**Project 2**

Title

**Mastermind**

Course

**CSC-7**

Section

**42486**

Due Date

**May 31, 2018**

Author

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Rules & Overview:

Mastermind is a single player game where the objective is to guess the 4 digit randomly generated key. The player has a maximum of 10 guesses otherwise they lose and they can either choose to play again to exit the game. If the player guess the key correctly before all 10 of their attempts are up they win the game and can either choose to play again or exit. Generally it is in the player’s best interest to try and use as few of their guesses as they can. The game is played by asking the player to input his guesses for each digit, and the game will respond with a count of how many digits were correct, and how many digits were correct and in the same spot; however, if the digits are in the correct spot and it is the correct digit it will not be duplicately displayed as a correct digit in the other hint. Therefore, a maximum of 4 hints will be given per turn.

Pseudocode:

1. The game begins by telling the user to input a four digit code with number from 0 to 9
2. The program then validates their input forcing them to input a correct number
3. The program then displays each AI guess
4. The AI utilizes multiple vectors holding clue values and guesses in order to make its next guess
5. The game itself uses multiple vectors and pushes back values based on the AI function’s output
6. Their is one utility function that checks if a string is in a vector of strings
7. The program displays all of the AI’s guesses, the number of guesses, whether the AI guessed it correctly or not, and what the actual key is
8. When the AI guesses the correct code the program ends

Code:

/\*

\* File: main.cpp

\* Author: Josh McIntyre

\* Created on May 22, 2018, 5:19 PM

\*/

//Global Constants

//System Libraries

#include <iostream>

#include <ctime>

#include <cstdlib>

#include <vector>

#include <string>

using namespace std;

//User Libraries

//Function Prototypes

string AI(vector<string>, vector<int>, vector<int>, vector<int> &);

bool contains(vector<string>,string);

//Main Function

int main(int argc, char\*\* argv) {

//Declare Variables

string key;

vector<string> guesses;

vector<int> clues1;

vector<int> clues2;

vector<int> pNums;

int turns=0;

bool solved=false;

//Prompt User for Input

cout<<"Welcome to MasterMind Solver by Josh McIntyre!\n\n";

cout<<"Please enter a 4 digit key with digits ranging from 0 to 9: ";

cin>>key;

//Validate Input

for(int i=0; i<4; i++){

bool done=false;

do{

if(key[i]-'0'<0||key[i]-'0'>9){

cout<<"Please enter a new digit: ";

cin>>key[i];

} else done=true;

}while(!done);

}

//Game Loop

do{

//Declare Game Variables

int slots=0,colors=0;

string guess,rGuess;

string check=" ";

//Displays Key and Guess

cout<<"Key: "<<key[0]<<key[1]<<key[2]<<key[3]<<endl;

guess=AI(guesses,clues1,clues2,pNums);

rGuess=guess;

cout<<"Guess: "<<guess<<endl;

cout<<"Number of Guesses: "<<guesses.size()<<endl;

//Check how many are right place

for(int i=0;i<key.length();i++){

if(key[i]==guess[i]){

slots++;

check[i]='x';

guess[i]='x';

}

}

//Check how many are wrong place

for(int j=0;j<key.length();j++){

for(int i=0;i<key.length();i++){

if((i!=j)&&(key[i]==guess[j])&&(check[i]==' ')){

colors++;

check[i]='x';

break;

}

}

}

//Displays Clues

cout<<"Correct Slots: "<<slots<<endl;

cout<<"Correct Colors: "<<colors<<endl;

//Checks End Game Condition

if(slots==4) {

solved=true;

cout<<"Congratulations, you solved the key!\n";

}

//Puts Information Into Arrays for AI

guesses.push\_back(rGuess);

clues1.push\_back(slots);

clues2.push\_back(colors);

//Blanks Screen

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

//Increments Turns

turns++;

}while(turns<35 && !solved);

//Exits Program

return 0;

}

//AI Function

string AI(vector<string> guesses, vector<int> clues1, vector<int> clues2, vector<int> &pNums){

//Declare AI Variables

string guess;

bool sum4=false;

//Initial Guess

if(guesses.size()==0) return "0000";

//If Numbers Are Correct Guess New Order

for(int i=0; i<guesses.size(); i++){

if((clues1[i]+clues2[i])==4) {

sum4=true;

int j=0;

guess=guesses[i];

do{

int swap1=rand()%4,swap2=rand()%4;

int temp=guess[swap1];

guess[swap1]=guess[swap2];

guess[swap2]=temp;

}while(contains(guesses,guess));

return guess;

}else sum4=false;

}

//Try To Find New Numbers

if(!sum4){

int last=guesses.size()-1;

guess=guesses[last];

string tGuess=guess;

if(pNums.size()==4){

tGuess[0]=pNums[0];

tGuess[1]=pNums[1];

tGuess[2]=pNums[2];

tGuess[3]=pNums[3];

if(!contains(guesses, tGuess)) return tGuess;

}

else if(clues1[last]>0){

for(int y=0; y<clues1[last]; y++){

pNums.push\_back(guess[0]);

}

}

guess[0]++;

guess[1]++;

guess[2]++;

guess[3]++;

return guess;

}

return guess;

}

//Utility Function

bool contains(vector<string> guesses, string str){

for(int i=0; i<guesses.size(); i++){

if(str.compare(guesses[i])==0) return true;

}

return false;

}

Repository:

<https://github.com/JMAK13/McIntyreJosh_CSC_7_Spring2018/tree/master/Projects/MasterMind_With_AI>