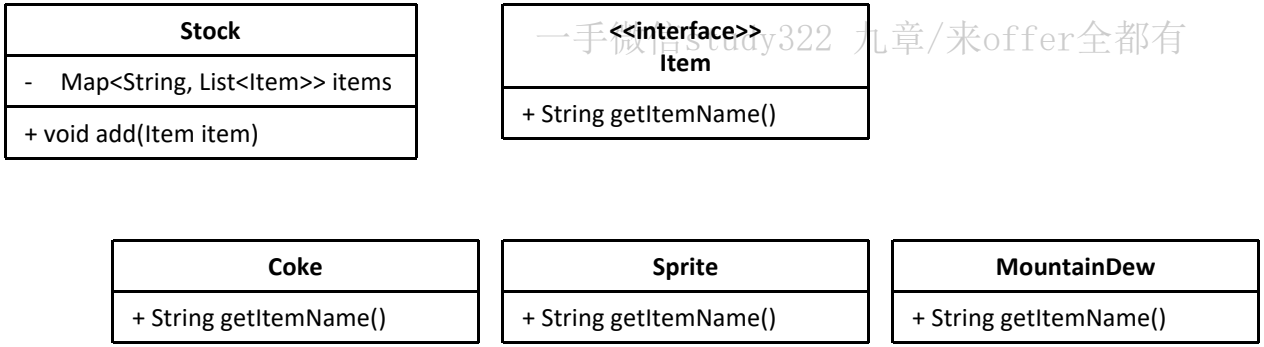
- 例子：



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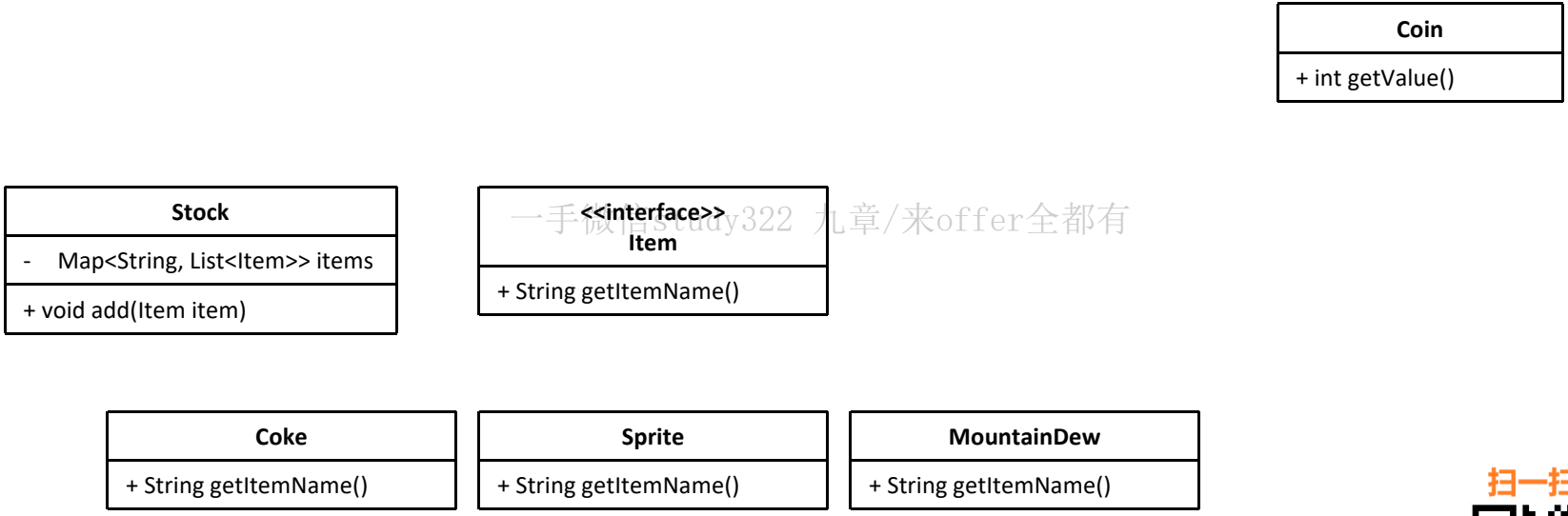
Adapter

- 例子：



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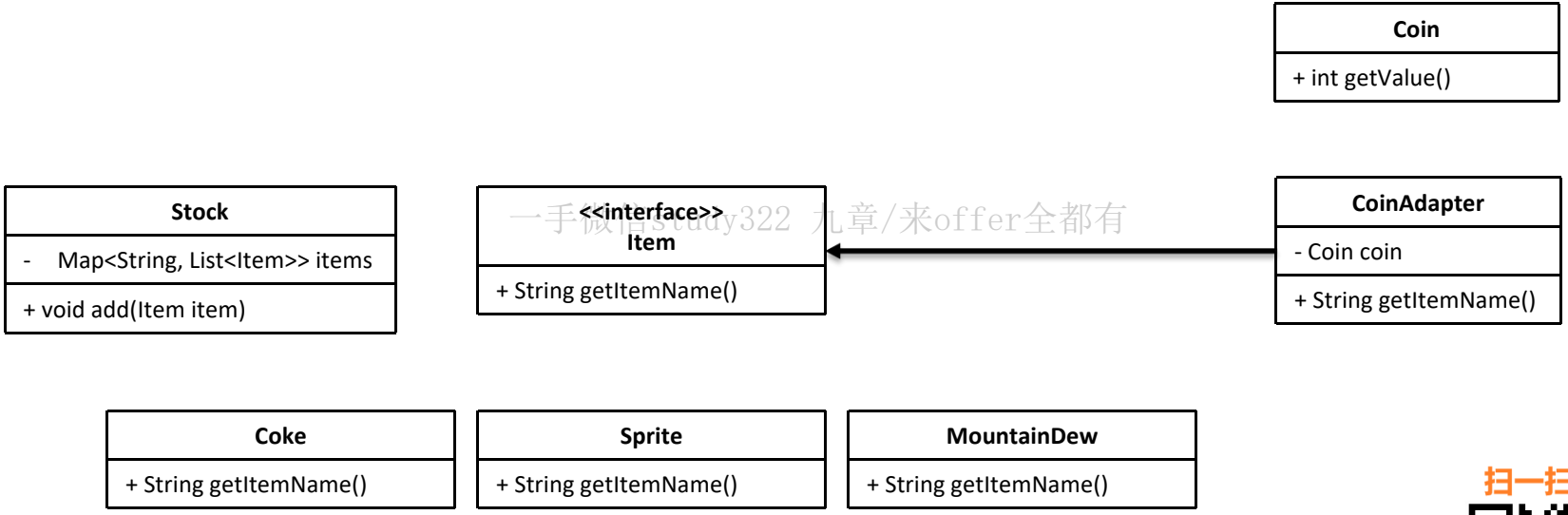
Adapter

- 例子：



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Adapter


```
public class CoinAdapter implements Item
{
    private Coin coin;

    public CoinAdapter(Coin coin)
    {
        this.coin = coin;
    }

    public String getItemName()
    {
        return new String(coin.getValue());
    }
}
```

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Strategy v.s. Factory

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Strategy v.s. Factory

42

Strategy is about behavior. Factory is about creation/instatation.

Suppose you have an algorithm, to calculate a discount percentage. You can have 2 implementations of that algorithm; one for regular customers, and one for extra-ordinary good customers.
You can use a strategy DP for this implementation: you create an interface, and 2 classes that implement that interface. In one class, you implement the regular discount-calculation algorithm, in the other class you implement the 'good customers' algorithm.

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Then, you can use a factory pattern to instantiate the class that you want. The factory method thus instantiates either the regular customer-discount algorithm, or the other implementation.

In short: the factory method instantiates the correct class; the strategy implementation contains the algorithm that must be executed.

share improve this answer

answered Mar 21 '11 at 8:

Frederik Gheysel

45.8k ● 8 ● 78 ●

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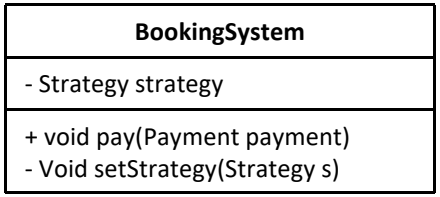
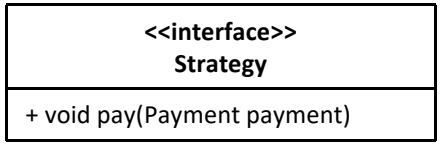
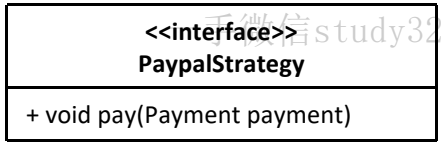
Strategy v.s. Factory







BookingSystem
- Strategy strategy
+ void pay(Payment payment) - Void setStrategy(Strategy s)

<<interface>> Strategy
+ void pay(Payment payment)

<<interface>> PaypalStrategy
+ void pay(Payment payment)

<<interface>> CreditCardStrategy
+ void pay(Payment payment)

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```
String account = payment.getAccount();
String password = payment.getPassword();
```

```
String cardId = payment.getCardId();
String name = payment.getName();
String cvv = payment.getCvv();
```

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Strategy v.s. Factory

```
public class StrategyFactory
{
    public Strategy createStrategy(Payment payment)
    {
        if(payment.getMethod().equals("paypal"))
        {
            strategy = new PaypalStrategy();
        }
        else if(payment.getMethod().equals("credit card"))
        {
            strategy = new CreditCardStrategy();
        }
    }
}

public void pay(Payment payment)
{
    strategy = createStrategy(payment);
    strategy.processPayment(payment);
}
```

```
public interface Strategy
{
    public void processPayment(Payment payment);
}

public class PaypalStrategy implements Strategy
{
    public void processPayment(Payment payment)
    {
        // get paypal account
        // get paypal password
        // ...
    }
}
```

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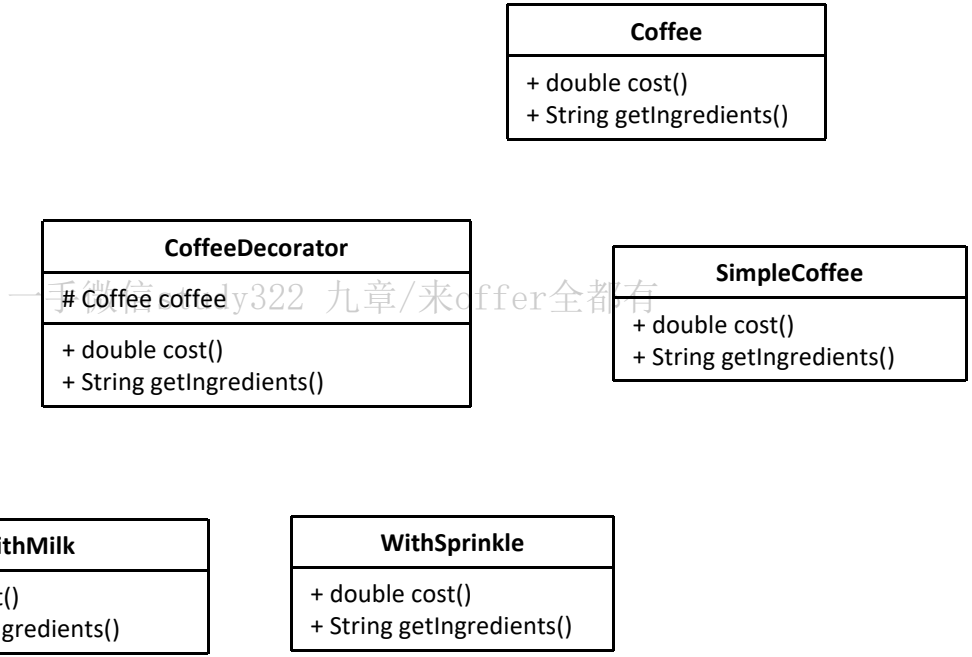
Decorator



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Decorator


```java
// The interface Coffee defines the functionality of Coffee implemented by decorator
public interface Coffee {
    public double getCost(); // Returns the cost of the coffee
    public String getIngredients(); // Returns the ingredients of the coffee
}

// Extension of a simple coffee without any extra ingredients
public class SimpleCoffee implements Coffee {
    @Override
    public double getCost() {
        return 1;
    }

    @Override
    public String getIngredients() {
        return "Coffee";
    }
}
```

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Decorator


```
// Abstract decorator class - note that it implements Coffee interface
public abstract class CoffeeDecorator implements Coffee {
    protected final Coffee decoratedCoffee;

    public CoffeeDecorator(Coffee c) {
        this.decoratedCoffee = c;
    }

    public double getCost() { // Implementing methods of the interface
        return decoratedCoffee.getCost();
    }

    public String getIngredients() {
        return decoratedCoffee.getIngredients();
    }
}
```

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Decorator

九章算法

```
// Decorator WithMilk mixes milk into coffee.
// Note it extends CoffeeDecorator.
class WithMilk extends CoffeeDecorator {
    public WithMilk(Coffee c) {
        super(c);
    }

    public double getCost() { // Overriding methods defined in the abstract superclass
        return super.getCost() + 0.5;
    }

    public String getIngredients() {
        return super.getIngredients() + ", Milk";
    }
}

// Decorator WithSprinkles mixes sprinkles onto coffee.
// Note it extends CoffeeDecorator.
class WithSprinkles extends CoffeeDecorator {
    public WithSprinkles(Coffee c) {
        super(c);
    }

    public double getCost() {
        return super.getCost() + 0.2;
    }

    public String getIngredients() {
        return super.getIngredients() + ", Sprinkles";
    }
}
```

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Decorator


```
public class Main {
    public static void printInfo(Coffee c) {
        System.out.println("Cost: " + c.getCost() + "; Ingredients: " + c.getIngredients());
    }

    public static void main(String[] args) {
        Coffee c = new SimpleCoffee();
        printInfo(c);

        c = new WithMilk(c);
        printInfo(c);

        c = new WithSprinkles(c);
        printInfo(c);
    }
}
```

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The output of this program is given below:

```
Cost: 1.0; Ingredients: Coffee
Cost: 1.5; Ingredients: Coffee, Milk
Cost: 1.7; Ingredients: Coffee, Milk, Sprinkles
```

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Q & A

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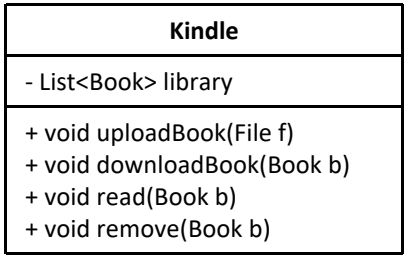
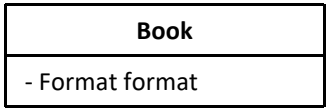
Classes





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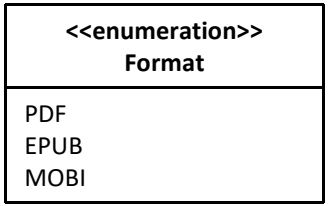

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Challenge

- How would read book work?

```
public void read(Book book)
{
    if(book.getFormat == Format.PDF)
    {
        PDFReader reader = new PDFReader(book);
        reader.display();
    }
    else if(book.getFormat == Format.MOBI)
    {
        MOBIReader reader = new MOBIReader(book);
        reader.display();
    }
    else if(book.getFormat == Format.EPUB)
    {
        EPUBReader reader = new EPUBReader(book);
        reader.display();
    }
}
```

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Challenge

- Solution: Factory design pattern

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Factory design pattern

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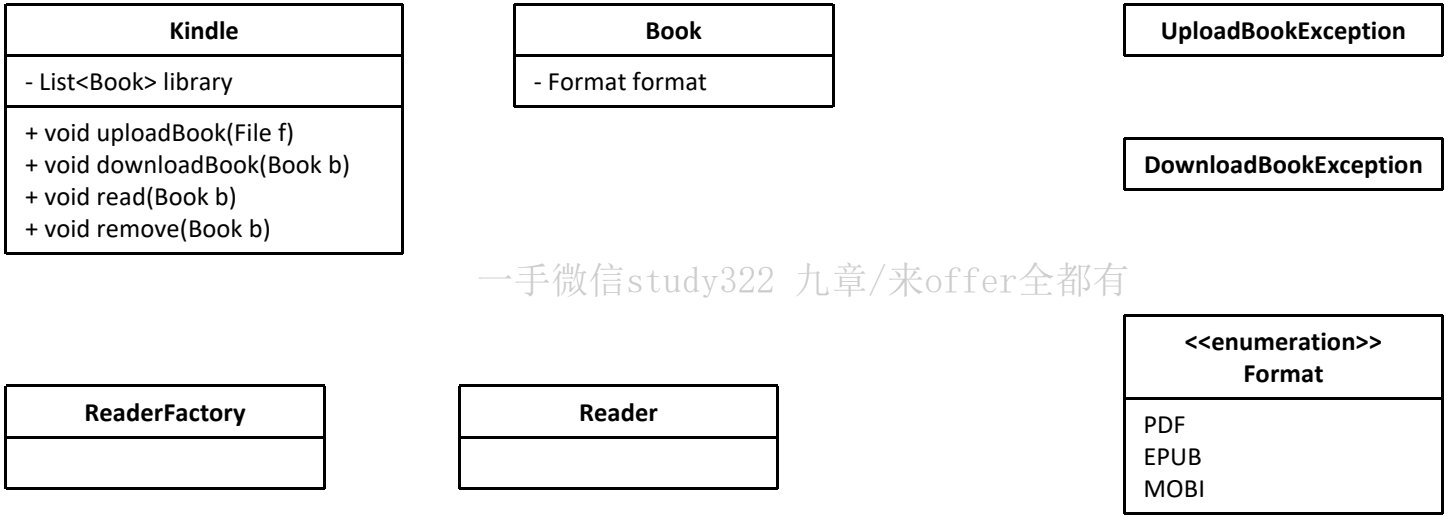
Factory design pattern



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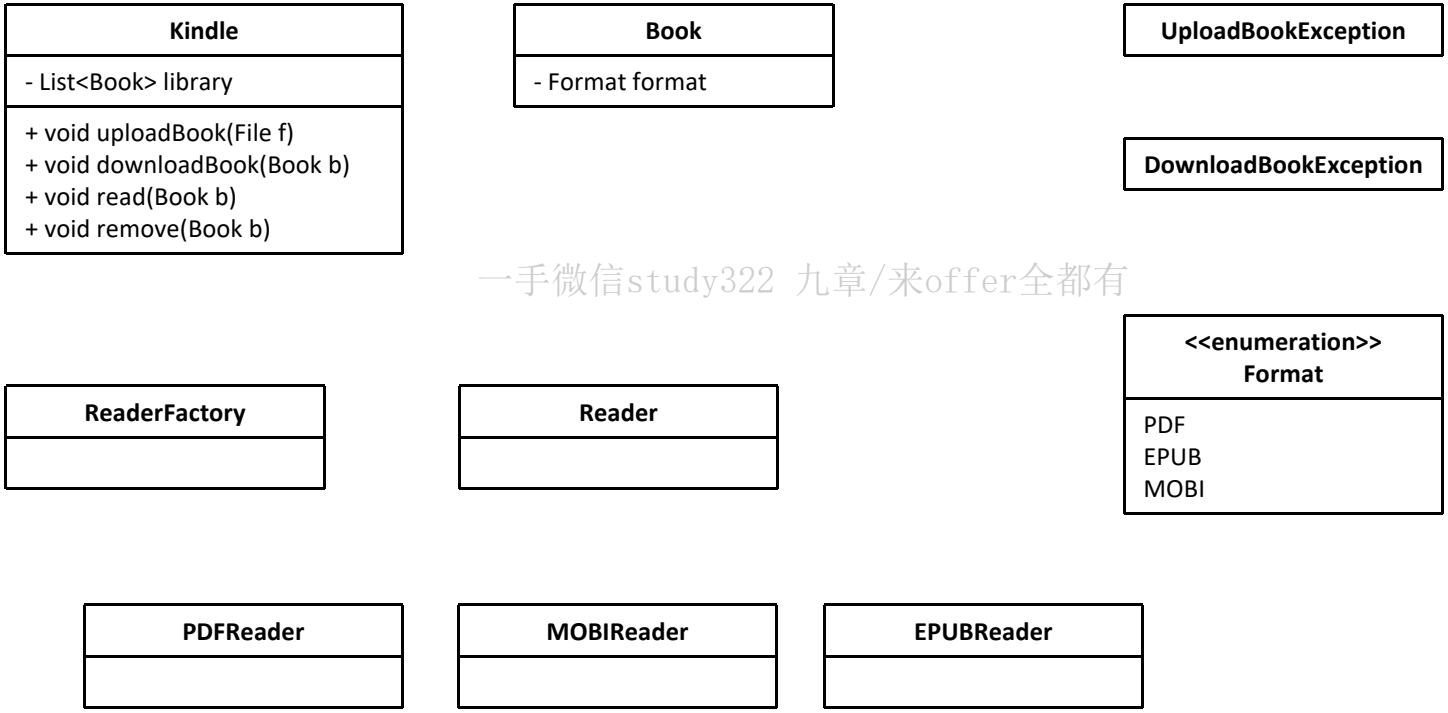

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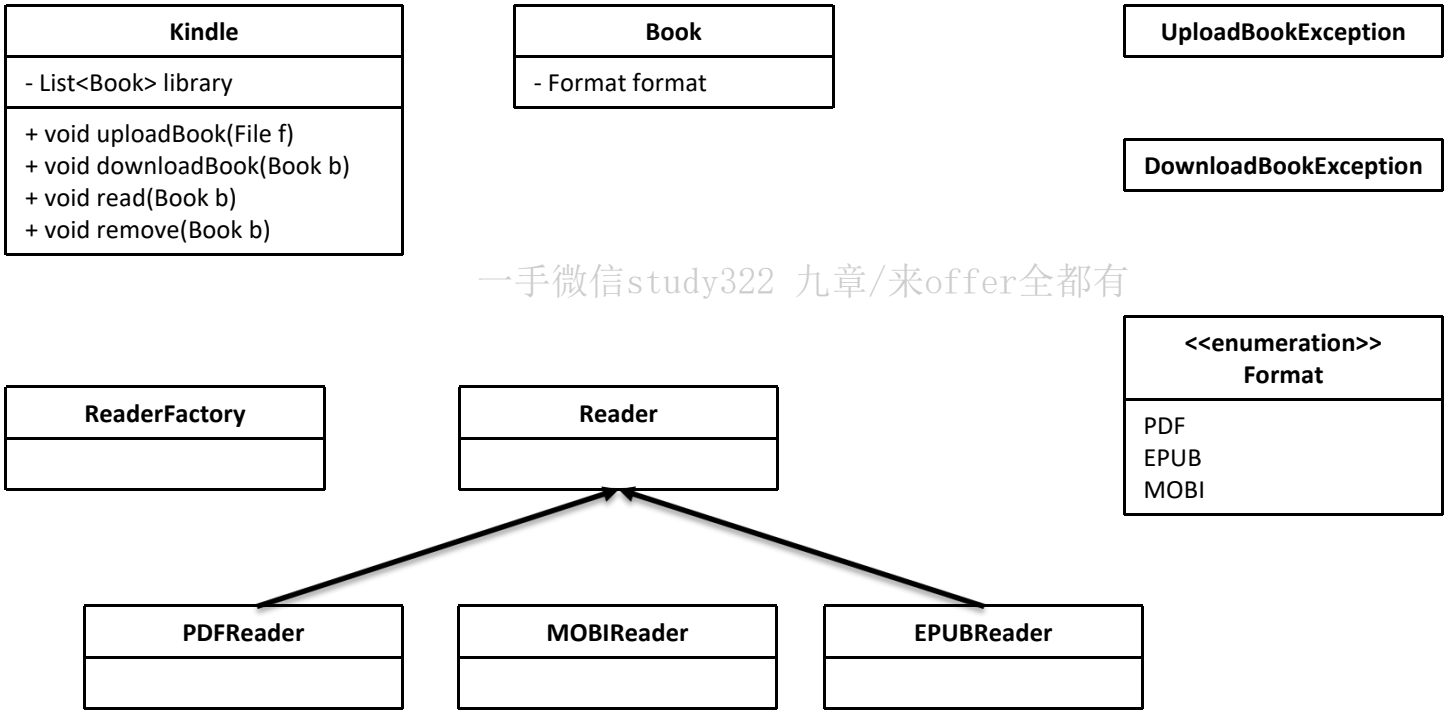

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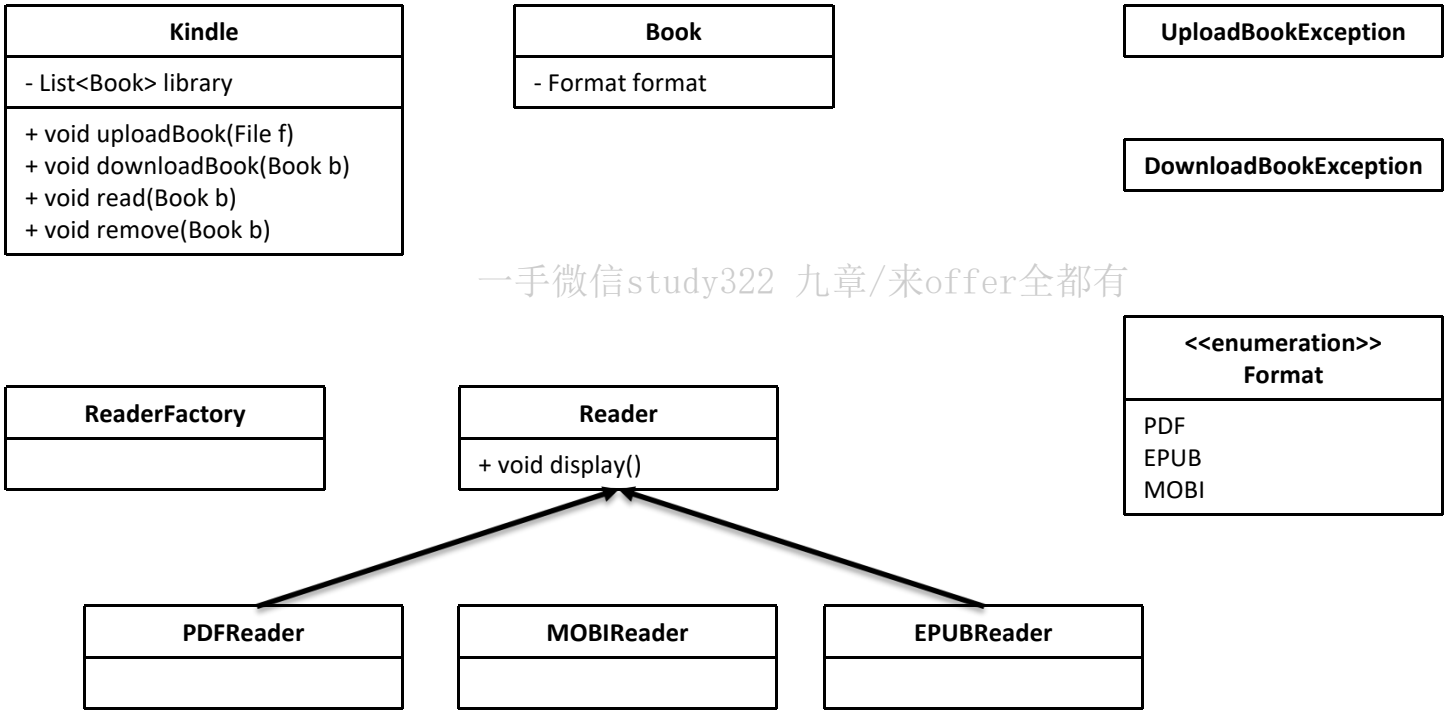

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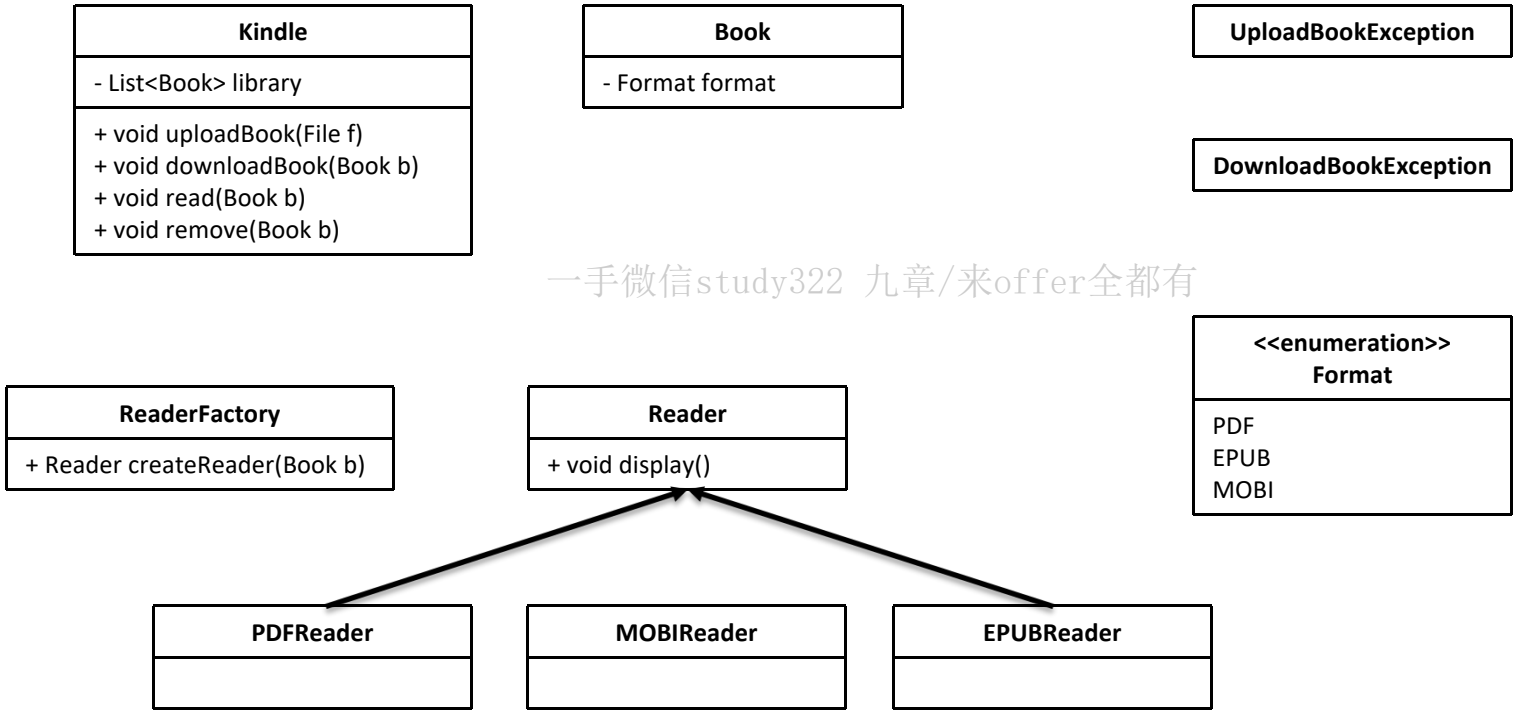

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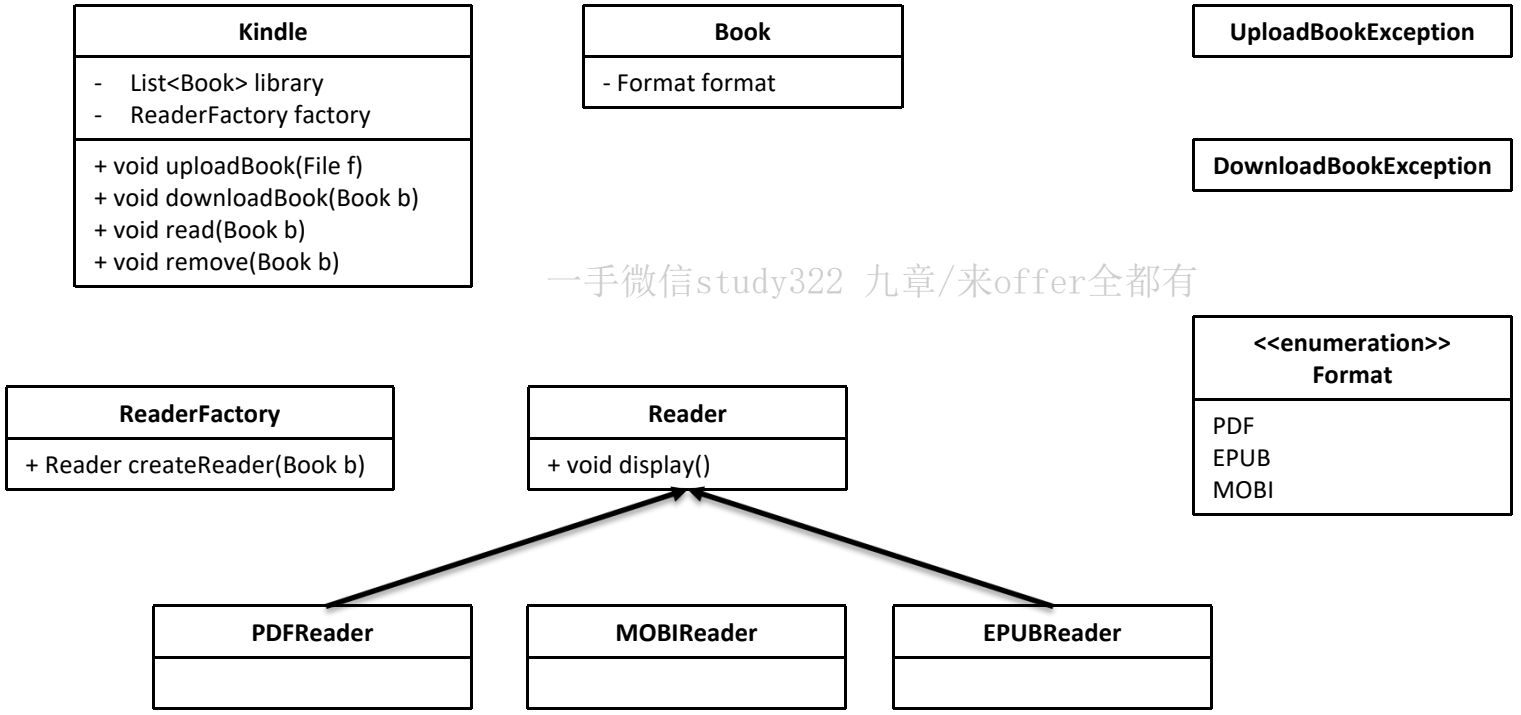

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Simple factory

```
public Reader createReader(Book book)
{
    if(book.getFormat == Format.PDF)
    {
        return new PDFReader(book);
    }
    else if(book.getFormat == Format.MOBI)
    {
        return new MOBIReader(book);
    }
    else if(book.getFormat == Format.EPUB)
    {
        return new EPUBReader(book);
    }
    retrun null;
}
```

```
Reader reader = factory.createReader(book);
reader.display();
```

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Factory design pattern

- Factory method
- Abstract factory

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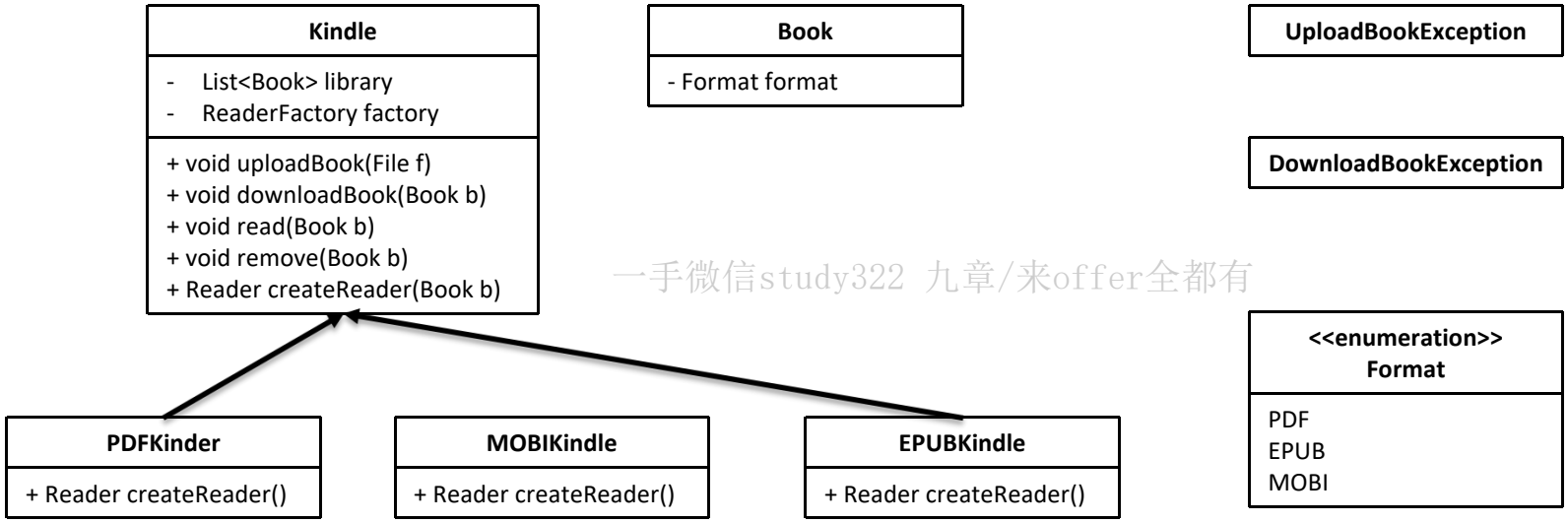
Factory method



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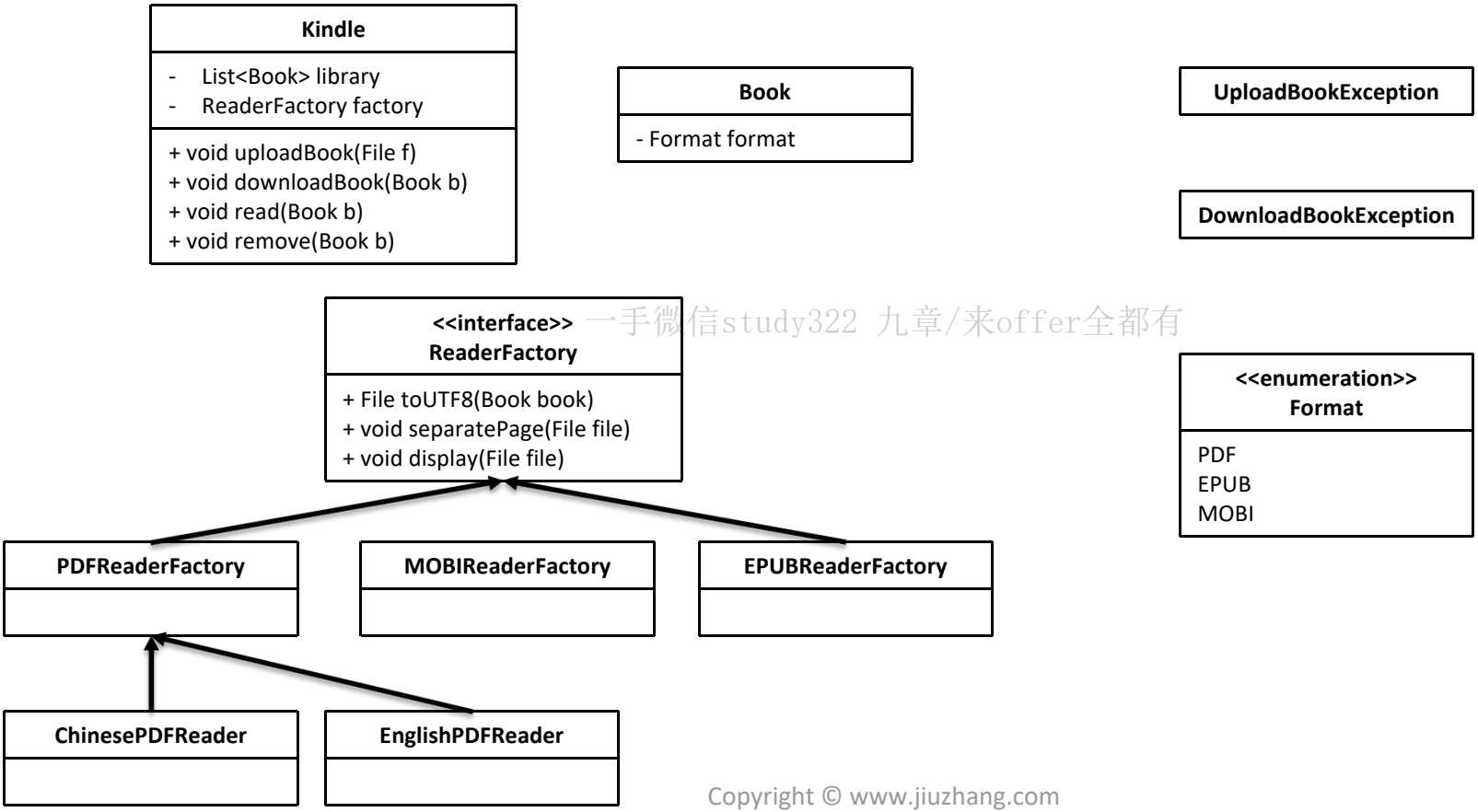
Abstract factory



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