Project 1

Tittle

Monopoly: Empire

Course

CSC-17C

Section

42526

Due Date

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Author

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I. Introduction

Monopoly is a common series of American board game which allow multiple players to roll dices and make movements on the game board. Depending on the luck of player, player can buy land, pay rent, or even get chance card to react differently by following the instruction.

Monopoly: Empire is a game that players collect brand billboards instead of land. Each player has 1000K at the beginning, and tries to use the money properly to get 800 credits of brands. During the time of collecting billboards, players also can attack each other to avoid their opponents to get enough credit.

Also, the chance card in the game plays an important role. Some of the card can help player get more money or attack opponents, but some can be harmful to player himself.

In the game, who collect 800 credits is the winner; however, who run out of money will automatically consider as loser. This asks players to take care of the usage of their money when busy collecting billboards!

II. Game Rules

A. Basic Rules

1.Each player has 1000K at beginning and start at position #0.

2.In each turn, player roll 2 dices, and move corresponding steps.

3.When stop at a position, follow the instruction of that position.

4.[1] represent player, [2] represent computer.

B. Game Board

1.Total 24 positions (0~24) of 7 types.

2.Start

- Every player start from here.
- When pass start point, collect as much money as your total collecting value.

3.Billboard

- Containing name, price, collecting value, and condition(0,1 or 2).
- The first two lines are the name of the brand.
- The third line is price (collecting value), eg.100K (50).
    - Price ≠ collecting value.

    - Price is how much cost you to buy the brand.
    - Collecting value is used for win the game.
- The fourth line is (condition), eg. (1).

  (0 = no owner; 1 = player own; 2 = computer own)
- The fifth line shows player's position, eg.[1] [2].
- The bottom line has the position # of that box.
- Exception: Electric Company Billboard. (See IV. Billboard-E)

4.Chance Card

- Randomly pick a chance card when stop at here.
- Total 8 kinds of chance cards.
- Chance card may not be good for player who pick it.

5.Jail

- To get out of jail, there are two choice.
    - During next turn, pay 100K and get out at once.
    - Roll a double up to 3 turns, if not, pay 50K and get out at 3rd turn.
- Position #19 is go to jail, player will be move to jail on Position #7.

- Simply stop at position #7 is pass by, is not in jail.

6.Take a trip

- You can spend 100K to move to anywhere on board, or simply do nothing.
- If you move to a new position, you have to follow the instruction on that position.

7.Tower Tax

- Tower Tax: return your topmost billboard to board.
- Rival Tower Tax: return your opponent's topmost billboard to board.

C. Dices

1.One normal dice, one special dice with a 'swap' face.

2.When 'swap' face is up, you have a chance of sneaky swap.

(sneaky swap: swap your topmost billboard with your opponent's)

3.When you roll a double, you can have another turn until you don't have a double.

(double: two dices have same number)

D. Billboard

1.14 billboards total; different price with different collecting value; choose smartly!

2.You can buy billboards when you stop at the corresponding position if the condition is no owner.

3.You have to pay rent fee if you stop at a position whose billboard is owner by your opponents.

4.Nothing will happen if you stop at the position that is owned by your-self.

5.One exception is Electric Company Billboard at position #9.

- Has 4 in total
- Doesn't own by anyone.

E. Chance Card

Total 8 cards has different functions.

F. Win

1.Whoever first get 800 collecting value wins.

2.Whoever first run out of money loses.

III. Summary

Total Line of Code	**1496**
Comment Line	-
Variable	36
Class	2

Basically, the game is for 2 players playing. There is a player class contain a single player's information, and a game class to control all process happened during the game. I make all the decisions in main function to see the structure clearly.

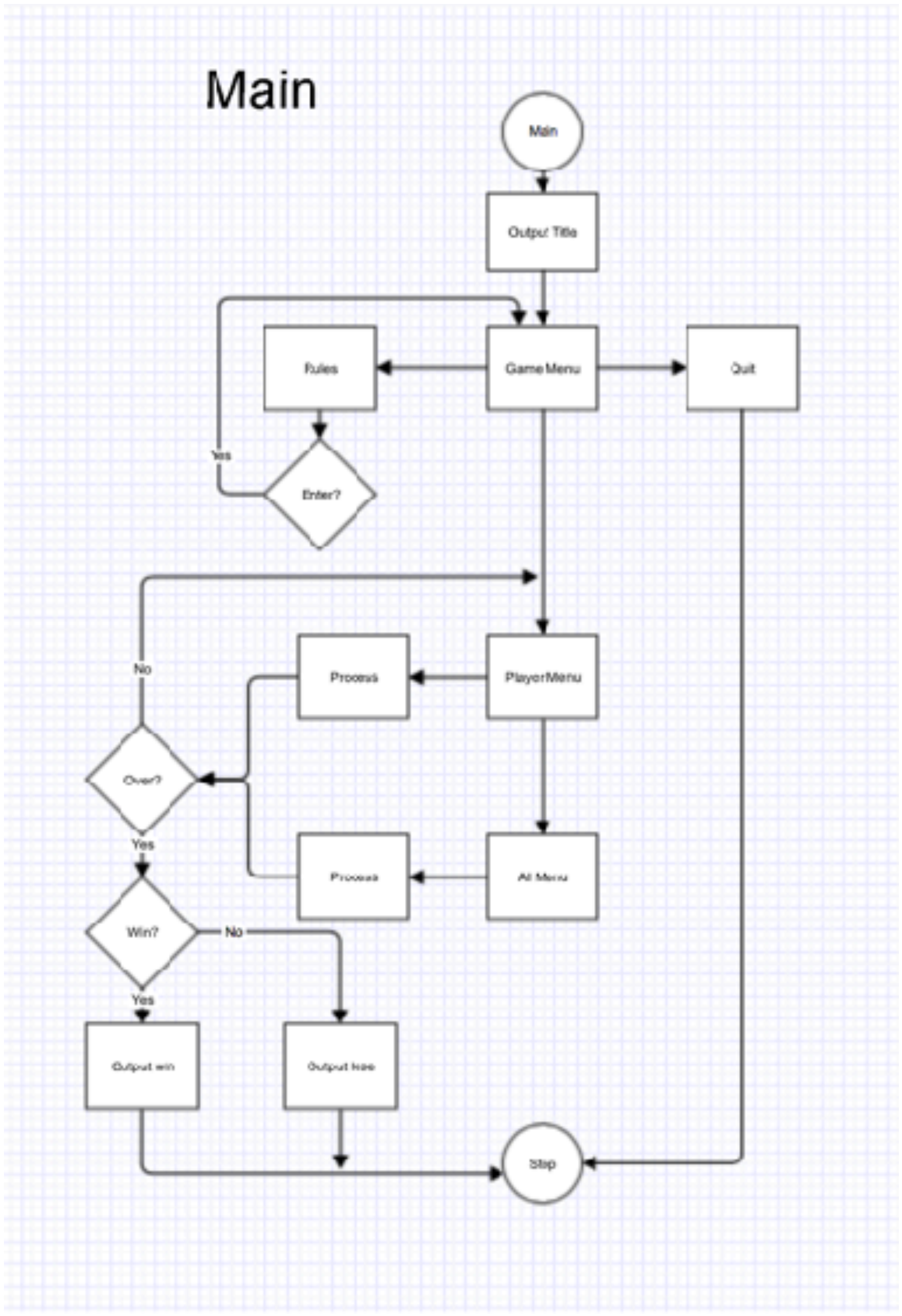
My program basically build on the linked list and its extending usage. In these function, I utilized linked list to contain the collecting value, and use linked list to be act like a stack. I also use map to match the corresponding position #, selling price and collecting value.

I tried to use clear windows function, but it seems somewhere is not so correct; there will be some remaining from last step showing in the window when clear it, and I do not really know how to fix it now, but I will work on it later.

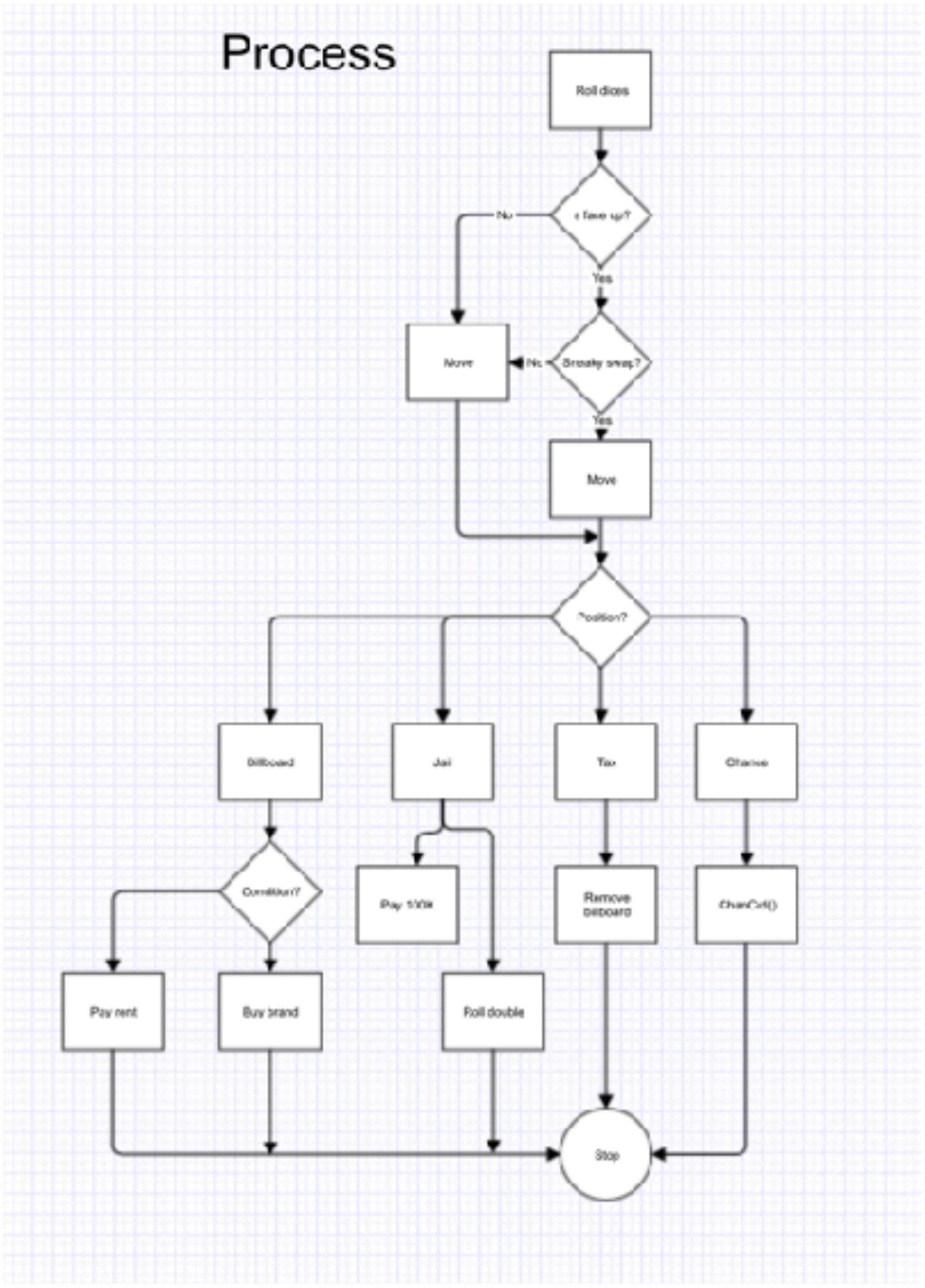
IV. Description

A. Flowcharts

Main:



Process:


Process
Roll dices
No
Yes
Move
No
Yes
Move
Position?
Billboard
Jail
Tax
Chance
Condition?
Pay 100k
Remove billboard
Pay rent
Buy brand
Roll double
Stop

B. Concepts

Concept of STL	Type	Code	Location(line)
Linked list	Link *	struct Link { int data; Link *LinkPtr; };	Link.h
		Link *bdName;	Player.h 24
		Link *bdFront;	Player.h 25
Stack	Linked list	void addBdName(int); void addFront(int);	Player.h 36-37
		void pop(int);	Player.h 40
Find end	Linked list	Link *endLst(int);	Player.h 30
Search	Linked list	bool search(int, int);	Player.h 31
Print list	Linked list	void prntLst(int);	Player.h 44
Map	<int, int>	map<int, int>sell; map<int, int>coll;	Game.h 32-33

VI. Code

main.cpp

```
/*
 * File:   main.cpp
 * Author: Sili Guo
 * Created on April 14, 2017
 * Purpose: Game---Monopoly: Empire
 */


//System Libraries
#include <iostream>
#include <stdlib.h>
#include <cstdlib>
#include <ctime>
#include <cctype>
using namespace std;


//User Libraries
#include "Game.h"
//Global Constants
```

```
//Function Prototypes
void enterRcd(char);


//Execution Begins here!


int main(int argc, char** argv) {
    //Random number seed
    srand(static_cast<unsigned int> (time(0)));


    //Declare Variables
    Game game; //New game
    char enter; //Record enter
    char cho; //Record player's choice
    int choice; //Transfer cho to int for calculation
    string pName; //Player's name
    char sneaky; //Answer for sneaky swap
    int pos; //Hold the position info
    char buy; //Hold buying info
    char jum; //Hold answer for jump
    int jail; //choice in jail
    int start; //start the game first
    bool doub; //Judge for rolling double
    //Title
    game.title();



    //Start Menu
    do {
        //Next page
        enterRcd(enter);

        cout << "\n Monopoly: Empire" << endl;
        cout << "\n Start Menu" << endl;
        cout << " 1. Start New Game" << endl;
        cout << " 2. Read Rules" << endl;
        cout << " 0. Quit" << endl;
        cout << "(For a better playing experience,strongly suggest read rules before you start the
game!!!)" << endl;
        do {
            cout << "\nPlease enter the number of your choice (0~2):" << endl;
            cin >> cho;
            if (cho != 48 && cho != 49 & cho != 50)
                cout << "Invalid input! Please enter a number between 0 to 2." << endl;
        } while (cho != 48 && cho != 49 & cho != 50);
        //Transfer cho to int
        choice = cho - 48;


        //Quit the game
        if (choice != 1 && choice != 2) {
            system("clear");
            cout << "You quit the game." << endl;
        }


        switch (choice) {
            case 1:
                system("clear");
                //Promote for players' name
                cout << "Please enter your name correctly:" << endl;
                cin >> pName;
                game.setName(pName, "Computer");


                system("clear");
                //Output the game board
                cout << "Monopoly: Empire Game Board:" << endl;
```

```
game.output();


//Randomly choose who starts first
cout << "\nRandomly choosing who starts first..." << endl;
game.setStart();
start = game.getStart();


if (start == 0) cout << "You are first to start!" << endl;
else cout << "Computer starts first." << endl;


//Next page
cout << "\nPress enter to continue." << endl;
cin.ignore();
enterRcd(enter);


do {
   //Turn 1
   system("clear");
   cout << "\n Turn #" << game.getTurn() << endl;
   game.output();


   switch (start) {
```

```
case 0://Player starts first
    //If player is in jail
    do {
        doub = false;
        cout << "Your turn:" << endl;
        if (game.getJail(1) == true) {
            cout << "\nYou are currently in jail, and you have two choices: " << endl;
            cout << " 1. Pay 100K to get out." << endl;
            cout << " 2. Roll a double up to 3 turns; if not, pay 50K." << endl;
            do {
                cout << "\nPlease enter your choice (1 or 2): ";
                cin >> jail;
                cout << endl;
                if (jail < 1 || jail > 2)
                    cout << "Invalid input! Please enter 1 or 2." << endl;
                if (game.jailJudge(jail) == false)
                    cout << "You are unable to pay the fee." << endl;
            } while (jail < 1 || jail > 2 || game.jailJudge(jail) == false);
            game.outJail(1, jail);

            //Next page
            cout << "\nPress enter to continue." << endl;
```

```
                cin.ignore();
                enterRcd(enter);

                //Output
                game.output();
            }
            if (game.getJail(1) == false) {
                //First roll two dice
                cout << "\nRolling dice..." << endl;
                game.setDices();
                cout << "Your result is: " << game.getDice1() << " " << game.getDice2()
<< endl << endl;
                if (game.getDice1() == game.getDice2()) doub = true;
                //If get the swap face up
                if (game.getDice1() == 's') {
                    cout << "Do you want to use the sneaky swap?" << endl;
                    cout << "(Switch your topmost billboard with your opponent's topmost
billboard," << endl;
                    cout << "then don't move this turn; or just use the second dice to
move.)" << endl;
                    do {
                        cout << "\nPlease enter yes or no (y or n): ";
```

```
        cin >> sneaky;

        if (tolower(sneaky) != 'y' && tolower(sneaky) != 'n')

            cout << "Invalid input! Please enter y or n." << endl;

    } while (tolower(sneaky) != 'y' && tolower(sneaky) != 'n');

    //Do sneaky swap

    if (tolower(sneaky) == 'y') {

        cout << "\nYou use sneaky swap." << endl;

        game.swap();

        //Or just use the second dice

    } else {

        cout << "\nYou did not use sneaky swap." << endl;

        game.move(1, game.getDice2() - 48);

    }

    cout << "\nPress enter to continue." << endl;

    cin.ignore();

} else {//Normally just move by using two dices

    game.move(1, (game.getDice1() - 48) + (game.getDice2() - 48));

    cout << "\nPress enter to continue." << endl;


}

enterRcd(enter);
```

```
//Output
game.output();


//Ask player to buy brand if land on it
pos = game.getPos(1);
if (pos == 12) {
    cout << "\nDo you want to take a trip (100K)?" << endl;
    cout << "(You can spend 100K to move to anywhere on board or do
nothing)" << endl;
    do {
        cout << "\nPlease enter yes or no (y or n): ";
        cin >> jum;
        cout << endl;
        if (tolower(jum) != 'y' && tolower(jum) != 'n')
            cout << "Invalid input! Please enter y or n." << endl;
    } while (tolower(jum) != 'y' && tolower(jum) != 'n');
    if (tolower(jum) == 'y') {
        cout << "Where do you want to go?" << endl;
        do {
            cout << "Please enter the position # (0~23): ";
            cin >> pos;
            cout << endl;
```

```
                    if (pos < 0 || pos > 23 || pos == 12)
                        cout << "Invalid input! Please enter a number between 0~23."
<< endl;
                } while (pos < 0 || pos > 23 || pos == 12);
                game.jump(1, pos);
                cout << "\nYou jump to position #" << pos << endl;
            }
            //Next page
            cout << "\nPress enter to continue." << endl;
            cin.ignore();
            enterRcd(enter);

            //Output
            game.output();
        }
        if (pos == 2 || pos == 4 || pos == 6 || pos == 8 || pos == 10 || pos == 11 ||
pos == 13
                || pos == 15 || pos == 16 || pos == 18 || pos == 20 || pos == 21 || pos
== 23) {
            cout << game.sale(pos) << endl;
            if (game.sale(pos) == 0) {
                cout << "\nYou stopped at position #" << pos << endl;
                cout << "Do you want to spend " << game.getSell(pos) << "K to buy
this brand?" << endl;
                do {
                    cout << "\nPlease enter yes or no (y or n): ";
                    cin >> buy;
                    cout << endl;
                    if (tolower(buy) != 'y' && tolower(buy) != 'n')
                        cout << "Invalid input! Please enter y or n." << endl;
                } while (tolower(buy) != 'y' && tolower(buy) != 'n');
                //Buy the brand
                if (tolower(buy) == 'y') {
                    cout << "You bought the brand at position " << pos << " with " <<
game.getSell(pos) << "K." << endl;
                    game.buyBrnd(1, pos);
                }
                cin.ignore();
            } else if (game.sale(pos) == 2) {
                if (game.getJail(2)) {
                    cout << "\nComputer is currently in jail." << endl;
                    cout << "You don't need to pay the fee." << endl;
                } else {
                    cout << "\nThis brand belongs to " << game.getName(2) << "." <<
endl;
                    cout << "You have to pay " << game.getName(2) << " " <<
game.getSell(pos) << "K." << endl;
                    game.payRent(1, pos);
                  }
                } else cout << "\nYou stop at the brand belongs to you." << endl;
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);

                //Output
                game.output();
              } else if (pos == 19) {
                cout << "\nYou are sending to jail!" << endl;
                game.jail(1);
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);

                //Output
                game.output();
```

```
            } else if (pos == 1) {
                cout << "\nYou stopped at Rival Tower Tax." << endl;
                cout << "You return Computer's topmost billboard to the board." <<
endl << endl;
                game.remove(2);
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);

                //Output
                game.output();
            } else if (pos == 22) {
                cout << "\nYou stopped at Tower Tax." << endl;
                cout << "You return your topmost billboard to the board." << endl <<
endl;
                game.remove(1);
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);

                //Output
                game.output();
            } else if (pos == 3 || pos == 5 || pos == 14 || pos == 17) {
                cout << "\nYou randomly pick a chance card!" << endl;
                game.chanCrd(1);
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);


                //Output
                game.output();
            } else if (pos == 9) {
                if (game.getElc() > 0) {
                    cout << "\n Do you want to spend 150K to buy a Electric Company
Billboard?" << endl;
                    do {
                        cout << "\nPlease enter yes or no (y or n): ";
                        cin >> buy;
                        cout << endl;
                        if (tolower(buy) != 'y' && tolower(buy) != 'n')
                            cout << "Invalid input! Please enter y or n." << endl;
                    } while (tolower(buy) != 'y' && tolower(buy) != 'n');
                    if (tolower(buy) == 'y') {
```

```
                    cout << "You bought one Electric Company Billboard with " <<
game.getSell(pos) << "K." << endl;
                    game.buyElec(1);
                  }
                  cin.ignore();
                } else cout << "\nNo Electric Company Billboard available!" << endl;
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);


                //Output
                game.output();
              }
            }
          } while (doub);
        case 1:
          do {
            doub = false;
            cout << "Computer's turn: " << endl;
            //If player is in jail
            if (game.getJail(2) == true) {
              cout << "\nComputer is currently in jail." << endl << endl;
```

```
                game.outJail(2, 0);
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);


                //Output
                game.output();
            }
            if (game.getJail(2) == false) {
                //First roll two dices
                cout << "\nRolling dice..." << endl;
                game.setDices();
                cout << "Computer's result is: " << game.getDice1() << " " << game.get-
Dice2() << endl << endl;
                if (game.getDice1() == game.getDice2()) doub = true;
                //If get the swap face up
                if (game.getDice1() == 's') {
                    if (game.compare()) {
                        cout << "Computer used sneaky swap!" << endl;
                        game.swap();
                    } else {
                        cout << "Computer didn't use sneaky swap!" << endl;
```

```
        game.move(2, game.getDice2() - 48);
    }
} else {
    game.move(2, (game.getDice1() - 48) + (game.getDice2() - 48));

}
//Next page
cout << "\nPress enter to continue." << endl;
enterRcd(enter);

//Output
game.output();

//Ask player to buy brand if land on it
pos = game.getPos(2);
if (pos == 12) {
    game.tripAI();
    //Next page
    cout << "\nPress enter to continue." << endl;
    enterRcd(enter);

    //Output
```

```
                        game.output();
                    }
                    if (pos == 2 || pos == 4 || pos == 6 || pos == 8 || pos == 10 || pos == 11 ||
pos == 13
                            || pos == 15 || pos == 16 || pos == 18 || pos == 20 || pos == 21 || pos
== 23) {
                        if (game.sale(pos) == 0) {
                            if (game.getMoney(2) > 500) {
                                cout << "\nComputer bought the brand at position " << pos << "
with " << game.getSell(pos) << "K." << endl;
                                game.buyBrnd(2, pos);
                            } else if (game.getMoney(2) > 2 * game.getSell(pos)) {
                                cout << "\nComputer bought the brand at position " << pos << "
with " << game.getSell(pos) << "K." << endl;
                                game.buyBrnd(2, pos);
                            }
                        } else if (game.sale(pos) == 1) {
                            if (game.getJail(1)) {
                                cout << "\nYou are currently in jail." << endl;
                                cout << "Computer did not pay you." << endl;
                            } else {
                                cout << "\nComputer stop at the brand belongs to you." << endl;
                    cout << "Computer paid you " << game.getSell(pos) << "K." <<
endl;
                    game.payRent(2, pos);
                  }
                }
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);


                //Output
                game.output();
              } else if (pos == 19) {
                cout << "\nComputer is sending to jail!" << endl;
                game.jail(2);
                //Next page
                cout << "\nPress enter to continue." << endl;
                enterRcd(enter);


                //Output
                game.output();
              } else if (pos == 1) {
                cout << "\nComputer stopped at Rival Tower Tax." << endl;
```

```
                        cout << "Computer return your topmost billboard to the board." << endl
<< endl;
                        game.remove(1);
                        //Next page
                        cout << "\nPress enter to continue." << endl;
                        enterRcd(enter);

                        //Output
                        game.output();
                    } else if (pos == 22) {
                        cout << "\nComputer stopped at Tower Tax." << endl;
                        cout << "Computer return its topmost billboard to the board." << endl
<< endl;
                        game.remove(2);
                        //Next page
                        cout << "\nPress enter to continue." << endl;
                        enterRcd(enter);

                        //Output
                        game.output();
                    } else if (pos == 3 || pos == 5 || pos == 14 || pos == 17) {
                        cout << "\nComputer randomly picks a chance card!" << endl;
                    game.chanCrd(2);

                    //Next page

                    cout << "\nPress enter to continue." << endl;

                    enterRcd(enter);


                    //Output

                    game.output();

                  } else if (pos == 9) {

                    if (game.getElc() > 0) {

                      if (game.getMoney(2) > 500) {

                        cout << "\nComputer bought one Electric Company Billboard with
" << game.getSell(pos) << "K." << endl;

                        game.buyElec(2);

                      } else if (game.getMoney(2) > 2 * game.getSell(pos)) {

                        cout << "\nComputer bought one Electric Company Billboard with
" << game.getSell(pos) << "K." << endl;

                        game.buyElec(2);

                      }

                    }

                    //Next page

                    cout << "\nPress enter to continue." << endl;

                    enterRcd(enter);
```

```
                //Output
                game.output();
              }
            }
          } while (doub);
      }//End of switch (start first)
      start = 0;
      game.setOver();
    } while (game.getOver() == false);
    //Next page
    cout << "\nPress enter to continue." << endl;
    enterRcd(enter);

    //Output
    game.output();
    if (game.getWin() == true) {
      cout << "\nCongratulation! You win the game." << endl;
    } else {
      cout << "\nSorry you lose the game." << endl;
    }
  case 2:
```

```
            system("clear");
            game.rules();
            break;
        }//End of switch (game menu)
        cout << "\n Press enter to go back to Game Menu." << endl;
        do {
            enter = getchar();
        } while (enter != '\n');
    } while (enter == '\n');

    //Exit Stage right!
    return 0;
}

void enterRcd(char en) {
    do {
        en = getchar();
    } while (en != '\n');
    system("clear");
}
```

Link.h

```
/*
 * File:   Player.h
 * Author: Sili Guo
 * Created on April 14, 2017
 * Purpose: Game---Monopoly: Empire; structure for linked list
 */


#ifndef LINK_H
#define LINK_H


struct Link {
    int data;
    Link *LinkPtr;
};
#endif /* LINK_H */
```

Player.h

```
/*
 * File:   Player.h
 * Author: Sili Guo
 * Created on April 14, 2017
 * Purpose: Game---Monopoly: Empire
 */

#ifndef PLAYER_H
#define PLAYER_H

#include <iostream>
using namespace std;

#include "Link.h"

class Player {
private:
   string name; //Player's name
   int money; //Money in player's hand
   int position; //Current position on board
   int bonus; //Bonus player totally collected
   bool jail; //Condition in jail
   int jTurn; //Turns in jail;
   Link *bdName; //The front of Billboard Titles names
   Link *bdFront; //The front of Billboard Titles linked list
   int sum; //Billboard collecting value sum
public:
```

```
Player(); //Constructor

virtual ~Player(); //Destructor

Link *endLst(int);

bool search(int, int);

void setName(string);

void setPosition(int);

void setJump(int);

void setSum();

void addBdName(int);

void addBdFront(int);

void sptMoney(int);

void takMoney(int);

void pop(int);

void inJail();

void oJail();

void jailTurn();

void prntLst(int);


string getName() {

   return name;

}
```

```
int getMoney() {
   return money;
}

int getPostion() {
   return position;
}

bool getJail() {
   return jail;
}

int getJTurn() {
   return jTurn;
}

Link *getBdName() {
   return bdName;
}

Link *getBdFront() {
   return bdFront;
```

```
    }

    int getSum() {
        return sum;
    }
};

#endif /* PLAYER_H */
```

Player.cpp

```
/*
 * File:   Player.h
 * Author: Sili Guo
 * Created on April 14, 2017
 * Purpose: Game---Monopoly: Empire
 */

#include "Player.h"

Player::Player() {
    name = " "; //Initialize name to empty
    money = 1000; //Initialize money to 800K
    position = 0; //Initialize position at starting point

    bonus = 0; //Initialize total bonus to 0

    jail = false; //Not in jail

    jTurn = 0; //Initialize turns in jail to 0

    bdName = NULL; //Have no Billboard Titles

    bdFront = NULL; //Have no Billboard Titles

    sum = 0;

}


Player::~Player() {

    if (bdName == NULL && bdFront == NULL) return;

    if (bdName != NULL) {

        do {

            Link *temp = bdName->LinkPtr;

            delete bdName;

            bdName = temp;

        } while (bdName != NULL);

    }

    if (bdFront != NULL) {

        do {

            Link *temp = bdFront->LinkPtr;

            delete bdFront;
            bdFront = temp;
        } while (bdFront != NULL);
    }
}

Link *Player::endLst(int n) {
    Link *lnk, *end;
    if (n == 1) {
        if (bdName == NULL) end = NULL;
        else {
            lnk = bdName;
            do {
                end = lnk; //Are we at the end yet?
                lnk = lnk->LinkPtr; //Traverse to the next link
            } while (lnk != NULL); //Finally found the end when NULL
        }
    } else if (n == 2) {
        if (bdFront == NULL) end = NULL;
        else {
            lnk = bdFront;
            do {
                end = lnk; //Are we at the end yet?
            lnk = lnk->LinkPtr; //Traverse to the next link
         } while (lnk != NULL); //Finally found the end when NULL
      }
   }
   return end;
}


bool Player::search(int s, int n) {
   if (s == 1) {
      if (bdName == NULL) return false;
      Link *lnk = bdName;
      while (lnk->data != n) {
         lnk = lnk->LinkPtr;
         if (lnk == NULL) return false;
      }
   } else if (s == 2) {
      if (bdFront == NULL) return false;
      Link *lnk = bdFront;
      while (lnk->data != n) {
         lnk = lnk->LinkPtr;
         if (lnk == NULL) return false;
      }
```

```
    }
    return true;
}

void Player::setName(string n) {
    name = n;
}

void Player::setPosition(int n) {
    position += n;
    if (position > 23) {
        position -= 24;
        setSum();
        money += sum;
    }
}

void Player::setJump(int n) {
    position = n;
}

void Player::setSum() {
    sum = 0;
    Link *lnk = bdFront;
    while (lnk != NULL) {
        sum += lnk->data;
        lnk = lnk->LinkPtr;
    }
}

void Player::inJail() {
    //    if (jail == true) jail = false;
    //    if (jail == false) jail = true;
    jail = true;
}

void Player::oJail() {
    jail = false;
    position = 7;
}

void Player::jailTurn() {
    if (jTurn >= 0 && jTurn <= 3) jTurn++;
    else return;
```

```
}

void Player::addBdName(int n) {
    Link *lnk = new Link;
    lnk->data = n;
    lnk->LinkPtr = NULL;
    if (bdName == NULL) {
        bdName = lnk;
    } else {
        Link *end = endLst(1);
        if (end != NULL) end->LinkPtr = lnk;
    }
}

void Player::addBdFront(int n) {
    Link *lnk = new Link;
    lnk->data = n;
    lnk->LinkPtr = NULL;
    if (bdFront == NULL) {
        bdFront = lnk;
    } else {
        Link *end = endLst(2);
        if (end != NULL) end->LinkPtr = lnk;
    }
}

void Player::pop(int n) {
    if (n == 1) {
        if (bdName == NULL) return;
        else if (bdName->LinkPtr == NULL)
            bdName = NULL;
        else {
            Link *lnk = bdName;
            Link *end = endLst(1);
            while (lnk->LinkPtr != end)
                lnk = lnk->LinkPtr;
            lnk->LinkPtr = NULL;
        }//End of else
    } else if (n == 2) {
        if (bdFront == NULL) return;
        else if (bdFront->LinkPtr == NULL)
            bdFront = NULL;
        else {
            Link *lnk = bdFront;
            Link *end = endLst(2);
            while (lnk->LinkPtr != end)
                lnk = lnk->LinkPtr;
            lnk->LinkPtr = NULL;
        }//End of else
    }
}

void Player::sptMoney(int m) {
    money -= m;
}

void Player::takMoney(int m) {
    money += m;
}

void Player::prntLst(int n) {
    if (n == 1) {
        if (bdName == NULL) {
            cout << " ";
            return;
        }
        Link *next = bdName;
        do {
            cout << next->data << " ";
            next = next->LinkPtr;
        } while (next != NULL);
    } else if (n == 2) {
        if (bdFront == NULL) {
            cout << " " << endl;
            return;
        }
        Link *next = bdFront;
        do {
            cout << next->data << " ";
            next = next->LinkPtr;
        } while (next != NULL);
    }
    cout << endl;
}
```

Game.h

```
/*
 * File:   Player.h
 * Author: Sili Guo

 * Created on April 14, 2017

 * Purpose: Game---Monopoly: Empire

 */


#ifndef GAME_H

#define GAME_H


#include <iostream>

#include <cstdlib>

#include <iomanip>

#include <map>

using namespace std;


#include "Player.h"


class Game {

private:

    int turn; //Game turns

    int cond; //Billboard condition

    int start; //Who starts first

    int elcNum; //Number of electric company
    bool over; //Judge for game over
    bool win; //If player wins
    int *chance; //8 Chance Card
    Player p1; //First player
    Player p2; //Second player
    char dice1; //First dice: the special one
    char dice2; //Second dice: the normal one
    map<int, int>sell; //Brand selling price
    map<int, int>coll; //Brand collecting value
    void initial();
public:
    Game();
    virtual ~Game();
    int sale(int);
    void shuffle(int *);
    string stopAt(int);
    string defineC(int);
    void chanCrd(int);
    void swap();
    void move(int, int);
    void jump(int, int);
    bool compare();
```

```
void tripAI();

void jail(int);

bool jailJudge(int);

void outJail(int, int);

void buyBrnd(int, int);

void buyElec(int);

void payRent(int, int);

void remove(int);

void title();

void output();

void setOver();

void setName(string, string);

void setStart();

void setDices();

int getPos(int);

int getMoney(int);

string getName(int);

void rules();


char getDice1() {

   return dice1;

}
```

```
char getDice2() {
    return dice2;
}

int getStart() {
    return start;
}

int getTurn() {
    return ++turn;
}

int *getChance() {
    return chance;
}

int getSell(int p) {
    return sell[p];
}

int getColl(int p) {
        return coll[p];
    }
    int getJail(int);


    bool getOver() {
        return over;
    }


    bool getWin() {
        return win;
    }


    int getElc() {
        return elcNum;
    }
};


#endif /* GAME_H */
```

Game.cpp

```
/*
 * File:   Player.h
 * Author: Sili Guo
 * Created on April 14, 2017
 * Purpose: Game---Monopoly: Empire
 */

#include "Game.h"

Game::Game() {
    turn = 0; //Initialize game turns to 1
    cond = 0; //Initialize all Billboard Titles are not sold
    start = 0; //Initialize start to 0;
    elcNum = 4; //Four electric company in total
    over = false; //Game not over
    win = false; //Player not win
    chance = new int[8];
    for (int i = 0; i < 8; i++)
        chance[i] = i;
    initial();
}

void Game::initial() {
    //Selling price
```

```
sell[2] = 50;

sell[4] = 100;

sell[6] = 100;

sell[8] = 150;

sell[9] = 150;

sell[10] = 200;

sell[11] = 200;

sell[13] = 250;

sell[15] = 250;

sell[16] = 300;

sell[18] = 300;

sell[20] = 350;

sell[21] = 350;

sell[23] = 400;

//Collecting value

coll[2] = 50;

coll[4] = 50;

coll[6] = 50;

coll[8] = 100;

coll[9] = 50;

coll[10] = 100;

coll[11] = 100;
```

```
    coll[13] = 150;

    coll[15] = 150;

    coll[16] = 150;

    coll[18] = 150;

    coll[20] = 200;

    coll[21] = 200;

    coll[23] = 200;

}


int Game::sale(int n) {

    if (p1.search(1, n) == true) cond = 1;

    else if (p2.search(1, n) == true) cond = 2;

    else cond = 0;

    return cond;

}


Game::~Game() {

    delete [] chance;

}


void Game::setName(string n1, string n2) {

    p1.setName(n1);
    p2.setName(n2);
}

void Game::setStart() {
    start = rand() % 2;
    //    start = 0;
}

void Game::setDices() {
    dice1 = rand() % 6 + 49;
    if (dice1 == 49)
        dice1 = 's';
    dice2 = rand() % 6 + 49;
}

void Game::setOver() {
    if (p1.getMoney() <= 0) {
        cout << "You run out of money!" << endl;
        over = true;
        win = false;
    }
    if (p2.getMoney() <= 0) {
        cout << "Computer runs out of money!" << endl;
        over = true;
        win = true;
    }
    p1.setSum();
    if (p1.getSum() >= 800) {
        cout << "Your billboard reach the top!" << endl;
        over = true;
        win = true;
    }
    p2.setSum();
    if (p2.getSum() >= 800) {
        cout << "Computer's billboard reach the top!" << endl;
        over = true;
        win = false;
    }
}

string Game::stopAt(int n) {
    string pos;
    if (p1.getPostion() == n)
        pos = "[1] ";
    else pos = "    ";

    if (p2.getPostion() == n)

        pos += " [2]";

    else pos += "    ";

    return pos;

}


void Game::shuffle(int *card) {

    int temp;

    int r; //Hold a random number

    for (int i = 0; i < 8; i++) {

        r = rand() % 8;

        temp = card[r];

        card[r] = card[i];

        card[i] = temp;

    }

    //    //For test

    //    for (int i = 0; i < 8; i++)

    //        cout << card[i] << " ";

}


void Game::swap() {
    if (p1.getBdName() == NULL || p2.getBdName() == NULL || p1.getBdFront() == NULL ||
p2.getBdFront() == NULL) return;
    Link *end1 = p1.endLst(1);
    Link *end2 = p2.endLst(1);
    Link *temp;
    temp->data = end1->data;
    end1->data = end2->data;
    end2->data = temp->data;

    Link *end3 = p1.endLst(2);
    Link *end4 = p2.endLst(2);
    temp->data = end3->data;
    end3->data = end4->data;
    end4->data = temp->data;
}

void Game::move(int p, int n) {
    if (p == 1)
        p1.setPosition(n);
    else if (p == 2)
        p2.setPosition(n);
    else return;
```

```
}

void Game::jump(int p, int pos) {
    if (p == 1) {
        p1.setJump(pos);
        p1.sptMoney(100);
    } else if (p == 2) {
        p2.setJump(pos);
        p2.sptMoney(100);
    } else return;
}

bool Game::compare() {
    if (p1.getBdFront() == NULL || p2.getBdFront() == NULL) return false;
    Link *end1 = p1.endLst(2);
    Link *end2 = p2.endLst(2);
    if (end1->data > end2->data) return true;
    else return false;
}

void Game::tripAI() {
    int pos;
    if (p2.getMoney() > 500) {
        if (rand() % 5 < 3) {
            do {
                pos = rand() % 24;
            } while (p1.search(1, pos) || pos == 12 || pos == 19 || pos == 22);
            cout << "\nComputer jumps to position #" << pos << endl;
            jump(2, pos);
        }
    }
}

void Game::jail(int p) {
    if (p == 1) {
        if (p1.getJTurn() == 0 && p1.getJail() == false) {
            p1.inJail();
            p1.jailTurn();
            //          p1.setJump(7);
        }
    } else if (p == 2) {
        if (p2.getJTurn() == 0 && p2.getJail() == false) {
            p2.inJail();
            p2.jailTurn();
        //          p2.setJump(7);
      }
    } else return;
}


bool Game::jailJudge(int n) {
    if (n == 1) {
        if (p1.getMoney() <= 100) return false;
        else return true;
    } else return true;
}


void Game::outJail(int p, int n) {
    if (p == 1) {
        if (n == 1) {
            cout << "You spent 100K to get out of jail." << endl;
            p1.sptMoney(100);
            p1.oJail();
        } else {
            char roll1, roll2;
            setDices();
            roll1 = getDice1();
            roll2 = getDice2();
            cout << "You choose to roll dices." << endl;
            cout << "Your result is: " << roll1 << " " << roll2 << endl << endl;
            if (roll1 == roll2) {
              cout << "Congratulation! You rolled double." << endl;
              p1.oJail();
            } else {
              cout << "Sorry, you did not get double in this turn." << endl;
              if (p1.getJTurn() == 3) {
                cout << "You paid 50K to get out of jail." << endl;
                p1.sptMoney(50);
                p1.oJail();
              } else p1.jailTurn();
            }
        }
    } else if (p == 2) {
        if (p2.getMoney() > 400) {
            cout << "Computer spent 100K to get out of jail" << endl;
            p2.sptMoney(100);
            p2.oJail();
        } else {
            char roll1, roll2;
```

```
         setDices();

         roll1 = getDice1();

         roll2 = getDice2();

         cout << "Computer choose to roll dices." << endl;

         cout << "Computer's result is: " << roll1 << " " << roll2 << endl << endl;

         if (roll1 == roll2) {

            cout << "Computer rolled double and get out of jail." << endl;

            p2.oJail();

         } else {

            cout << "Computer did not get double." << endl;

            if (p2.getJTurn() == 3) {

               cout << "computer paid 50K to get out of jail." << endl;

               p2.sptMoney(50);

               p2.oJail();

            } else p2.jailTurn();

         }

      }

   }

}


void Game::buyBrnd(int p, int pos) {

   if (p == 1) {
      p1.sptMoney(sell[pos]);
      p1.addBdName(pos);
      p1.addBdFront(coll[pos]);
   } else if (p == 2) {
      p2.sptMoney(sell[pos]);
      p2.addBdName(pos);
      p2.addBdFront(coll[pos]);
   } else return;
}

void Game::buyElec(int p) {
   if (p == 1) {
      p1.sptMoney(sell[9]);
      p1.addBdName(9);
      p1.addBdFront(coll[9]);
      elcNum--;
   } else if (p == 2) {
      p2.sptMoney(sell[9]);
      p2.addBdName(9);
      p2.addBdFront(coll[9]);
      elcNum--;
   } else return;
```

```
}

void Game::payRent(int p, int pos) {
    if (p == 1) {
        p1.sptMoney(sell[pos]);
        p2.takMoney(sell[pos]);
    } else if (p == 2) {
        p2.sptMoney(sell[pos]);
        p1.takMoney(sell[pos]);
    } else return;
}

void Game::remove(int p) {
    if (p == 1) {
        p1.pop(1);
        p1.pop(2);
    } else if (p == 2) {
        p2.pop(1);
        p2.pop(2);
    } else return;
}
```

```
int Game::getJail(int p) {
   if (p == 1) return p1.getJail();
   else if (p == 2) return p2.getJail();
   else return false;
}


void Game::title() {
   cout << "                                   [][][][][]                                   " << endl;
   cout << "                                [][][]     [][][]                                " << endl;
   cout << "[][][][][][][][][][][][][][][][][][][][][][]          [][][][][][][][][][][][][][][][][][][][][][]" << 
endl;
   cout << "[]                                                                              []" << endl;
   cout << "[]  []        []   [][][]   []     []   [][][]   [][][]     [][][]   []   []     []  []" << endl;
   cout << "[]  [][]     [][]  []     []  [][]   []  []     []  []   []  []     []  []   []     []  []" << endl;
   cout << "[]  []  []  []  []  []     []  []  []  []  []     []  []   []  []     []  []     []  []   []" << endl;
   cout << "[]  []    []    []  []     []  []   [][]  []     []  [][][]   []     []  []       []     []" << endl;
   cout << "[]  []        []   [][][]   []     []   [][][]   []        [][][]   [][][]  []       []" << endl;
   cout << "[]                                                                              []" << endl;
   cout << "[][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][][]" 
<< endl;
   cout << "\nPress enter to continue." << endl;
}
```

```
void Game::output() {

   cout << "
____________________________________________________________________________________________
_________________________ " << endl;
   cout << "|    FREE    | GUITARHERO |   CHANCE   |   YAHOO!   |    Ford    |  CHANCE   |
ebay    |   GO TO    | " << "Player's Info:" << endl;
   cout << "|  PARKING |    LIVE    |    CARD    |            |            |   CARD    |            |  JAIL!
| " << "------------------------" << endl;
   cout << "|            | 250K (150) |            | 250K (150) | 300K (150) |            | 300K (150) |
| " << p1.getName() << endl;
   cout << "|            |    (" << sale(13) << ")    |            |    (" << sale(15) << ")    |    (" << sale(16)
<< ")    |            |    (" << sale(18) << ")    |            | " << "Money: " << p1.getMoney() << "K" <<
endl;
   cout << "|  " << stopAt(12) << "  |  " << stopAt(13) << "  |  " << stopAt(14) << "  |  " <<
stopAt(15) << "  |  " << stopAt(16) << "  |  " << stopAt(17) << "  |  " << stopAt(18) << "  |
| " << "Brand Value: " << endl;
   cout << "|_____12_____|_____13_____|_____14_____|_____15_____|_____16_____|
_____17_____|_____18_____|_____19_____| ";
   p1.prntLst(2);
```

```
    cout << "|   Candy    |                                                        | UNIVERSAL  | " << "--
---------------------" << endl;
    cout << "|   Crush    |                                                        |            | " << p2.get-
Name() << endl;
    cout << "| 200K (100) |                                                        | 350K (200) | " <<
"Money: " << p2.getMoney() << "K" << endl;
    cout << "|    (" << sale(11) << ")     |                                              |    (" <<
sale(20) << ")     | " << "Brand Value: " << endl;
    cout << "|  " << stopAt(11) << "  |                                                |  " <<
stopAt(20) << "  | ";
    p2.prntLst(2);
    cout << "|_____11_____|                                                        |_____20_____|" <<
endl;
    cout << "|    LEVIS   |                                                        |    XBOX    |" << endl;
    cout << "|            |                                                        |            |" << endl;
    cout << "| 200K (100) |                                                        | 350K (200) |" <<
endl;
    cout << "|    (" << sale(10) << ")     |                                              |    (" <<
sale(21) << ")     |" << endl;
    cout << "|  " << stopAt(10) << "  |                                                |  " <<
stopAt(21) << "  |" << endl;
```

```
    cout << "|_____10_____|                                                     |_____21_____|" <<
endl;
    cout << "|  ELECTRIC  |                                                     |   TOWER    |" <<
endl;
    cout << "|  COMPANY   |                                                     |   TAX      |" <<
endl;
    cout << "| 150K(50," << elcNum << ") |                                                     |
|" << endl;
    cout << "|            |                                                     |            |" << endl;
    cout << "|  " << stopAt(9) << "  |                                                     |  " <<
stopAt(22) << "  |" << endl;
    cout << "|_____09_____|                                                     |_____22_____|" <<
endl;
    cout << "|    PUMA    |                                                     |   skype    |" << endl;
    cout << "|            |                                                     |            |" << endl;
    cout << "| 150K (100) |                                                     | 400K (200) |" <<
endl;
    cout << "|    (" << sale(8) << ")     |                                                     |    (" <<
sale(23) << ")     |" << endl;
    cout << "|  " << stopAt(8) << "  |                                                     |  " <<
stopAt(23) << "  |" << endl;
```

```
   cout << "|_____08_____|
_____________________________________________________________________________|
_____23_____|" << endl;
   cout << "|  IN JAIL!  |  POLAROID  |   CHANCE    |    RAZOR    |   CHANCE    |TRANS-
FORMERS|   RIVAL    |    START    |" << endl;
   cout << "|__" << stopAt(19) << "__|            |    CARD    |            |    CARD    |            |  TOW-
ER    |            |" << endl;
   cout << "|  PASS BY   | 100K (50)  |            | 100K (50)  |            |  50K (50)  |    TAX     |
GO!    |" << endl;
   cout << "|            |    (" << sale(6) << ")     |            |    (" << sale(4) << ")     |            |    ("  <<
sale(2) << ")     |            |            |" << endl;
   cout << "|  " << stopAt(7) << "  |  " << stopAt(6) << "  |  " << stopAt(5) << "  |  " << stopAt(4)
<< "  |  " << stopAt(3) << "  |  " << stopAt(2) << "  |  " << stopAt(1) << "  |  " << stopAt(0) << "
|" << endl;
   cout << "|_____07_____|_____06_____|_____05_____|______04____|______03____|
_____02_____|_____01_____|_____00_____|" << endl;

}

string Game::defineC(int n) {
   string defi;
   switch (n) {
    case 0:
        defi = "Speed ahead!\nMove forward to 5 space.";
        break;
    case 1:
        defi = "Casino night!\nBoth you and your opponent roll.\nHighest-roller collects 200K
from the bank.";
        break;
    case 2:
        defi = "Profits soar!\nAdvance to GO to collect your tower value.";
        break;
    case 3:
        defi = "Launch your website!\nSales skyrocket!\nCollect 300K from the bank.";
        break;
    case 4:
        defi = "Solar power bonus!\nTake a free Electric Company billboard.\nAdd it to your
tower.\nIf none are available, do nothing.";
        break;
    case 5:
        defi = "Insider trading fine!\nPay the Bank 200K.";
        break;
    case 6:
        defi = "Tallest tower bonus!\nCheck what the highest tower is currently worth.\nCollect
that amount from the bank.";


        break;
    default:
        defi = "Go To Jail!\nDo not collect cash for passing GO.";
}
return defi;
}


void Game::chanCrd(int p) {
int n = rand() % 8;
cout << "You pick Chance Card #" << n << endl << endl;
cout << defineC(n) << endl << endl;
switch (n) {
    case 0:
        if (p == 1) {
            cout << "You move forward 5 steps." << endl;
            p1.setPosition(5);
        } else {
            cout << "Computer moves forward 5 steps." << endl;
            p2.setPosition(5);
        }
        break;
      case 1:
        cout << "Both you and Computer roll." << endl << endl;
        char roll1, roll2;
        setDices();
        roll1 = getDice2();
        setDices();
        roll2 = getDice2();
        cout << "Your result is: " << roll1 << endl;
        cout << "Computer's result is: " << roll2 << endl << endl;
        if (roll1 > roll2) {
          cout << "You got higher number; Bank gives you 200K in reward." << endl;
          p1.takMoney(200);
        } else if (roll1 < roll2) {
          cout << "Computer got higher number; Computer collect 200K from bank." << endl;
          p2.takMoney(200);
        } else {
          cout << "Both you and Computer get same number; both of you can collect 200K." <<
endl;
          p1.takMoney(200);
          p2.takMoney(200);
```

```
    }
    break;
case 2:
    if (p == 1) {
        p1.setSum();
        cout << "You collect " << p1.getSum() << "K from Bank." << endl;
        p1.takMoney(p1.getSum());
    } else {
        p2.setSum();
        cout << "Computer collects " << p2.getSum() << "K from Bank." << endl;
        p2.takMoney(p2.getSum());
    }
    break;
case 3:
    if (p == 1) {
        cout << "You collect 300K from Bank." << endl;
        p1.takMoney(300);
    } else {
        cout << "Computer collects 300K from Bank." << endl;
        p2.takMoney(300);
    }
    break;
```

```
case 4:
   if (elcNum > 0) {
      if (p == 1) {
         cout << "You collect a free Electric Company billboard." << endl;
         p1.addBdName(9);
         p1.addBdFront(50);
      } else {
         cout << "Computer collects a free Electric Company billboard." << endl;
         p2.addBdName(9);
         p2.addBdFront(50);
      }
      elcNum--;
   } else {
      cout << "Sorry,there are no Electric Company billboards left." << endl;
   }
   break;
case 5:
   if (p == 1) {
      cout << "You pay Bank 200K." << endl;
      p1.sptMoney(200);
   } else {
      cout << "Computer pays Bank 200K." << endl;
```

```
        p2.sptMoney(200);
    }
    break;
case 6:
    int amount;
    p1.setSum();
    p2.setSum();
    if (p1.getSum() >= p2.getSum()) {
        amount = p1.getSum();
        cout << "You have a higher tower of " << amount << "K." << endl;
    } else {
        amount = p2.getSum();
        cout << "Computer has a higher tower of " << amount << "K." << endl;
    }
    if (p == 1) {
        cout << "You collect " << amount << "K from Bank." << endl;
        p1.takMoney(amount);
    } else {
        cout << "Computer collects " << amount << "K from Bank." << endl;
        p2.takMoney(amount);
    }
    break;
```

```
        default:
            if (p == 1) {
                cout << "You are sending to jail!" << endl;
                jail(1);
                p1.setJump(19);
            } else {
                cout << "Computer is sending to jail!" << endl;
                jail(2);
                p2.setJump(19);
            }
    }
}

int Game::getPos(int p) {
    if (p == 1) {
        return p1.getPostion();
    } else {
        return p2.getPostion();
    }
}

int Game::getMoney(int p) {
    if (p == 1) {
        return p1.getMoney();
    } else {
        return p2.getMoney();
    }
}

string Game::getName(int p) {
    if (p == 1) {
        return p1.getName();
    } else {
        return p2.getName();
    }
}

void Game::rules() {
    cout << "****************** Monopoly: Empire Rules
********************************" << endl;
    cout << "I. Basic rules" << endl;
    cout << "   A. Each player has 1000K at beginning and start at position #0." << endl;
    cout << "   B. In each turn, player roll 2 dices, and move corresponding steps." << endl;
    cout << "   C. When stop at a position, follow the instruction of that position." << endl;
    cout << "   D. [1] represent player, [2] represent computer." << endl;
    cout << endl;
    cout << "II. Game Board" << endl;
    cout << "   A. Total 24 positions (0~24) of 7 types." << endl;
    cout << "   B. Start" << endl;
    cout << "       1. Every player start from here." << endl;
    cout << "       2. When pass start point, collect as much money as your total collecting value."
<< endl;
    cout << "   C. Billboard" << endl;
    cout << "       1. Containing name, price, collecting value, and condition(0,1 or 2)." << endl;
    cout << "       2. The first two lines are the name of the brand." << endl;
    cout << "       3. The third line is price (collecting value), eg.100K (50)." << endl;
    cout << "           a. Price ≠ collecting value." << endl;
    cout << "           b. Price is how much cost you to buy the brand." << endl;
    cout << "           c. Collecting value is used for win the game." << endl;
    cout << "       4. The fourth line is (condition), eg. (1)." << endl;
    cout << "            (0 = no owner; 1 = player own; 2 = computer own)" << endl;
    cout << "       5. The fifth line shows player's position, eg.[1] [2]." << endl;
    cout << "       6. The bottom line has the position # of that box." << endl;
    cout << "       7. Exception: Electric Company Billboard. (See IV. Billboard-E)" << endl;
    cout << "   D. Chance Card" << endl;
    cout << "       1. Randomly pick a chance card when stop at here." << endl;
```

```
   cout << "       2. Total 8 kinds of chance cards." << endl;
   cout << "       3. Chance card may not be good for player who pick it." << endl;
   cout << "   E. Jail" << endl;
   cout << "       1. To get out of jail, there are two choice." << endl;
   cout << "           a. During next turn, pay 100K and get out at once." << endl;
   cout << "           b. Roll a double up to 3 turns, if not, pay 50K and get out at 3rd turn." <<
endl;
   cout << "       2. Position #19 is go to jail, player will be move to jail on Position #7." << endl;
   cout << "       3. Simply stop at position #7 is pass by, is not in jail." << endl;
   cout << "   F. Take a trip" << endl;
   cout << "       1. You can spend 100K to move to anywhere on board, or simply do nothing."
<< endl;
   cout << "       2. If you move to a new position, you have to follow the instruction on that posi-
tion." << endl;
   cout << "   E. Tower Tax" << endl;
   cout << "       1. Tower Tax: return your topmost billboard to board." << endl;
   cout << "       2. Rival Tower Tax: return your opponent's topmost billboard to board." << endl;
   cout << endl;
   cout << "III. Dices" << endl;
   cout << "   A. One normal dice, one special dice with a 'swap' face." << endl;
   cout << "   B. When 'swap' face is up, you have a chance of sneaky swap." << endl;
   cout << "       (sneaky swap: swap your topmost billboard with your opponent's)" << endl;
```

```
    cout << "    C. When you roll a double, you can have another turn until you don't have a dou-
ble." << endl;
    cout << "        (double: two dices have same number)" << endl;
    cout << endl;
    cout << "IV. Billboard" << endl;
    cout << "    A. 14 billboards total; different price with different collecting value; choose smart-
ly!" << endl;
    cout << "    B. You can buy billboards when you stop at the corresponding position if the con-
dition is no owner." << endl;
    cout << "    C. You have to pay rent fee if you stop at a position whose billboard is owner by
your opponents." << endl;
    cout << "    D. Nothing will happen if you stop at the position that is owned by yourself." <<
endl;
    cout << "    E. One exception is Electric Company Billboard at position #9." << endl;
    cout << "        1. Has 4 in total" << endl;
    cout << "        2. Doesn't own by anyone." << endl;
    cout << endl;
    cout << "V. Chance Card" << endl;
    cout << "    A. Suggestion: Better read card function before playing game." << endl;
    cout << "    B. Explanation of each card:" << endl;
    cout << "        1.Speed ahead!\nMove forward to 5 space." << endl;
```

```
  cout << "       2.Casino night!\nBoth you and your opponent roll.\nHighest-roller collects 200K
from the bank." << endl;
  cout << "       3.Profits soar!\nAdvance to GO to collect your tower value." << endl;
  cout << "       4.Launch your website!\nSales skyrocket!\nCollect 300K from the bank." <<
endl;
  cout << "       5.Solar power bonus!\nTake a free Electric Company billboard.\nAdd it to your
tower.\nIf none are available, do nothing." << endl;
  cout << "       6.Insider trading fine!\nPay the Bank 200K." << endl;
  cout << "       7.Tallest tower bonus!\nCheck what the highest tower is currently worth.\nCol-
lect that amount from the bank." << endl;
  cout << "       8.Go To Jail!\nDo not collect cash for passing GO." << endl;
  cout << endl;
  cout << "VI. Win" << endl;
  cout << "   A. Whoever first get 800 collecting value wins." << endl;
  cout << "   B. Whoever first run out of money loses." << endl;
}
```