# Final Project
# Wheel of Fortune

**CSC 17C - 48948**

**Name: Javier Borja**

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## Introduction

First half of semester: For this project I have chosen to revisit a game I am familiar with and enjoy. I previously wrote a Wheel of Fortune for CSC 17A, but this effort is much better. This time around I aimed to utilize the STL Library to improve performance and decrease line counts while increasing the number of features. This project was not overly difficult, but it took a good effort to learn and utilize a library that I had no familiarity with. As I was learning these new constructs, I had to consult several texts to properly implement the STL library. The end result is a game that I am proud of.

Second half of semester: For the second half of the semester I extended my project with some of the concepts we have covered in class. In terms of gameplay, there are not many changes, but there are changes behind the scenes and in the code. I will fully explain my project extension in the Project Summary and Requirements sections. All in all, I feel like this project is really complete and it is difficult to think of significant improvements to the actual game.

# Input Validation

The menus in this game are self-explanatory and easy to navigate. All inputs are validated and are not case sensitive. Options that have a “(default)” label are selected if the user types an invalid input.

# Tutorial

If a save file is detected, you will have to option to continue. If do you not continue a save file, you will input your name and start with $500.00 and 0 Points. You will then be taken to a menu with four options.

```
Select an option below:
 1. Begin a new game of Wheel of Fortune
 2. View the leaderboard
 3. Append to the Library
 4. View the Library(You'll spoil all the answers!)
```

### Playing a Game:

To win, you must guess the phrase; if you run out of money, you lose. Once you begin playing, you are given a category and phrase to guess. Displayed will be your hidden phrase with spaces, used/unused letters, and your money. Select an appropriate option to continue.

```
Song Title
□□□□□□□□ □□ □□□□□□
Your keyboard:
ABCDEFGHIJKLM
NOPQRSTUVWXYZ
Your money = $500.00


What would you like to do?
 1. Spin the Wheel ✪
 2. Buy a vowel ($500.00)
 3. Solve the Puzzle ✉(Bad guess lose $300.00)
```

### Spin the Wheel:

After spinning, you will be displayed a monetary value. If you correctly guess a letter, you will be awarded that amount of money and gain 10 points for each letter in the

phrase that matched, else if you guess incorrectly, you will lose that amount. You can keep guessing if you have not used all the letters. Every letter you used will be blacked out and each letter you correctly guessed will be displayed.

```
You spun $100.00
Movie
TH□ T□□□□□□T□□

Your keyboard:
A■■DEFG■IJK■M
NO■QR■■■VWXYZ

What letter do you want to use?
```

**Buy a Vowel:**

You will be displayed the same graphics as above, except you must buy a vowel. You will lose $500.00 for buying a vowel.

```
Which vowel do you want to buy? u
You have bought a vowel for $500.00
```

**Solve the Puzzle:**

Input the phrase you think is the answer. It is not case sensitive, but you do need to correctly match all the letters and spaces. If you incorrectly guess, you will lose $300.00; if you correctly guess, you will gain 30 points for each hidden letter revealed. You will then be displayed the amount of money left in your account and current amount of points you have earned.

```
Movie
TH□ T□RM□N□T□R

Your keyboard:
A■■DEFG■IJK■■
■O■Q■■■■VWXYZ

Input the final answer: the terminator

You gain 30 points for each hidden letter you guessed
You gain 150 points
Congrats you win!
```

**Losing and Leaderboard:**

If you run out of money, the correct phrase will be displayed. You lose the game and have to exit the program to play again. You will have the option to put your score in the leaderboard.

```
You did not guess correctly. You have lost $300.00
The phrase was actually:
STAIRWAY TO HEAVEN
You have no money.
You must restart the game to play again
```

If you lost, you can exit the program through the menu and input your score to the leaderboard.

```
Do you wish to add your score to the leaderboard?
Input 1 to add
Input 2 to exit(default):
```

If you still have money you can save your game and continue later.

```
Thanks for playing Javier!
Your final score: 360 points
Do you wish to save?
1.Save
2.Exit without saving(default)
```

# Project Summary

| | |
|---|---|
| Project size | **1553 Lines** |
| Lines of code | 1126 Lines |
| Comment/Blank lines | 427 Lines |

First half of semester:

I slowly implemented the STL library because I was not familiar with it. In each version I tried to utilize more and more concepts from it. Like most programming efforts, there were many bugs for each version that I had to fix. A difficulty I had was taking chunks of code and replacing it with a required construct. It was hard to test out since many class functions depended on others.

Second half of semester:

This development process was a bit of trouble because I had spent so much effort in the first version, that making significant changes to accommodate the concepts we covered in class was not easy because the gameplay is pretty much hard coded. I

did, however, attempt to add the new constructs we learned. I created two new templated functions for recursive sorting and developed two new classes for trees and hashes. I honestly could not find a way to incorporate graphs in my game and I hope that my final exam shows enough proof of my understanding of this concept.

You can see previous versions of this program on the github link.

https://github.com/javierborja95/CSC17C

**Unsolved issue**: Very rarely the clues don't read in properly. Attempting to play will show an extremely long array of blocks. I cannot pinpoint the source to the problem.

Version 1

In this working version, the only STL library constructs implemented were queues, a vector iterator, and a single algorithm.

Version 2

In this version I implemented maps for the clue categories while cleaning up some of the code.

Version 3

This version was mostly touch up by getting rid of unnecessary dynamic memory allocation. I also edited code here and there.

Version 4

I successfully implemented lists for letters and phrases. Began to implement extra sorting options.

Version 5

Here I added load/saving and implemented queues again while replacing one queue with a stack. I also added several sorting algorithms for different types of sorting.

Version 6

In this version I created two new templated search functions. I took two search functions I was familiar with, bubble and insertion sorts, and made them recursive and templated so that I could use my classes with them.

Version 7

This final version I implemented a binary search tree and made that templated as well. I had to overload stream operators in my classes to use the binary search tree. I accidentally did not copy version 7 and create a version 8, but updated version 7.In this update I developed a hash class with my own hashing algorithm. I created a bucket array of linked lists in case of collisions. I used it to check for answer inputs.

# Project Requirements:

First half of semester:

| | |
|---|---|
| Maps | ✓ |
| Sets | ✓ |
| Lists | ✓ |
| Stacks | ✓ |
| Queues | ✓ |
| Iterators | ✓ |
| Algorithms | ✓ |

While requirements were to utilize the STL Library, I have included many more concepts that I learned in CSC-5 and CSC-17A, including arrays, pointers, strings, structures, classes and inheritance, and exceptions. I have included every required construct and I will go in detail to show where in code the required constructs are used plus some comments that I had about the STL library.

Second half of semester:

| | |
|---|---|
| Recursive Sorts | ✓ |
| Hashing | ✓ |
| Trees | ✓ |
| Graphs | ✗ |

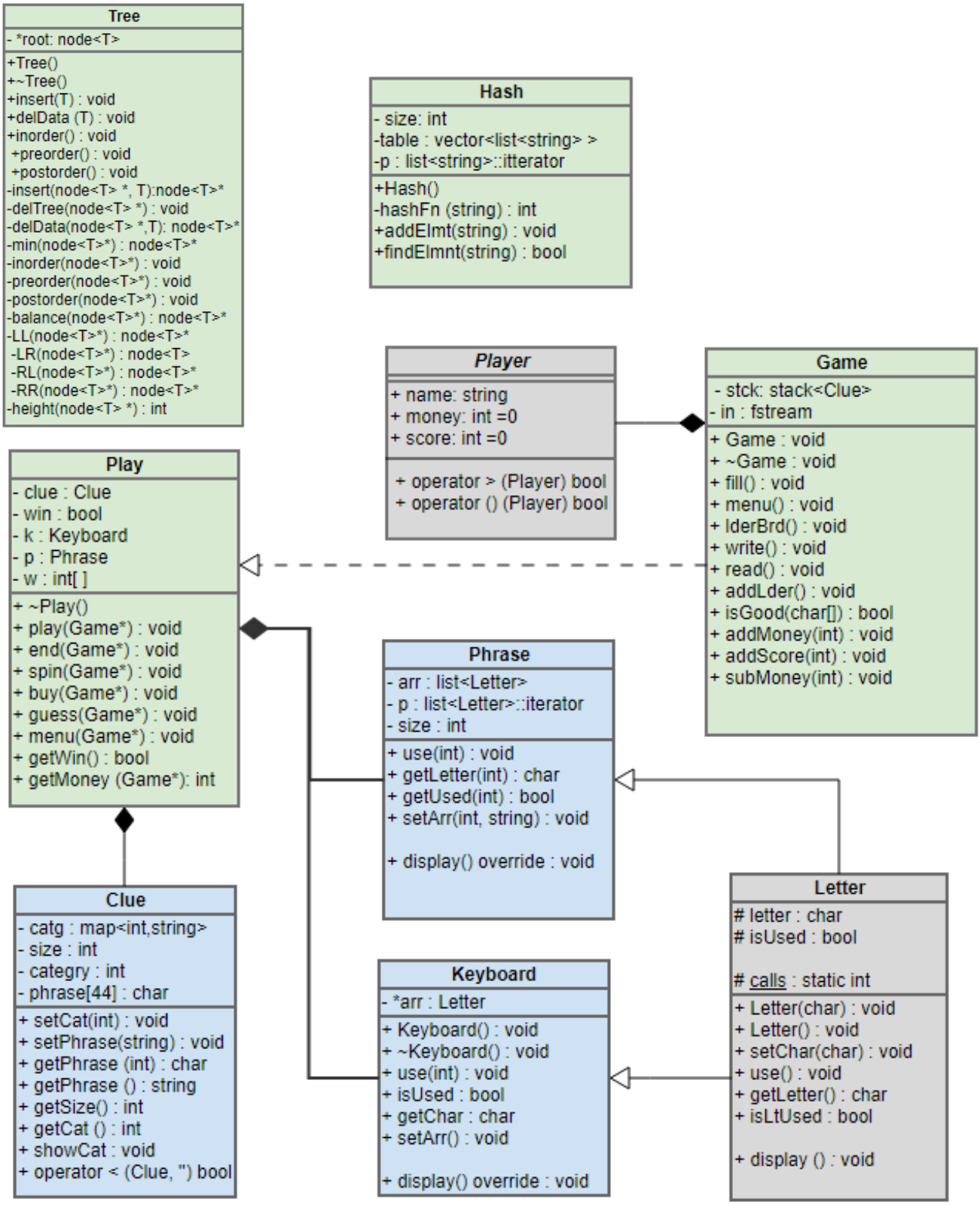
Only graphs were not implemented because I could not find a use for them. It is not a valid excuse but I hope my implementation in the Final Exam shows my understanding of the concept.

You can find the examples by searching the final pages with ctrl-f.

| Concept | Examples | Comments |
|---|---|---|
| Maps | map<int, string> catg;<br>catg[1]="TV Show";<br>cout<<catg[categry]<<endl; | These were useful because I did not have to do any if else statements or switch statements to access categories, since they are already numbered. |
| Sets | set<Player,greater<Player>> arr;<br>set<Clue> tset;<br>tset.insert(clue); | These were utilized for organizing players on the leaderboard and clues since they automatically sort themselves. I had to overload the < operator to get these to work correctly. |
| Lists | list<Letter> arr;<br>arr.push_back(s[i]);<br>p->use(); | I used it for Keyboard/Phrase classes since they are made up of Letter classes. I didn't need to random access these, I just iterated through them. |
| Stacks | stack <Clue> stck;<br>this->stck.push(*p); | These were highly useful because after importing the clues and phrases, I had to |

| | | |
|---|---|---|
| | temp=a->stck.top();<br>a->stck.pop(); | access them and then pop them off so they don't repeat. |
| Queues | queue<Clue> que;<br>while(!que.empty())<br>{clue=que.front(); que.pop(); | I could have used stacks as well but I utilized it to read clues through a file and I utilized these clues in the order that I read them in. |
| Iterators | list<Letter>::iterator p;<br>p=arr.begin(); advance(p,i);<br>for(p=arr.begin();p!=arr.end();p++) | I used a lot of iterators to go through the many containers in my program. I learned the hard way that iterating through a queue is not possible, but that concept makes sense. |
| Algorithms | sort(a.begin(),a.end(),name_sort());<br>random_shuffle(arr.begin(),arr.end()); | These were great at cutting down blocks of code into single lines. I felt like I did not use a lot of Algorithms, but their uses were very helpful. |
| Vector | vector<Clue> arr;<br>arr.push_back(temp);<br>vector<Player>::iterator p; | Not really a requirement, but these are also STL containers. I used them a lot because they are highly versatile, especially when working with arrays with variable memory because they delete themselves without problems. |
| Recursive Sorts | void insertRec(vector<T> &array,int size){ … insertRec(array,size-1);<br>void bubbleRec(vector<T> &array,int size){ …bubbleRec(array,size-1); | I used recursive sorts to sort arrays of classes to display. I overloaded the less than operator to perform these sorts. |
| Hashing | Hash table;<br>int bucket=hashFn(s)%size;<br>p=table[bucket].begin(); | Implemented a hash table with arrays of linked lists. I put clues into arrays and a player submits an answer string; if no collision, turn lost, else iterate through bucket linked list to see if its there. |
| Trees | Tree<Clue> tree;<br>void Tree<T>::inorder(node<T> *leaf){<br>tree.insert(clue); | I used a binary tree to display phrases inorder. While I implemented the tree pretty normally, for this game I could have made some branches have a category, so the overall tree would have several roots. I thought this could work because the STL sort was the best because I was able to make it sorted with categories in mind. |

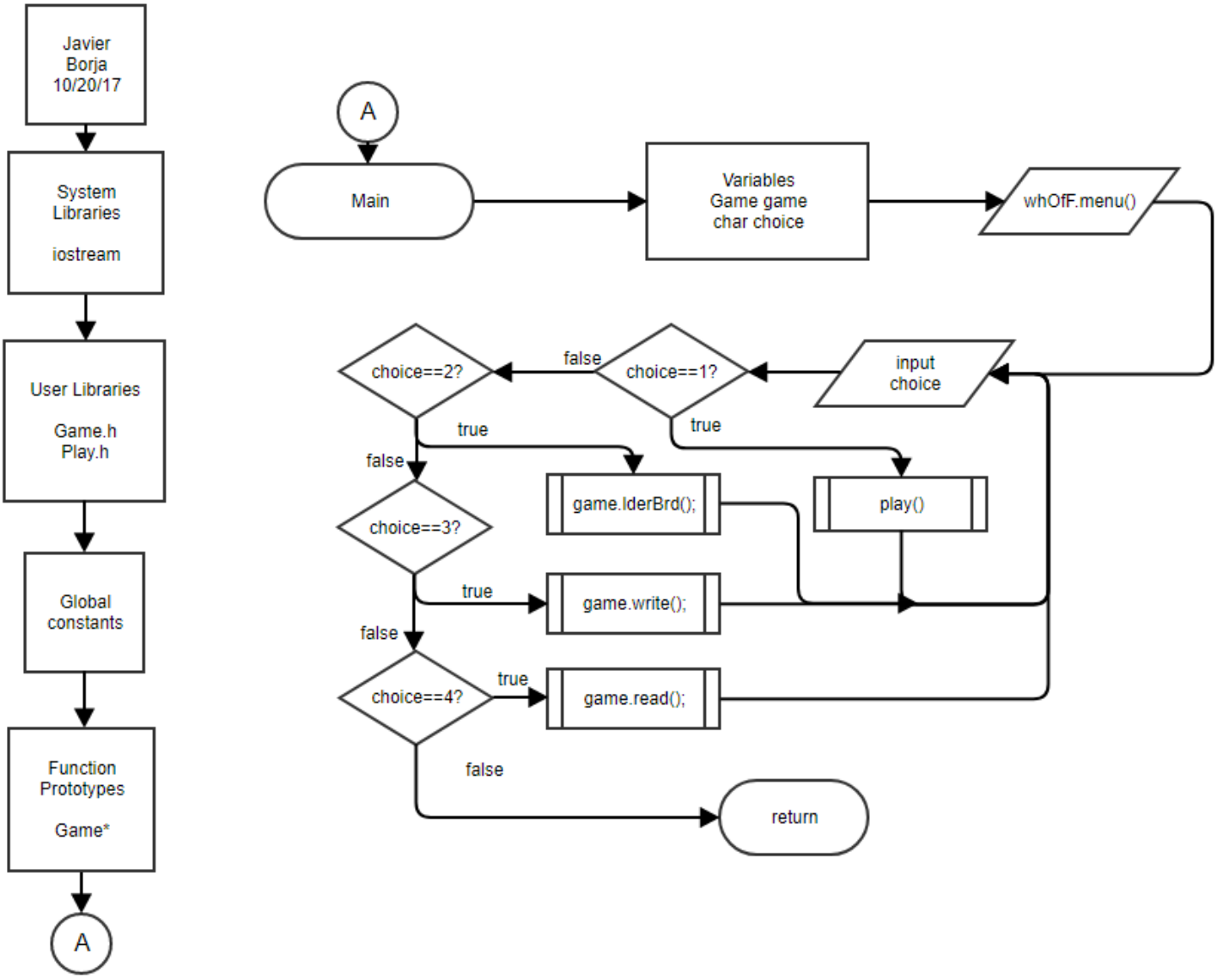
# Class/UML Diagrams



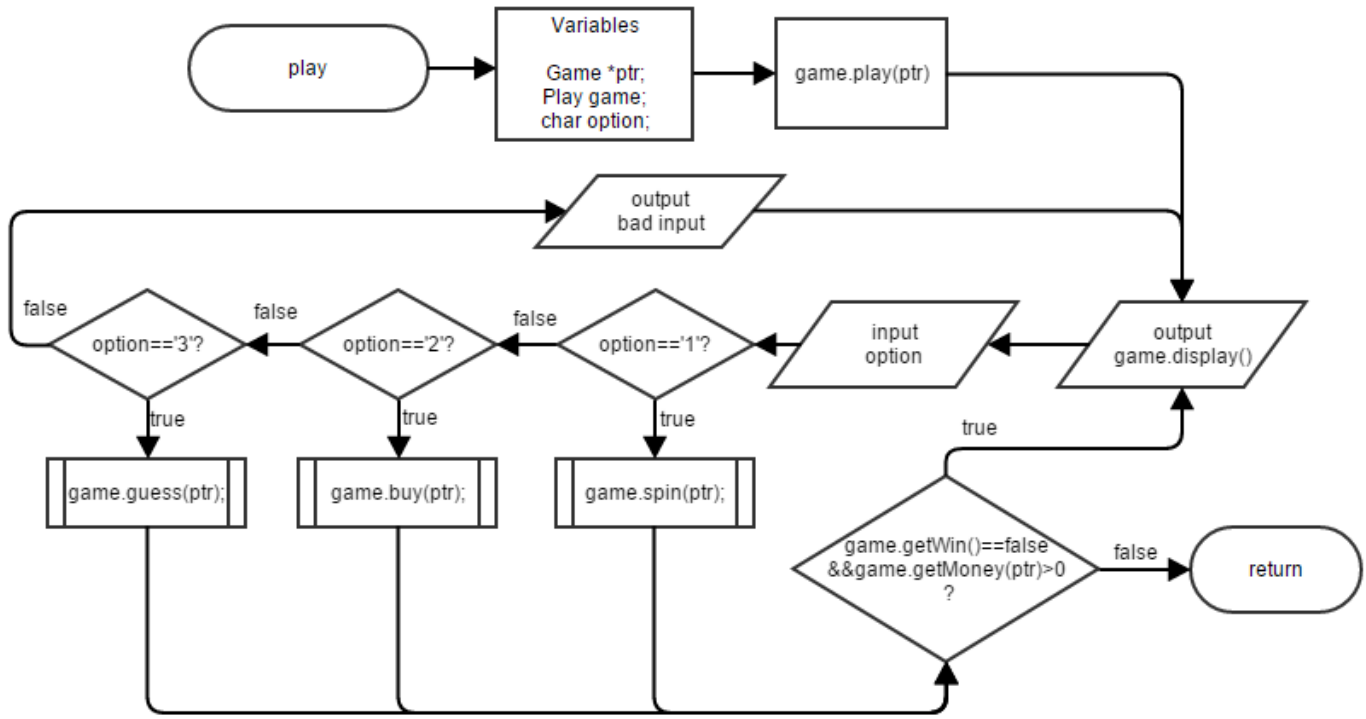
# Pseudocode and Flowcharts

**Main:**

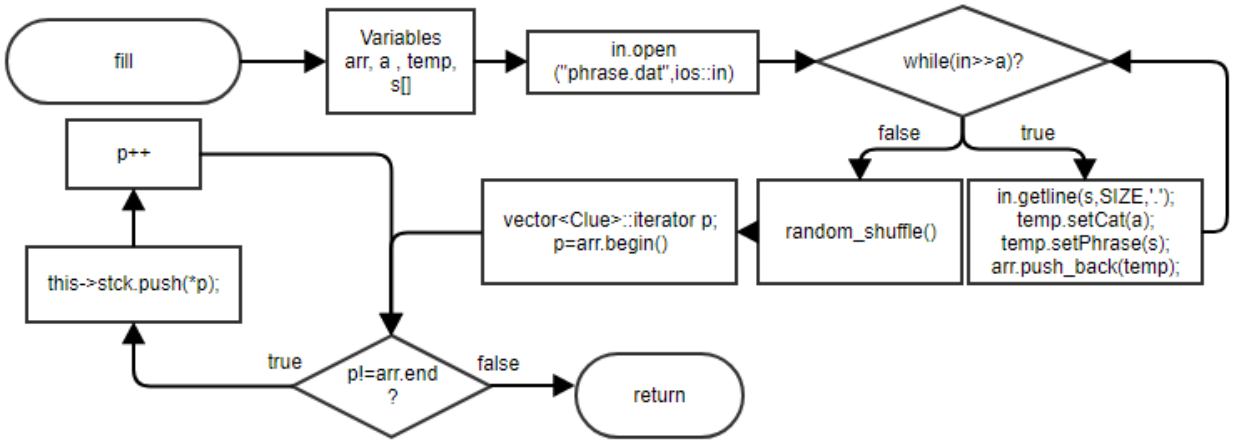
Create a Game object
Show Game.menu
Input menu choice
Do{
    Switch(choice)
        Case 1: Play()
        Case 2: Game.leaderBrd()
        Case 3: Game.write()
        Case 4: Game.read()
}While (choice is 1-4)



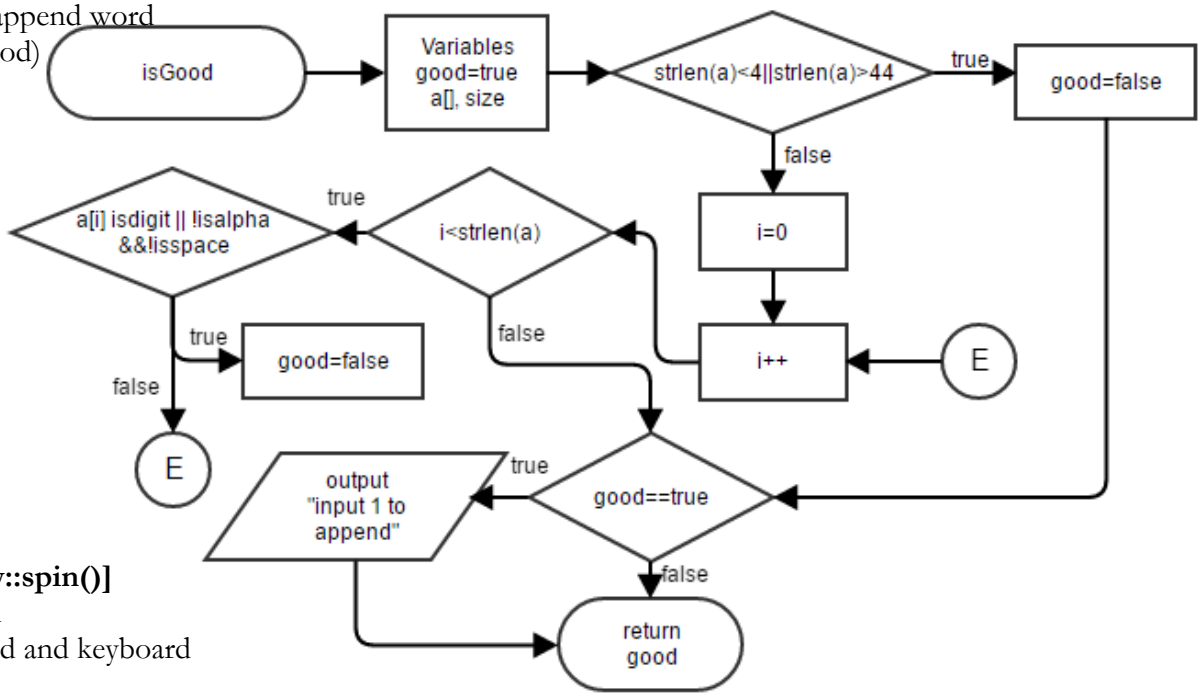
**Play:**
Create Play object
object.play(this)
Do{
    Output display()
    Input option
    Switch(option){
        Case 1: object.spin()
        Case 2: object.buy()
        Case 3: object.guess()
        Default: Output error message
    }
}While(object.getWin()==false and object.getMoney(this) is greater than 0)



**Fill: [Game::fill()]**
Open phrase file
While(reading from file)
  Set temporary clues
  Push temp into array
Shuffle array
For(beginning of array, not end of array, iterator++){
  Push into stack
} return array

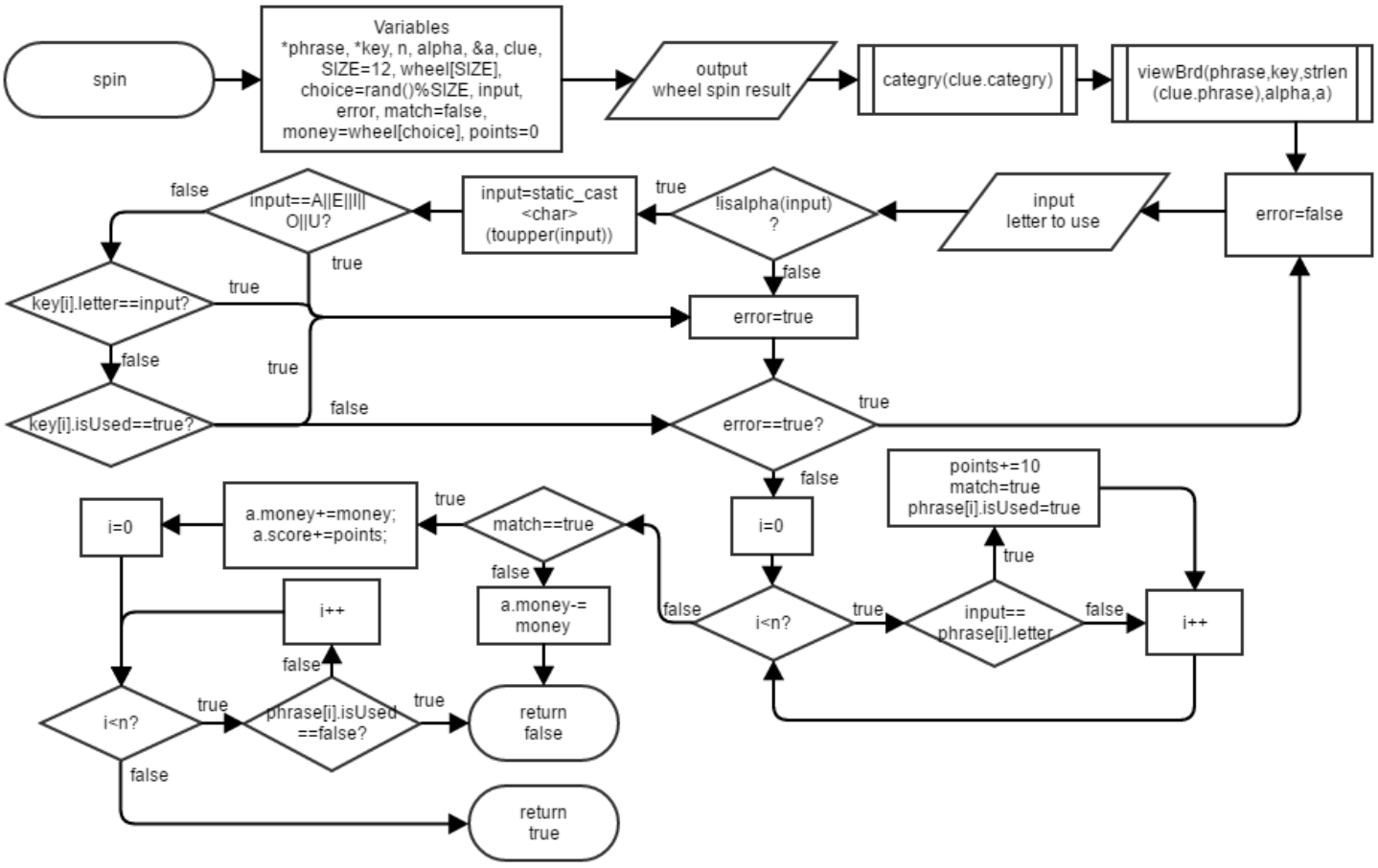



**isGood:[Game::isGood()]**
(Is length of string <4||>44?)
T: Good=false
F: For(i=0;i<length of string;i++){
  (If character is not letter or space) good=false
If(good==true)
T: Ask to append word
Return (good)



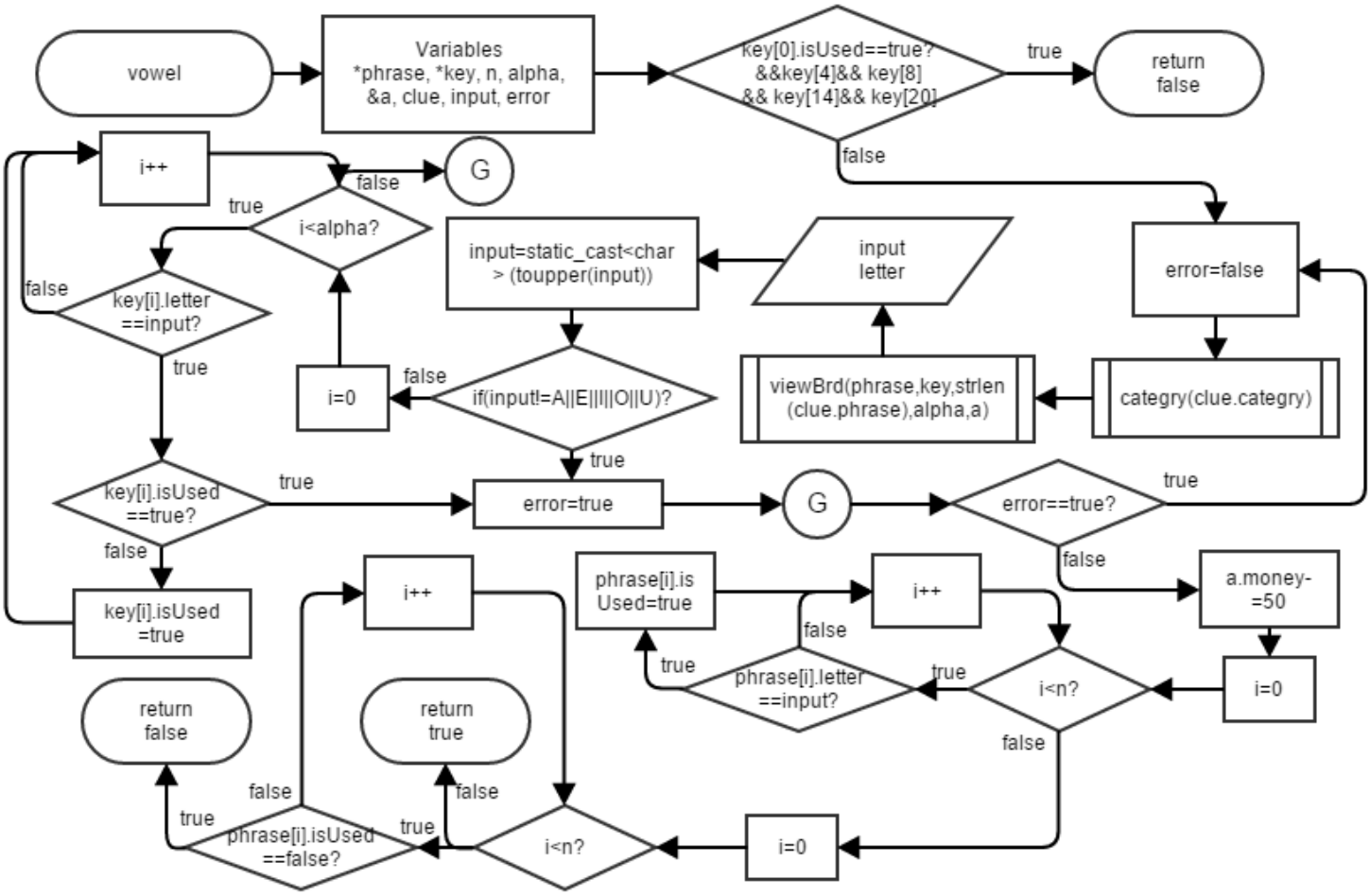

**Spin:[Play::spin()]**
Spin wheel
Show board and keyboard

Do{
Error=false
Input letter to use
(is letter==vowel||non alphabet||or already used?)
Error=true
While(error==true)
If(letter input==hidden letter)
T: {add points
Match=true}
If(match==true)
T:{Add money
Add points to score
Make hidden letters shown
(If all letters revealed) Return win
}
F: lose money, return loss



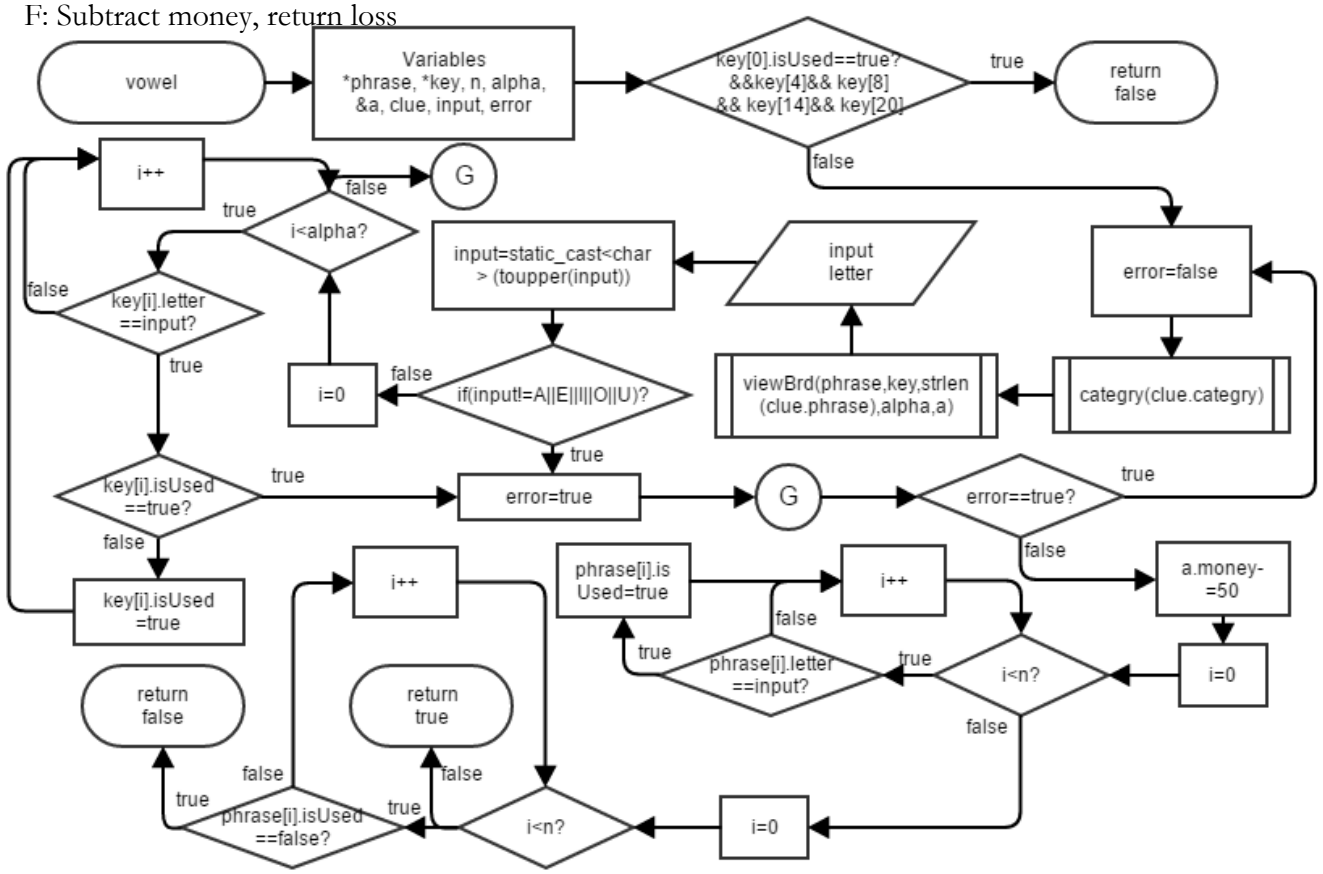

**Vowel: [Play::buy()]**
(if all vowels are used) return
Do{
Error =false

Show board and keyboard
Input letter
(if input is not vowel)
Error =true
(if vowel is used)
T: error =false
F: make key used
While(error==true)
Subtract money
Reveal vowels from phrase
(If all letters are revealed) return win
Else return loss

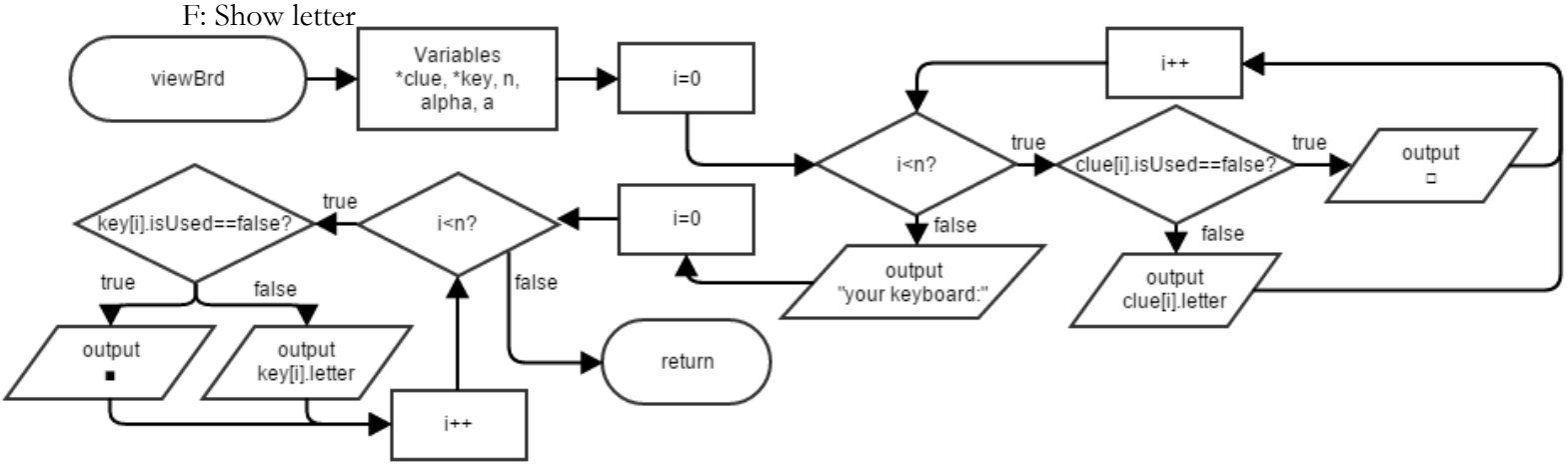



**Guess:[Play::guess()]**
Show board and keyboard
Input phrase

(if input matches board phrase)
T: Return win
F: Subtract money, return loss

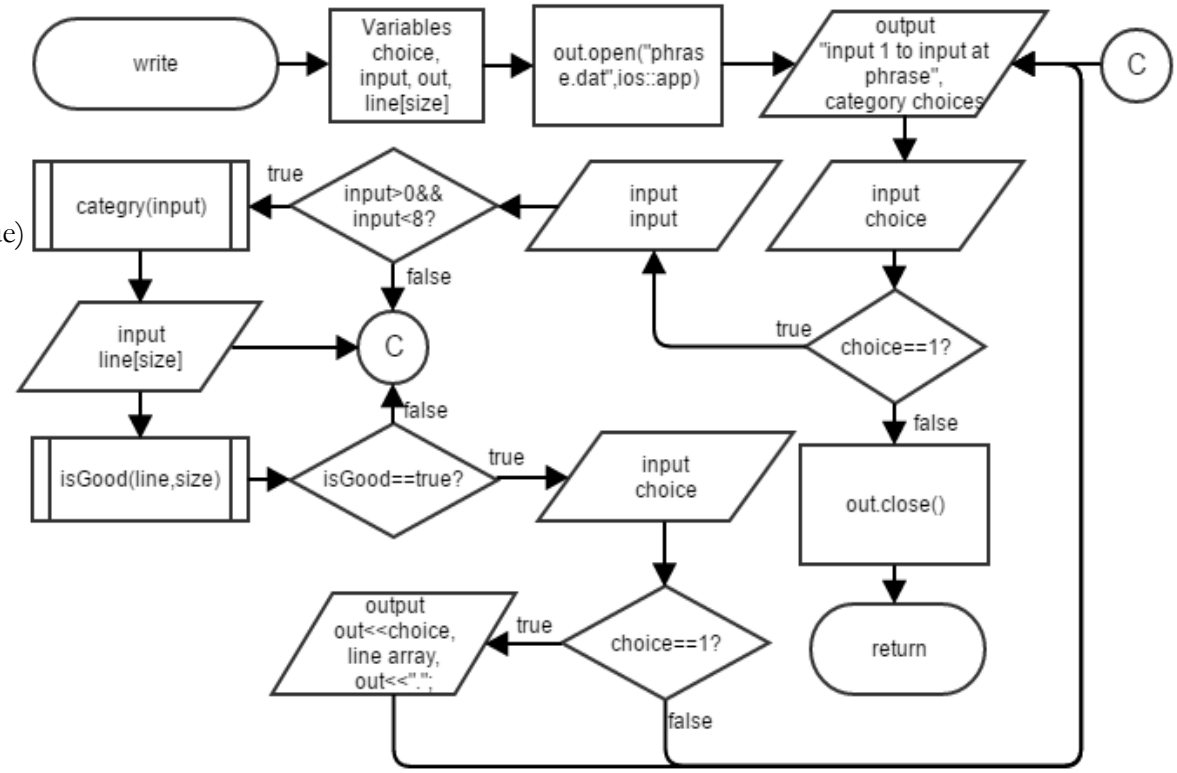



**viewBrd:[Play::display][Keyboard::display()][Phrase::display()]**
(If phrase letter is hidden)
T: Show square
F: Show letter
(If keyboard letter is used)
T: Show square
F: Show letter



**Write: [Game::write()]**

Open file to append
Input category
Input phrase
isGood(phrase)
(if good)
    T:Ask to input
    Input choice
    (If choice is true)
        write to file
Close file



## Major Variables:

Local variables of different member functions are not included.

| Type | Variable Name | Description | Location |
|---|---|---|---|
| Player | user | Contains user name, money and score | Game.h, Play.h |
| stack <Clue> | stck | A stack of clues | Game.h |
| map <int, string> | catg | Map of categories | |
| int | size | Generic variable that shows size | Clue.h, Letter.h |
| Game | game | Wheel of fortune game object | main |
| int | category | Number to represent a category | Clue.h |
| char [ ] | phrase | Phrase | Clue.h |
| string | name | Name of player | Player.h |
| int | money | Money | Player.h |
| int | score | Score | player.h |
| Clue | clue | Holds category and clue phrase | Play.h |
| bool | win | Represents whether one lost | Play.h |
| Keyboard | k | A keyboard object | Play.h |
| Phrase | p | A phrase object | Play.h |
| int [ ] | w | Wheel spin options | Play.h |
| list <Letter> | arr | List of letters | Keyboard.h, Phrase.h |
| list<Letter>::iterator | p | Iterator to travers list | Keyboard.h, Phrase.h |
| char | letter | A single character that letter represents | Letter.h |
| bool | isUsed | Shows whether to reveal or hide letter | Letter.h |
| fstream | in | General input from files | Game..h |
| Hash | table | A hash table full of clues and phrases | Game.h Play.h |
| Tree<Clue> | tree | A tree of clues for inorder outputting | Game.cpp |

# References:

CSC-17C class

--For concepts learned

https:://opendsa-server.cs.vt.edu

--Online book for trees and hash introduction

Savitch, Walter. (2014) *Problem Solving with C++*. Pearson

--For STL introduction

https://www.sgi.com/tech/stl/

--Extra information on STL

http://wheeloffortuneanswer.com/

--Copied phrases to fill dictionary

# Source Code:

```
/*
 * File:   main.cpp
 * Author: Javier Borja
 * Created on October 20, 12:00 PM
 * Purpose: Wheel of fortune. Player guesses a phrase with category as a clue.
 */

//System Libraries
#include <iostream>   //Input/Output
using namespace std;

//User Libraries
#include "Game.h"
#include "Play.h"

//Global Constants

//Function Prototypes

//Execution

int main(int argc, char** argv){
   //Variables
   Game game;       //Wheel of fortune Game object
   char choice;     //Menu choice

   //Input Data
   do{
      game.menu();
      cin>>choice;
      cin.ignore();
```

```
        cout<<"\n\n\n\n\n";

    //Process Data
        switch(choice){
            case'1':{
                game.play();
                break;
            }
            case'2':{
                game.lderBrd();
                break;
            }
            case'3':{
                game.write();
                break;
            }
            case'4':{
                game.read();
                break;
            }
        }
    }while((choice=='1'||choice=='2'||
            choice=='3'||choice=='4'));

    //Process Data

    return 0;
}
/* File:   Play.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Implementation File for play class
 */

//User Libraries
#include "Play.h"

void Play::play(Game *a){
    //Variables
    win=false;
    unsigned int c; //Temp char
    char   s[SIZE]; //Temp string

    //Input Data
    Clue temp;
    temp=a->stck.top();
    a->stck.pop();
    this->clue.setCat(temp.getCat());
    this->clue.setPhrase(temp.getPhrase());

    //Create a new Phrase
    Phrase p;
    p.setArr(temp.getPhrase());

    //Copy Phrase to pointer
    this->p=p;
```

```
}

void Play::end(Game *a){
   //Output Data
   if(a->getMoney()<=0){
      cout<<"The phrase was actually: "<<endl;
      cout<<clue.getPhrase()<<endl;
      cout<<"You have no money.\n"
         "You must restart the game to play again"<<endl;
   }else cout<<"Congrats you win!\n"
         "You have $"<<a->getMoney()*10<<".00 left in your account"<<endl;
}

void Play::spin(Game *a){
   //Variables
   int choice=rand()%WHEEL;//Random wheel choice
   char input;            //Letter input
   bool error;            //Incorrect letter input
   bool match=false;      //Did letter match?
   int money=w[choice];   //Money to add or subtract from user's money
   int points=0;          //Counter for points
   bool win=true;

   //Input Data
   cout<<"Spinning...\nPress Enter to continue";
   cin.get();
   cout<<"_____"<<endl;
   if(money==0) cout<<"You spun a free guess"<<endl;
   else cout<<endl<<"You spun $"<<money*10<<".00"<<endl;
   display();
   do{
      try{
         error=false;
         cout<<"What letter do you want to use? ";
         cin>>input;
         cin.ignore();

   //Process Data
         if(!isalpha(input)){
            throw "Input must be part of the alphabet";
         }
         input=static_cast<char>(toupper(input)); //Make uppercase
         if(input=='A'||input=='E'||input=='I'||input=='O'||input=='U'){
            throw "You have to buy vowels";
         }
         for(int i=0;i<ALPHA;i++){
            if(k.getChar(i)==input){
               if(k.isUsed(i)==true){
                  cout<<"You already used that letter"<<endl;
                  return;
               }else k.use(i);
            }
         }
      }
      catch(char const* s){
         cout<<s<<endl;
```

```
            error=true;
            cout<<"Press enter to continue"<<endl;
            cin.get();
        }
    }while(error); //Keep looping until valid input
    for(int i=0;i<p.getSize();i++){
        if(input==p.getLetter(i)){  //If letter matches
            points+=10;             //Add ten points
            match=true;             //Match is true
            p.use(i);              //Don't hide letter anymore
        }
    }
    //Output Data
    if(match){ //If match is true
        cout<<"You have been awarded $"<<money*10<<".00"<<endl;
        a->addMoney(money);
        cout<<"You gain 10 points for each letter guessed"<<endl;
        cout<<"You gained "<<points<<" points"<<endl<<endl;
        a->addScore(points);
        for(int i=0;i<p.getSize();i++){
            if(p.getUsed(i)==false){
                win=false;   //Not all letters are revealed, win=false;
            }
        }
        this->win=win;       //All letters of phrase are revealed, win=true
    }else{ //Match is not true
        a->subMoney(money);
        cout<<"_____"<<endl;
        cout<<"You have lost $"<<money*10<<".00."<<endl<<endl;
    }if(a->getMoney()<=0){
        end(a);
    }
    if(this->win==true){
        end(a);
    }
}

void Play::buy(Game *a){
    //Conditions to return
    if((k.isUsed(0))&&(k.isUsed(4))&&(k.isUsed(8))&&(k.isUsed(14))&&(k.isUsed(20))){
        cout<<"You have already bought all the vowels"<<endl;
        return; //Exit
    }
    if(a->getMoney()<=50){
        cout<<"You don't have enough money!"<<endl;
        cout<<"Spin the wheel or guess the puzzle"<<endl;
        cout<<"Input a key to continue: ";
        cin.get();
        return; //Exit
    }

    //Variables
    char input;     //Input for vowel
    bool error;     //Error
    bool win=true;  //Win
```

```
    //Input Data
    do{
        try{
            error=false;
            cout<<"_____"<<endl;
            display();
            cout<<"Which vowel do you want to buy? ";
            cin>>input;
            cin.ignore();
            input=static_cast<char>(toupper(input));
            if(input=='A'||input=='E'||input=='I'||input=='O'||input=='U'){

            }
            else{
                throw "You did not choose a vowel";
            }
            for(int i=0;i<ALPHA;i++){
                if(k.getChar(i)==input){
                    if(k.isUsed(i)==true){
                        throw "You already used that letter";
                    }else k.use(i);
                }
            }
        }
        catch(char const* s){
            cout<<s<<endl;
            error=true;
            cout<<"Press enter to continue"<<endl;
            cin.get();
        }
    }while(error==true); //Loop until valid input

    //Process Data
    cout<<"You have bought a vowel for $500.00"<<endl;
    a->subMoney(50);            //Subtract money from user
    for(int i=0;i<p.getSize();i++){
        if(p.getLetter(i)==input) //Reveal vowels from clue phrase
            p.use(i);
    }
    for(int i=0;i<p.getSize();i++){
        if(p.getUsed(i)==false){
            win=false;//Not all letters are revealed, win=false;
        }
    }
    if(win==true){    //All letters of phrase are revealed,
        this->win=win;//win=true
        end(a);
    }
}

void Play::guess(Game *a){
    //Variables
    string answer; //Player answer
    int counter=0; //Amount of empty letters in keyboard array
    int score=30;  //Points=score*counter
    bool win; //true=win---false=loss
```

```
    //Input Data
    display();
    cout<<"Input the final answer: ";
    getline(cin,answer);

    //Process Data
    for(int i=0;i<p.getSize();i++){ //Convert to uppercase
        answer[i]=static_cast<char>(toupper(answer[i]));
    }
    win=a->table.findElmnt(answer);
    cout<<endl;
    //998133622
    //Output Data
    if(win==true){
        for(int i=0;i<p.getSize();i++){    //Go through phrase array to add
            if((p.getUsed(i))==false){     //points for each letter that is not used
                counter++;
            }
        }
        score*=counter;
        cout<<"You gain 30 points for each hidden letter you guessed"<<endl;
        cout<<"You gain "<<score<<" points"<<endl;
        a->addScore(score);
        this->win=win;              //Make private member win=local win;
        end(a);                     //Go to end
    }else{
        cout<<"You did not guess correctly. You have lost $300.00\n";
        a->subMoney(30);
    }
    if(a->getMoney()<=0){
        end(a);
    }
}

void Play::display(){
    //Output Data
    clue.showCat();
    p.display();
    k.display();
    cout<<endl;
}

void Play::menu(Game *a){
    //Output Data
    cout<<"Your money = $"<<a->getMoney()*10<<".00"<<endl;
    cout<<endl<<endl<<"What would you like to do?"<<endl;
    cout<<  " 1. Spin the Wheel ✪\n"
    " 2. Buy a vowel ($500.00)\n"
    " 3. Solve the Puzzle ✉(Bad guess lose $300.00)\n"<<endl;
}
/* File:   Phrase.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Implementation File for Phrase class
 */
```

```
//User Libraries
#include "Phrase.h"
#include "Letter.h"

void Phrase::use(int i){
   p=arr.begin();
   advance(p,i);
   p->use();
}

void Phrase::setArr(string s){
   //Input Data
   size=s.length();
   p=arr.begin();
   for(int i=0;i<size;i++,p++){    //Initialize phrase array with clue
      arr.push_back(s[i]);
      if(isspace(p->getLetter())){//If letter is space
         p->use();               //Don't hide it
      }
   }
}

void Phrase::display(){
   //Output Data
   for(p=arr.begin();p!=arr.end();p++){         //Go through clue array
      if(p->isLtUsed()==false){  //If letter has not been used, hide letter
         cout<<"□";
      }else{
         p->display();
      }
   }
   cout<<endl;
}

char Phrase::getLetter(int i){
   p=arr.begin();
   advance(p,i);
   return p->getLetter();
}

bool Phrase::getUsed(int i){
   p=arr.begin();
   advance(p,i);
   return p->isLtUsed();
}
/* File:   Letter.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for Letter class
 */

//User Libraries
#include "Letter.h"

Letter::Letter(char a){
```

```
    //Process Data
    letter=a;
    isUsed=false;
}

Letter::Letter(){
    //Process Data
    letter=' ';
    isUsed=false;
}
/* File:   Keyboard.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for Keyboard class
 */

//User Libraries
#include "Keyboard.h"

Keyboard::Keyboard(){
    //Initializing the keyboard
    for(int i=0;i<ALPHA;i++){   //Initialize with alphabet
        arr.push_back('A'+i);
    }
}

void Keyboard::display(){
    //Output Data
    cout<<endl<<"Your keyboard:"<<endl;
    p=arr.begin();
    for(p=arr.begin();p!=arr.end();p++){//Go through keyboard list
        if(p->isLtUsed()==false){ //If letter has not been used, hide letter
            p->display();
        }else cout<<"■";
        if((distance(arr.begin(),p)+1)%13==0) cout<<endl;
    }
}

void Keyboard::use(int i){
    p=arr.begin();
    advance(p,i);
    p->use();
}

bool Keyboard::isUsed(int i){
    p=arr.begin();
    advance(p,i);
    p->isLtUsed();
}

char Keyboard::getChar(int i){
    p=arr.begin();
    advance(p,i);
    p->getLetter();
}
/* File:   Hash.h
```

```
 * Author: Javier B
 * Created on December 10, 2017, 8:56 PM
 * Purpose: Class Implementation File for a Hash Class
 */

//User Libraries
#include "hash.h"
int Hash::hashFn(const string s){
    //Hash function
     int seed = 7567;
    for(int i=0;i<s.length();i++){
        seed^=s[i]*seed<<3;
        seed+=s[i]+7793;
    }
     if(seed<0) return seed*-1;
     else return seed;
}

//list<string> list; list.begin();

void Hash::addElmnt(string s){
    int bucket=hashFn(s)%size; //Create a hash and bucket
    table[bucket].push_back(s);       //Insert element into bucket
    //Linked list takes care of collisions
}

bool Hash::findElmnt(string s){
    //Look for bucket based on string
    int bucket=hashFn(s)%size;
    if(table[bucket].empty()){cout<<"empty"<<endl; return false;} //If empty, string is not in hash table
    else{ //Look through list to see if elements match string
        p=table[bucket].begin();
        while(p!=table[bucket].end()){
            if(s==*p){cout<<"Found"<<endl; return true; }//Return if found
            p++;
        }
    }
    cout<<"NOT Found"<<endl;
    return false; //Return not found
}
/* File:   Game.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Implementation File for Game class
 */

//User Libraries
#include "Game.h"
#include "Play.h"
#include "Tree.h"
#include "RecursiveSorts.h"

Game::Game(){
    //Variables
    int n;          //To hold score and money
    char s[SIZE];   //String to hold phrase
```

```
    //Initialize random seed.
    srand(static_cast<unsigned int>(time(0)));

    //Fill Library
    fill();

    //Try to load
    in.open("save.dat",ios::in);
    try{
       if(in.fail()){
          cout<<"No save detected"<<endl;
          throw 0;
       }else{
          if(in>>n){
             cout<<"Save file detected: would you like to continue?"<<endl
                <<"(Both options will delete the profile, you can save later)\n"
                <<"1.Continue\n2.New Game(default)"<<endl;
             cin>>s[0];
             cin.ignore();
             if(s[0]=='1'){
                in.getline(s,SIZE,'.');
                user.name=s;
                user.money=n;
                in>>user.score;
             }else throw 0;

          }else{
             cout<<"No save detected"<<endl;
             throw 0;
          }
       }
    }
    catch(const int &){
       cout<<"Input your name: ";
       getline(cin,user.name);
    }
    cout<<"Welcome to Wheel of Fortune "<<user.name<<"!\n";

    //Close istream
    in.close();
    in.clear();

    //Clear save
    ofstream out;
    out.open("save.dat",ios::out | ios::trunc);
    out.close();
}

Game::~Game(){
    //Variables
    ofstream out; //Output

    //Output Data
    char choice;
    cout<<"Thanks for playing "<<user.name<<"!"<<endl;
    cout<<"Your final score: "<<user.score<<" points"<<endl;
```

```
    if(user.money>0){
        cout<<"Do you wish to save?\n1.Save\n2.Exit without saving(default)\n";
        cin>>choice;
        cin.ignore();
    }
    if(choice!='1'||user.money<=0){
        cout<<"\nDo you wish to add your score to the leaderboard?\n"
            "Input 1 to add\n"
            "Input 2 to exit(default): ";
        cin>>choice;
        if(choice=='1') addLder(); //Add to leaderboard
    }else{
        if(user.name.size()==0){
            cout<<"Error: No name"<<endl;
            return;
        }
        out.open("save.dat",ios::out);
        out<<user.money<<user.name<<"."<<user.score;
        out.close();
        cout<<"Your file has been saved"<<endl;
    }
}

void Game::addLder(){
    if(user.name.size()==0){
        cout<<"Error: No name"<<endl;
        return;
    }
    //Variables
    ofstream out; //Output
    int n;       //Size of string

    //Output Data
    out.open("users.dat",ios::out|ios::app);
    out<<user.name.size()<<user.name<<user.score<<endl;
    cout<<"Your score has been added"<<endl;

    //Close files
    out.close();
}

void Game::fill(){
    //Variables
    vector<Clue> arr; //Vector that contains clues and category
    unsigned int a;   //Temp char
    Clue temp;        //Temp clue
    char s[SIZE];     //Temp char array

    //Open File
    in.open("phrase.dat",ios::in);
    if(in.fail()){
        cout<<"CRITICAL ERROR: File opening failed"<<endl;
        exit(1);
    }

    //Input Data
```

```
    while(in>>a){
        in.getline(s,SIZE,'\r');
        temp.setCat(a);
        temp.setPhrase(s);
        arr.push_back(temp);
        table.addElmnt(s); //Add string into hash table
    }

    //Process Data
    random_shuffle(arr.begin(),arr.end());
    vector<Clue>::iterator p;
    for(p=arr.begin();p!=arr.end();p++){
        this->stck.push(*p);
    }

    //Close Files
    in.close();
}

void Game::lderBrd(){
    //Variables
    fstream in;             //Input from file
    int n;                  //Size of string that is read from file
    set<Player,greater<Player> > arr;//Set of Player structures
    Player temp;            //Temp Player for input
    string a;               //Player inputs to continue
    in.clear();
    try{
        //Open files
        in.open("users.dat",ios::in);
        if(in.fail()){
            throw "users.dat not found";
        }
        //Input Data
        while(in>>n){ //Get size of string
            temp.name.resize(n);     //Resize string size to n
            in.read(&temp.name[0],n);//In name string of size n
            in>>temp.score;
            arr.insert(temp);
        }

        cout<<"Input sort method:\n1.By score(default)\n2.By name\n";
        cin>>n;
        cin.ignore();
        //Output Data
        if(n==2){
            vector<Player> a(arr.begin(),arr.end());
            sort(a.begin(),a.end(),name_sort());
            cout<<"Sorted Leaderboard by name:"<<endl;
            vector<Player>::iterator p;
            for(p=a.begin();p!=a.end();p++){
                cout<<p->name;
                cout<<setw(5)<<right<<p->score<<" points"<<endl<<endl;
            }
        }else{
            Tree<Player> tree;
```

```
            cout<<"Sorted Leaderboard by score:"<<endl;
            set<Player>::iterator p;
            for(p=arr.begin();p!=arr.end();p++){
               tree.insert(*p);
            }
            tree.inorder();
         }
         cout<<"Press enter to continue"<<endl;
         getline(cin,a);
      }
      catch(char* const s){
         in.close();
         cout<<s<<endl;
      }

      //Close files
      in.close();
}

void Game::read(){
      //Variables
      Clue clue;      //Temporary Clue to fill
      unsigned int n; //Categories are numbered
      char s[SIZE];   //String to hold phrase
      char choice;    //Choice variable
      queue<Clue> que;//Queue of clues

      //Open File
      in.clear();
      in.open("phrase.dat",ios::in);
      if(in.fail()){
         cout<<"CRITICAL ERROR: File opening failed"<<endl;
         return;
      }
      cout<<"Choose display option:\n1.Unsorted(default)\n2.Sorted\n";
      cin>>choice;
      cin.ignore();

      //Output Data
      if(choice=='2'){
         cout<<"Choose sort option:\n1.Binary tree inorder output(default)\n"
               "2.Recursive Sort\n"
               "3.STL sort\n";
         cin>>choice;
         cin.ignore();
         if(choice=='3'){
            set<Clue>::iterator p;
            for(int i=0;i<7;i++){
               set<Clue> tset;
               in.clear();
               in.seekg(0,ios::beg); //Go back to beginning
               while(in>>n){         //Repeat until in can't extract a char
                  in.getline(s,SIZE,'\r');
                  if(n==i+1){
                     clue.setCat(n);
                     clue.setPhrase(s);
```

```
                tset.insert(clue);
            }
        }
        for(p=tset.begin();p!=tset.end();p++){
            que.push(*p);
        }
    }
    int a=1,b=1; //Variables for algorthm
    while(!que.empty()){
        clue=que.front();
        que.pop();
        if(clue.getCat()==a){
            b=clue.getCat();
        }
        if(a==b){ //Algorithm for showing category once
            cout<<endl;
            clue.showCat();
            a++;
        }
        cout<<clue.getPhrase()<<endl;
    }
}else if(choice=='2'){
    vector<Clue> array;
    in.clear();
    in.seekg(0,ios::beg); //Go back to beginning
    while(in>>n){
        in.getline(s,SIZE,'\r');
        clue.setCat(n);
        clue.setPhrase(s);
        array.push_back(clue);
    }
    cout<<"\nChoose type of recursive sort\n"
        "1. Recursive Bubble(default):\n2. Recursive Insertion:"<<endl;
    cin>>choice;
    cin.ignore();
    if(choice=='2') insertRec(array,array.size());
    else bubbleRec(array,array.size());
    vector<Clue>::iterator p;
    for(p=array.begin();p!=array.end();p++){
        cout<<*p<<endl;
    }
}else{
    cout<<"Choice 1"<<endl;
    //Variables
    Tree<Clue> tree;
    in.clear();
    in.seekg(0,ios::beg); //Go back to beginning
    while(in>>n){        //Repeat until in can't extract a char
        in.getline(s,SIZE,'\r');
        clue.setCat(n);
        clue.setPhrase(s);
        tree.insert(clue);
    }
    tree.inorder();
}
}
```

```
   else{
      while(in>>n){       //Repeat until in can't extract a char
            in.getline(s,SIZE,'\r');
            clue.setCat(n); //Set category
            clue.showCat(); //View category
            cout<<s<<endl;  //Output string
      }
   }

   //Input Data
   in.close();
   cout<<endl<<"Input anything to continue: ";
   cin.get();
}

void Game::write(){
   //Variables
   char choice;    //Menu choice
   char input;     //Input for sub-menu
   fstream out;    //Output to file
   char line[SIZE];//Character array of size=44
   Clue clue;

   //Open File
   out.open("phrase.dat",ios::app);

   //Input Data
   cout<<endl<<"Input 1 to input a phrase\n"
         "Input 0 to exit: ";
   cin>>choice;
   cin.ignore();
   if(choice=='1'){
      cout<<endl<<"Input a category:\n";
      for(int i=1;i<=7;i++){
         cout<<i<<" ";
         clue.setCat(i);
         clue.showCat();
      }
      cout<<endl<<"0 Exit(default)"<<endl;
      cin>>input;
      cin.ignore();

   //Output Data
      if(input>48&&input<56){ //If input is '1'-'7'
         clue.setCat(input-48);
         cout<<"Input your phrase(max 44 characters): "<<endl;
         cin.getline(line,SIZE);
         if(isGood(line)){ //If input is good ask if wish to append
            cin>>choice;
            cin.ignore();
            if(choice=='1'){
               out<<input;
               for(int i=0;i<strlen(line);i++){
                  out<<static_cast<char>(toupper(line[i])); //Make uppercase
               }
               out<<'\r';
```

```
                cout<<"You must restart the game for effects to take effect"<<endl;
            }
        }
    }
}

//Close File
out.close();
}

bool Game::isGood(char a[]){
//Process Data
try{
    if(strlen(a)<4||strlen(a)>44){ //If char array doesn't fit size limit
        throw "ERROR: Phrase must be greater than 3 characters and less than 44";
    }
    for(int i=0;i<strlen(a);i++){
        if(isdigit(a[i])||(!isalpha(a[i])&&!isspace(a[i]))){//If not space or letter
            throw "ERROR: Input must be characters only\n";
        }
    }

//Output Data
    cout<<"Do you really wish to add the following phrase?"<<endl;
    for(int i=0;i<strlen(a);i++){
        cout<<static_cast<char>(toupper(a[i]));
    }
    cout<<endl<<endl<<"Input 1 to append\n"
          "Or anything else to cancel: ";
    return true;
}

//Catch errors
catch(char const* s){
    cout<<s<<endl;
    return false;
}
}

void Game::menu(){
//Output Data
cout<<"\n\nYour money: $"<<user.money*10<<".00\n"
    "Your score: "<<user.score<<" points\n\n"
    "Select an option below:\n"
    " 1. Begin a new game of Wheel of Fortune\n"
    " 2. View the leaderboard\n"
    " 3. Append to the Library\n"
    " 4. View the Library(You'll spoil all the answers!)\n\n";
if(user.money>0) cout<<"Any other input to exit and save your progress: ";
else cout<<"Any other input to exit: ";
}

void Game::play(){
if(user.money<0){
    cout<<"You have no money. Restart to play again."<<endl;
    return;
```

```
    }
    //Variables
    Play obj;       //Play object
    char option;    //Menu option
    obj.play(this); //Start playing

    //Input Data
    do{
        obj.display(); //Display hidden phrase and available keyboard letters
        do{
            obj.menu(this); //Display menu
            cin>>option;
            cin.ignore();
            switch(option){
                case'1':
                    obj.spin(this);
                    break;
                case'2':
                    obj.buy(this);
                    break;
                case'3':
                    obj.guess(this);
                    break;
                default: cout<<"ERROR: Bad Input"<<endl;
            }
        }while(option<49||option>51);
    //Loop until win or lose
    }while((obj.getWin()==false)&&(obj.getMoney(this)>0));
}
/* File:   Clue.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Implementation File for Clue class
 */

//User Libraries
#include "Clue.h"

Clue::Clue(){
    catg[1]="TV Show";
    catg[2]="Event";
    catg[3]="Movie";
    catg[4]="Landmark";
    catg[5]="Famous Person";
    catg[6]="Thing";
    catg[7]="Song Title";
}

void Clue::setCat(unsigned int n){
    categry=n;
}

void Clue::setPhrase(string s){
    size=s.length();
    //Input Data
    for(int i=0;i<s.length();i++){
```

```
        phrase[i]=s[i];
    }
    phrase[size]='\0';
}
/* File:   Hash.h
 * Author: Javier B
 * Created on December 10, 2017, 8:56 PM
 * Purpose: Class Specification File for a Hash Class
 */

#ifndef HASH_H
#define HASH_H

//System Libraries
#include <iostream>  //Input/ Output Stream Library
#include <vector>   //Vectors
#include <list>     //Lists
using namespace std; //Namespace of the System Libraries

//User Libraries

class Hash{
    private:
        int size=500;  //Max hash table size to minimize collisions. 500 buckets.
        vector<list<string> > table;
        list<string>::iterator p; //Iterator to traverse linked list
        int hashFn(const string); //Hash Function
    public:
        Hash()
        {vector<list<string> > preTable(size);
        table=preTable;} //Pre allocating memory
        void addElmnt(string); //Add element into hash table
        bool findElmnt(string);//Find element in the hash table. True if found.
};

#endif
/*
 * File:   Tree.cpp
 * Author: Javier Borja
 * Created on December 4, 2017,  10:00 AM
 * Reference: http://www.geeksforgeeks.org/binary-tree-data-structure/
 *            https://en.wikipedia.org/wiki/AVL_tree
 * Purpose: Tree class Specification and Implementation file
 */


#ifndef TREE_H
#define TREE_H

#include<iostream>

using namespace std;

template<class T>
struct node{
    T data;
```

```
   node* left=NULL;
   node* right=NULL;
   int height=0;
};

template<class T>
class Tree{
   private:
      node<T> *root;

      //Setter
      node<T>* insert(node<T> *,T);   //Insert data as a new leaf

      //Delete
      void delTree(node<T> *);       //Deletes itself
      node<T>* delData(node<T> *,T);  //Delete a single node, and replace it
      node<T>* min(node<T> *);      //Helper for deleting, no need for max

      //Display
      void inorder(node<T> *);       //View left-root-right
      void preorder(node<T> *);      //View root-left-right
      void postorder(node<T> *);     //View left-right-root

      //Balacing Functions
      node<T>* balance(node<T> *); //Performs balancing based on bottom conditions
      node<T>* LL(node<T> *);      //1 Right rotation
      node<T>* LR(node<T> *);      //Left rotate, then Right rotate
      node<T>* RL(node<T> *);      //Right rotate, then left rotate
      node<T>* RR(node<T> *);      //1 Left rotation
      int height(node<T> *leaf)  //Helper to keep tree balanced
      {if(leaf==NULL) return -1; return leaf->height;}

   public:
      //Constructor
      Tree()
      {root=NULL;}
      Tree(T data)
      {root=NULL; root=insert(root,data);}

      //Destructor
      ~Tree()
      {delTree(root);}

      //Set
      void insert(T data)    //Insert data as a new leaf
      {root=insert(root,data);}

      //Mutate
      void delData(T data)
      {root=delData(root,data);}

      //Display
      void inorder()      //View left-root-right
      {inorder(root); cout<<endl;}
      void preorder()     //View root-left-right
      {preorder(root); cout<<endl;}
```

```
        void postorder()    //View left-right-root
        {postorder(root); cout<<endl;}
};

template<class T>
void Tree<T>::delTree(node<T> *leaf){
   if(leaf!=NULL){
      delTree(leaf->left);
      delTree(leaf->right);
      delete leaf;
   }
}

template<class T>
node<T>* Tree<T>::insert(node<T> *leaf,T data){
   if(leaf==NULL){
      leaf=new node<T>;
      leaf->data=data;
   }else if(data<leaf->data){
      leaf->left=insert(leaf->left,data);
      if(height(leaf->left)-height(leaf->right)==2){
         if(data<leaf->left->data)
            leaf=LL(leaf);
         else
            leaf=RL(leaf);
      }
   }else if(data>leaf->data){
      leaf->right=insert(leaf->right,data);
      if(height(leaf->right)-height(leaf->left)==2){
         if(data>leaf->right->data) leaf=RR(leaf);
         else leaf=LR(leaf);
      }
   }
   int hLeft=height(leaf->left), hRight=height(leaf->right);
   if(hLeft>hRight) leaf->height=hLeft+1;
   else leaf->height=hRight+1;
   return leaf;
}

template<class T>
node<T>* Tree<T>::LL(node<T> *leaf){
   node<T> *child=leaf->left;
   leaf->left=child->right;
   child->right=leaf;
   {
      int hLeft=height(leaf->left), hRight=height(leaf->right);
      if(hLeft>hRight) leaf->height=hLeft+1;
      else leaf->height=hRight+1;
   }
   {
      int hLeft=height(child->left), hRight=leaf->height;
      if(hLeft>hRight) child->height=hLeft+1;
      else child->height=hRight+1;
   }
   return child;
}
```

```
template<class T>
node<T>* Tree<T>::LR(node<T> *leaf){
   leaf->right=LL(leaf->right);
   return RR(leaf);
}

template<class T>
node<T>* Tree<T>::RL(node<T> *leaf){
   leaf->left=RR(leaf->left);
   return LL(leaf);
}

template<class T>
node<T>* Tree<T>::RR(node<T> *leaf){
   node<T>* child=leaf->right;
   leaf->right=child->left;
   child->left=leaf;
   {
      int hLeft=height(leaf->left), hRight=height(leaf->right);
      if(hLeft>hRight) leaf->height=hLeft+1;
      else leaf->height=hRight+1;
   }
   {
      int hLeft=height(leaf->right), hRight=leaf->height;
      if(hLeft>hRight) child->height=hLeft+1;
      else child->height=hRight+1;
   }
   return child;
}

template<class T>
node<T>* Tree<T>::min(node<T> *leaf){
   if(leaf==NULL) return NULL;
   else if(leaf->left==NULL) return leaf;
   else return min(leaf->left);
}

template<class T>
node<T>* Tree<T>::delData(node<T> *leaf,T data){
   if(leaf == NULL) return NULL;

   else if(data<leaf->data) //Go left if data is less than
      leaf->left=delData(leaf->left, data);
   else if(data>leaf->data) //Go right if data is greater than
      leaf->right=delData(leaf->left, data);
   else if(leaf->left!=NULL&&leaf->right!=NULL){
      node<T>* temp=min(leaf->right);
      leaf->data=temp->data;
      leaf->right=delData(leaf->right,leaf->data);
   }else{
      node<T>* temp=leaf;
      if(leaf->left==NULL)
         leaf=leaf->right;
      else if(leaf->right==NULL)
         leaf=leaf->left;
```

```
        delete temp;
    }if(leaf==NULL)
        return leaf;
    int hLeft=height(leaf->left),hRight=height(leaf->right);
    if(hLeft>hRight) leaf->height=hLeft+1;
    else leaf->height=hRight+1;
    leaf=balance(leaf);
    return leaf;
}

template<class T>
node<T>* Tree<T>::balance(node<T> *leaf){
    if(height(leaf->left)-height(leaf->right)==2){
        if(height(leaf->left->left)-height(leaf->left->right)==1)
            return RR(leaf); //Rotate left once
        else return LR(leaf); //Rotate left, then right
    }
    else if(height(leaf->right)-height(leaf->left)==2){
        if(height(leaf->right->right)-height(leaf->right->left)==1)
            return LL(leaf); //Rotate right once
        else return RL(leaf); //Rotate right, then left
    }
    return leaf;
}

template<class T>
void Tree<T>::inorder(node<T> *leaf){
    if(leaf!=NULL){
        inorder(leaf->left);
        cout<<leaf->data<<endl;
        inorder(leaf->right);
    }
}

template<class T>
void Tree<T>::preorder(node<T> *leaf){
    if(leaf!=NULL){
        cout<<leaf->data<<endl;
        preorder(leaf->left);
        preorder(leaf->right);
    }
}

template<class T>
void Tree<T>::postorder(node<T> *leaf){
    if(leaf!=NULL){
        postorder(leaf->left);
        postorder(leaf->right);
        cout<<leaf->data<<endl;
    }
}
#endif /* TREE_H */
/* File:   RecursiveSorts.h
 * Author: Javier B
 * Created on December 7, 2017, 11:49 AM
 * Purpose:Specification File for Recursive Sorts
```

```
 */

#ifndef RECURSIVESORTS_H
#define RECURSIVESORTS_H

//System Libraries
#include <vector>
using namespace std; //Namespace of the System Libraries

//User Libraries

//Functions

//Recursive bubble Sort (Parameters:Vector,Sizeof() vector)
template<class T>
void bubbleRec(vector<T> &array,int size){
   if(size==1) return; //Finished recursion
   //Process Data
   for(int i=0;i<size-1;i++){
      if(array[i]>array[i+1]){
         T temp=array[i];
         array[i]=array[i+1];
         array[i+1]=temp;
      }
   }
   //End is sorted, sort previous
   bubbleRec(array,size-1);
}

//Recursive insertion Sort (Parameters:Vector,Sizeof() vector)
template<class T>
void insertRec(vector<T> &array,int size){
   if(size<=1) return; //Keep recursion going until you reach first index

   //Process Data
   insertRec(array,size-1); //From beg()array to end()array
   T key=array[size-1];
   int flag=size-2;
   while(flag>=0&&array[flag]>key){
      //swap()
      array[flag+1]=array[flag];
      flag-=1;
   }
   array[flag+1]=key;
}

#endif /* RECURSIVESORTS_H */
/* File:   Player.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Struct Specification File for Player
 */

#ifndef PLAYER_H
#define PLAYER_H
```

```
//System Libraries
#include <iostream>
#include <string>
using namespace std; //Namespace of the System Libraries

//User Libraries

struct Player{
   string name;
   int money;
   unsigned int score;

   Player(){
      money=50; //Player starts with $500.00
      score=0;  //Player starts with 0 points
   }

   friend bool operator> (const Player &left, const Player &right)
   {return left.score>right.score;}
   friend bool operator< (const Player &left, const Player &right)
   {return left.score<right.score;}
   friend ostream& operator<<(ostream &out,const Player p){
      out<<p.name<<setw(5)<<right<<p.score<<" points"<<endl;
   }
};

struct name_sort{
   bool operator()(const Player &left, const Player &right)
   {return left.name<right.name;}
};
#endif /* PLAYER_H */
/* File:   Play.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for play class
 */

#ifndef PLAY_H
#define PLAY_H

//System Libraries
#include <string>    //Strings
using namespace std; //Namespace of the System Libraries

//User Libraries
#include "Game.h"
#include "Keyboard.h"
#include "Phrase.h"

//Variables
const int WHEEL=12; //Size of wheel

class Play{
   private:
      Clue clue;   //Category and clue phrase
      bool win;    //Win or lose
```

```
        Keyboard k;  //Keyboard
        Phrase p;    //Phrase
        int w[WHEEL]={0,5,5,10,10,15,15,20,25,30,35,40}; //Wheel spin options
    public:

        //Member Functions
        void play(Game *); //The actual game
        void end(Game *);  //Ending screen, win or lose
        void spin(Game *); //Spin the wheel
        void buy(Game *);  //Buy a vowel
        void guess(Game *);//Guess the phrase
        void display();   //Display the keyboard and hidden phrase
        void menu(Game *); //Outputs the game menu

        //Accessors
        bool getWin()         //Returns win boolean
        {return win;}
        int getMoney(Game *a)  //Returns player's money
        {return a->getMoney();}
};

#endif /* PLAY_H */
/* File:   Phrase.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for Phrase class
 */

#ifndef PHRASE_H
#define PHRASE_H

//System Libraries
#include <iostream>  //Input/Output
#include <string>    //String Library
using namespace std; //Namespace of the System Libraries

//User Libraries
#include "Letter.h"

class Phrase: public Letter{
    private:
        list<Letter> arr;        //List
        list<Letter>::iterator p;//Iterator to traverse
        int size;    //Size of array
    public:
        //Mutators
        void use(int i);

        //Accessors
        int getSize(){return size;}
        char getLetter(int);
        bool getUsed(int);

        //Member Functions
        void setArr(string);
        void display() override;
```

```
};

#endif /* PHRASE_H */
/* File:   Letter.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for Letter class
 */

#ifndef LETTER_H
#define LETTER_H

//System Libraries
#include <iostream>  //Input/Output
#include <list>      //list
using namespace std; //Namespace of the System Libraries

//User Libraries

class Letter{
   protected:
      char letter;
      bool isUsed;

   public:
      //Constructors
      Letter(char);
      Letter();

      //Mutators
      void setChar(char a)
      {letter=a;}
      void use()
      {isUsed=true;}

      //Accessors
      char getLetter(){return letter;}
      bool isLtUsed(){return isUsed;}

      //Member functions
      virtual void display(){cout<<letter;}
};

#endif /* LETTER_H */
/* File:   Keyboard.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for Keyboard class
 */

#ifndef KEYBOARD_H
#define KEYBOARD_H

//System Libraries
#include <iostream>  //Input/Output
using namespace std; //Namespace of the System Libraries
```

```
//User Libraries
#include "Letter.h"

//Constants
const int ALPHA=26; //Size of the alphabet

class Keyboard: public Letter{
   public:
      list<Letter> arr;       //List
      list<Letter>::iterator p;//Iterator to traverse
   public:
      //Constructor
      Keyboard();

      //Mutators
      void use(int);

      //Accessors
      bool isUsed(int);
      char getChar(int);

      //Member functions
      void display() override;
};

#endif /* KEYBOARD_H */
/* File:   Game.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for Game class
 */

#ifndef GAME_H
#define GAME_H

//System Libraries
#include <iomanip>   //Output manipulation
#include <vector>    //Vectors
#include <algorithm> //For performing some algorithm functions
#include <stack>     //Stacks
#include <iterator>  //Iterator
#include <set>       //Sets
#include <queue>     //Queues
using namespace std; //Namespace of the System Libraries

//User Libraries
#include "Player.h"
#include "Clue.h"
#include "Hash.h"

//Variables
const int SIZE=44; //Max Size of Char array

class Game{
   private:
```

```
    Hash table;       //A hash table full of phrases
    Player user;      //The player
    stack <Clue> stck; //A stack of clues
    fstream in;       //Input

  public:
    //Constructor
    Game();  //Load game, Introduction, sets random seed, creates library

    //Destructor
    ~Game(); //closes file streams, appends to leaderboard, save game

    //Mutators
    void setName(string s)       //Sets a player's name
    {user.name=s;}
    void setScore(unsigned int n) //Sets a player's score
    {user.score=n;}
    void setMoney(int n)         //Sets a player's money
    {user.money=n;}

    //Accessors
    string getName(){return user.name;}
    unsigned int getScore(){return user.score;}
    int getMoney(){return user.money;}

    //Member Functions
    void fill();         //Creates an index to the library
    void menu();         //Displays the menu
    void lderBrd();      //Displays a leaderboard
    void write();        //Appends to the library
    void read();         //Displays the entire library
    void addLder();      //Adds profile to leaderboard
    bool isGood(char[]);  //Input verification
    void play();         //Play the game

    //Add Functions
    void addMoney(int n)
    {user.money+=n;}
    void addScore(unsigned int n)
    {user.score+=n;}

    //Subtract Functions
    void subMoney(int n)
    {user.money-=n;}

    //Play class can access private members of Game class
    friend class Play;
};

#endif /* GAME_H */
/* File:   Clue.h
 * Author: Javier B
 * Created on October 20, 12:00 PM
 * Purpose: Class Specification File for Clue class
 */
```

```
#ifndef CLUE_H
#define CLUE_H

//System Libraries
#include <string>    //Strings
#include <iostream>  //Input/Output
#include <fstream>   //File input/Output
#include <cstring>   //Cstrings for strlen() function
#include <map>       //Maps
using namespace std; //Namespace of the System Libraries

//User Libraries

class Clue{
   private:
      map<int, string> catg;//Map of categories
      int size;
      unsigned int categry; //Number to represent a category
      char phrase[44];      //Max Phrase length
   public:
      Clue(); //Initialize the map

      //Mutators
      void setCat(unsigned int);
      void setPhrase(string);

      //Accessors
      char getPhrase(int i)
      {return phrase[i];}
      string getPhrase()
      {return phrase;}
      int getSize()
      {return strlen(phrase);}
      unsigned int getCat()
      {return categry;}

      //Output
      void showCat()
      {cout<<catg[categry]<<endl;}

      //Operator overload
      friend bool operator< (const Clue &left,const Clue &right){
         string a=left.phrase,b=right.phrase;
         return a<b;
      }
      friend bool operator> (const Clue &left,const Clue &right){
         string a=left.phrase,b=right.phrase;
         return a>b;
      }
      friend ostream& operator<<(ostream& out, Clue &clue){
         clue.showCat();
         out<<clue.phrase<<endl;
      }
};

#endif /* CLUE_H */
```