装

订

线

实验报告

报告名称：合成十游戏

班级：计算机1班

学号：1651574

姓名：贾昊霖

完成日期：2017年12月23日

1. 题目及基本要求

1.1.题目

合成十游戏

1.2.基本要求

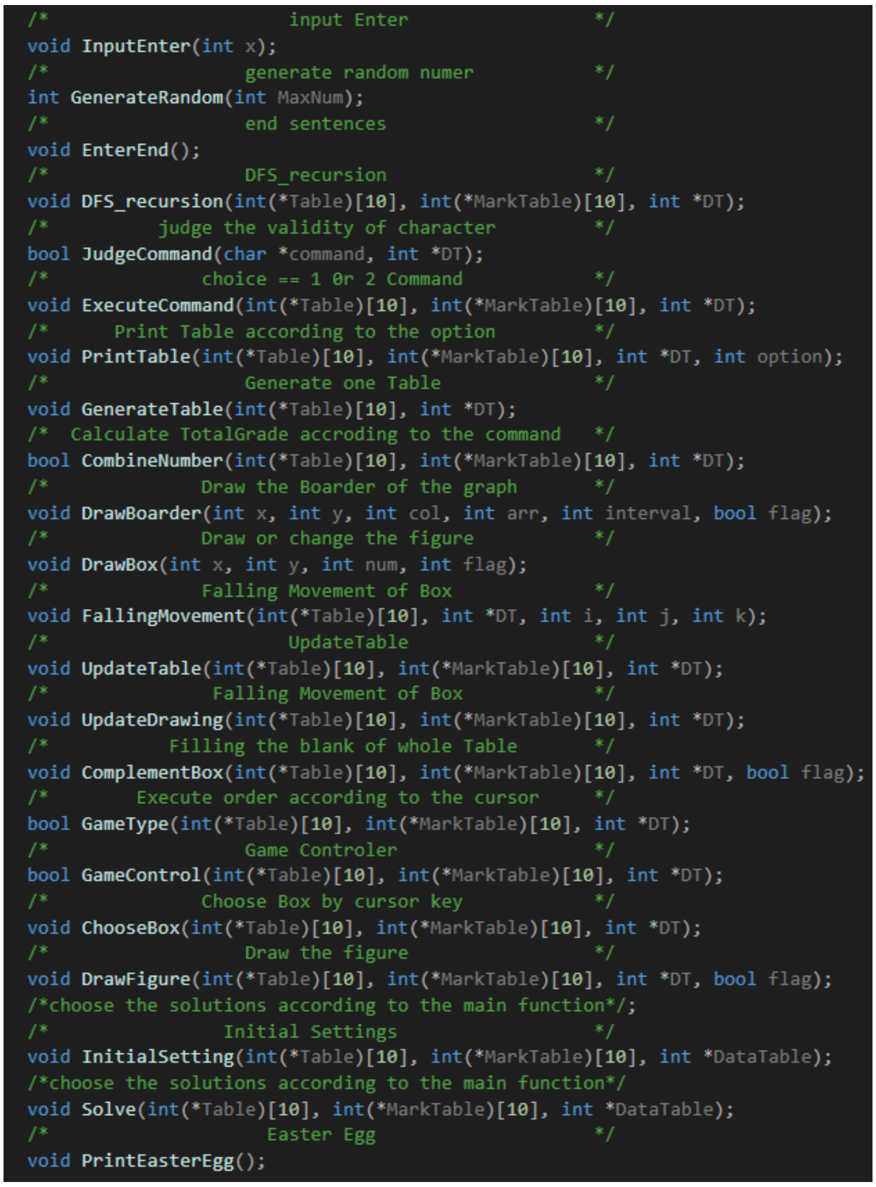
类似于2048的那个游戏，就是要用控制台实现比较复杂的动画以并满足各种繁杂的要求..pdf没有太过仔细看，基本照着老师的exe做的

2. 整体设计思路

输入之后进行菜单选择，先初始化函数，然后设置一系列的参数，然后根据不同的选择，从而在一个选择函数中选择不同的解决方案，这个实验与Hanoi不同的是需要更多的“控制函数”，就像硬件中控制系统一样，通过与控制函数的交互，实现对逻辑函数，即核心操作的函数进行控制，然而反复调用Solve那个函数，尽享二次选择，从而大大减少了代码量..此选择函数相当于控制器，在控制器中控制整个程序流程。

3. 主要功能的实现

每个函数都写有非常详尽的注释，并且函数以及变量名都起得让读程序者一下就明白，所以我这里不在过多赘述，给出大体框架结构：



```
/*                      input Enter                  */
void InputEnter(int x);
/*                  generate random numer            */
int GenerateRandom(int MaxNum);
/*                  end sentences                    */
void EnterEnd();
/*                  DFS_recursion                    */
void DFS_recursion(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*          judge the validity of character          */
bool JudgeCommand(char *command, int *DT);
/*              choice == 1 0r 2 Command             */
void ExecuteCommand(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*      Print Table according to the option          */
void PrintTable(int(*Table)[10], int(*MarkTable)[10], int *DT, int option);
/*                  Generate one Table               */
void GenerateTable(int(*Table)[10], int *DT);
/*  Calculate TotalGrade accroding to the command    */
bool CombineNumber(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*              Draw the Boarder of the graph        */
void DrawBoarder(int x, int y, int col, int arr, int interval, bool flag);
/*              Draw or change the figure            */
void DrawBox(int x, int y, int num, int flag);
/*              Falling Movement of Box              */
void FallingMovement(int(*Table)[10], int *DT, int i, int j, int k);
/*                      UpdateTable                  */
void UpdateTable(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*               Falling Movement of Box             */
void UpdateDrawing(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*           Filling the blank of whole Table        */
void ComplementBox(int(*Table)[10], int(*MarkTable)[10], int *DT, bool flag);
/*        Execute order according to the cursor      */
bool GameType(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*                  Game Controler                   */
bool GameControl(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*              Choose Box by cursor key             */
void ChooseBox(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*                  Draw the figure                  */
void DrawFigure(int(*Table)[10], int(*MarkTable)[10], int *DT, bool flag);
/*choose the solutions according to the main function*/;
/*                Initial Settings                   */
void InitialSetting(int(*Table)[10], int(*MarkTable)[10], int *DataTable);
/*choose the solutions according to the main function*/
void Solve(int(*Table)[10], int(*MarkTable)[10], int *DataTable);
/*                    Easter Egg                     */
void PrintEasterEgg();
```

有几个非常关键的函数，其1：DFS，深搜递归思想，也是整个题的主干，在棋盘中寻找符合要求的元素，并展示出来，其2：把彩色打印图标那个函数写得好，可以以后做模板，方便以后编程的需要，但是开始的时候，我为了追求效率，而写的很乱，最后改的时候非常困难..吸取了教训，其3：把相同的元素删除，并添加新的随机数这里非常麻烦，并且开始自己想到的算法不仅很复杂，还使得做到最后8，9菜单时不能很好地兼容，使得我花大量的时间重新改UpdateTable那个函数

装

订

线

4. 调试过程碰到的问题

遇到调试长时间的地方都用//important注释标注出来了，这里或者因为自己马虎，或者因为没有想到而造成的问题，其次遇到最大的问题就是自己写的程序与标准程序之间的差别，比如哪里没有光标显示，哪里需要把颜色调回黑白..其余没有遇到太多的问题，唯一就是很花时间..

断点调试还不是很熟练，不知道vs有没有像Linux下条件断点的那种强大功能..另外还有一个问题就是由于不能出现任何的全局变量，因此参数传递需要非常多，故，我把他们全部都放到了DataTable这个数组之中，也用枚举变量清晰地实现了dataTable的改变,在传递过程中方便了许多.

5. 心得体会

本次作业其中有一个下午是在上课的时候写的，另外两天晚上从1点写到凌晨1：00左右，然后周六早上写到晚上8点…一直完善并写实验报告..总体来说这次作业量很大很足..我写程序有一个习惯，只要能构造函数把代码压缩的，或者遇到相同的、重叠的函数、代码，都会想尽一切办法来用复杂的逻辑，把他们合并在一起，虽然这次作业老师没有要求做，但是我还是尽可能地合并了非常多的代码与函数，配合上显而易懂的命名，我认为这个程序显得很美.....但是做这个花费了确实很多的时间，但是也学到了很多的东西，并增强了写程序的熟练度，如何在短时间内高质高效地完成.

这次作业花费最长时间的不在于哪个函数，而是原本我个人习惯把纵轴当成x，横轴当成y，而老师给的，以及编译器系统给的是横轴为x，纵轴为y，因此我一开始用的非常乱，直接的后果就是我做大后面程序除了bug，我断点调试查一句，错一句，最后我生气地把好几个函数大体框架留着，其他细节涉及到坐标的，全部删除。重新写...所以这个宝贵的经验就是，以后一定要把横轴当成x，纵轴当成y...

其中1，2小题最简单，就是构造一个搜索函数

另外3，4小题也可归为一组，就是在原本的基础上继续增加，但这也遇到了写问题，比如，开始调试程序的时候总是不按照我的命令运行，我发现是忘记初始化，即每次运行都要memset我设立地DataTable那个指令集数组

而5，6小题...纯画图..很累，因为这块花了很长的时间，开始是因为自己太草率，写的程序健壮性很差，所以饮恨删除了重新写，写的比较完好，以后也可以用的边框模板。

7，8，9小题可以统一的归为一组，和1，2，3，4小题类似，在原本数字上加入了图画呈现，难点在于Box下落的动态，以及下落过程中遇到边框要重新打印的问题，但是这点不算很难，就是在连续写10小时以上程序，头脑不灵敏时，检查bug的效率极其低下..所以我认为不应该像我一样一头脑的写完，应该适当休息...下次要提升些效率了..

6. 附件：源程序

```
/*1651574 1 班  贾昊霖*/
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <iomanip>
#include <cstring>
#include <conio.h>
#include <windows.h>
#include <stdlib.h>
#include <ctime>
#include <cmath>
```

```
#include "cmd_console_tools.h"
#include "90-b2.h"
using namespace std;
/*                              main                              */
int main()
{
    int TotalGrade = 0;
    int Table[10][10];
    int MarkTable[10][10];
    int DataTable[20];

    srand(unsigned(time(NULL)));

    while (true) {
        setconsoleborder(INITIAL_Y, INITIAL_X);
        setcursor(CURSOR_VISIBLE_NORMAL);
        system("color 0F");
        memset(DataTable, 0, sizeof DataTable);

        std::cout << "----------------------------------" << endl;
        std::cout << "1.命令行找出可合成项并标识（非递归）" << endl;
        std::cout << "2.命令行找出可合成项并标识（递归）" << endl;
        std::cout << "3.命令行完成一次合成（分步骤显示）" << endl;
        std::cout << "4.命令行完整版（分步骤显示）" << endl;
        std::cout << "5.伪图形界面显示初始数组（无分隔线）" << endl;
        std::cout << "6.伪图形界面显示初始数组（有分隔线）" << endl;
        std::cout << "7.伪图形界面下用箭头键选择当前色块" << endl;
        std::cout << "8.伪图形界面完成一次合成（分步骤）" << endl;
        std::cout << "9.伪图形界面完整版" << endl;
        std::cout << "0.退出" << endl;
        std::cout << "----------------------------------" << endl;
        std::cout << "[请选择 0-9]";

        do {
            DataTable[Choice] = _getch();
            DataTable[Choice] -= '0';
        } while (DataTable[Choice] < 0 || DataTable[Choice] > 9);
        if (!DataTable[Choice])
            break;
        std::cout << DataTable[Choice] << endl;

        InitialSetting(Table, MarkTable, DataTable);
        Solve(Table, MarkTable, DataTable);
        system("cls");
    }
    gotoxy(0, INITIAL_X - 1);
    setconsoleborder(75, 50);
    system("color F0");
    setcolor(COLOR_HWHITE, COLOR_BLACK);
    PrintEasterEgg();
    return 0;
}
```

装

订

线

```
#include "90-b2.h"
/*                  Filling the blank of whole Table           */
void ComplementBox(int(*Table)[10], int(*MarkTable)[10], int *DT, bool flag)
{
	int x, y;
	for (int i = 0; i < DT[Array]; i++)
		for (int j = 0; j < DT[Column]; j++)
			if (MarkTable[i][j] == SIGNED) {
				x = 2 + j * 6 + 2 * j;
				y = 2 + i * 3 + i;
				if (flag)
					DrawBox(x, y, Table[i][j], 0);
				else if (i == DT[Orig_y] && j == DT[Orig_x])
					DrawBox(x, y, Table[i][j], 2);
				else
					DrawBox(x, y, Table[i][j], 1);
			}
}
/*              Execute order according to the cursor              */
bool GameType(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
	setcolor(COLOR_BLACK, COLOR_HWHITE);
	gotoxy(0, DT[Bottom] - 1);
	cout << "箭头键移动并取消选择，回车键合成\n";
	int x, y;
	MarkTable[DT[Orig_y]][DT[Orig_x]] = SIGNED;
	for (int i = 0; i < 4; i++) {
		DT[Tmp_y] = DT[Orig_y] + MOVE_XY[i][0];
		DT[Tmp_x] = DT[Orig_x] + MOVE_XY[i][1];
		DFS_recursion(Table, MarkTable, DT);
	}
	if (!DT[Count]) {
		setcolor(COLOR_BLACK, COLOR_HYELLOW);
		std::cout << "周围无相同值!";
		setcolor(COLOR_BLACK, COLOR_HWHITE);
		std::cout << "请重新输入\n";
		return false;
	}
	ComplementBox(Table, MarkTable, DT, false);

	/*sparkle*/
	x = 2 + DT[Orig_x] * 6 + 2 * DT[Orig_x];
	y = 2 + DT[Orig_y] * 3 + DT[Orig_y];
	for (int i = 1; i <= TIMES; i++) {
		DrawBox(x, y, Table[DT[Orig_y]][DT[Orig_x]], 2);
		Sleep(5);
		DrawBox(x, y, Table[DT[Orig_y]][DT[Orig_x]], 3);
		Sleep(5);
	}
	return true;
}
/*                          Game Controler                         */
bool GameControl(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
    char c;
    if (!GameType(Table, MarkTable, DT))
        return true;
    UpdateDrawing(Table, MarkTable, DT);
    GenerateTable(Table, DT);

    ComplementBox(Table, MarkTable, DT, true);
    if (DT[Choice] == 8)
        return false;
    setcolor(COLOR_BLACK, COLOR_HWHITE);
    gotoxy(0, DT[Bottom] - 1);
    cout << "本次合成结束,按 Q 退出游戏\n";
    while (true) {
        c = _getch();
        if (c == 'q' || c == 'Q')
            return false;
        return true;
    }
}
/*                  Choose Box by cursor key                */
void ChooseBox(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
    int End_col = DT[Column], End_arr = DT[Array];
    int col = 0, arr = 0, x = 2, y = 2;
    unsigned short _char;
    setcursor(CURSOR_INVISIBLE);
    while (true) {
        DrawBox(x, y, Table[arr][col], 1);
        showch(0, DT[Bottom] - 1, ' ', COLOR_BLACK, COLOR_HWHITE, CLEAR);
        setcolor(COLOR_BLACK, COLOR_HWHITE);
        gotoxy(0, DT[Bottom] - 1);
        cout << "方向键控制移动，回车确定\n";
        _char = _getch();
        if (_char == 0xd) {
            if (DT[Choice] == 7)
                break;
            else {
                DT[Orig_x] = col;
                DT[Orig_y] = arr;
                DT[Count] = 0;
                if (!GameControl(Table, MarkTable, DT))
                    break;
                memset(MarkTable, UNSIGNED, sizeof(int) * 10 * 10);          //important!
            }
        }
        else if (_char != 0xe0)
            continue;
        else {
            _char = _getch();
            DrawBox(x, y, Table[arr][col], 0);
            if (_char == 0x4b && col > 0)//left
                col--;
            else if (_char == 0x50 && arr < End_arr - 1)//down
                arr++;
```

装

订

线

```
            else if (_char == 0x4d && col < End_col - 1)//right
                col++;
            else if (_char == 0x48 && arr > 0)//up
                arr--;
            x = 2 + col * 6 + 2 * col;
            y = 2 + arr * 3 + arr;
            DrawBox(x, y, Table[arr][col], 1);
        }
    }
    setcolor(COLOR_BLACK, COLOR_HWHITE);
    gotoxy(0, DT[Bottom] - 1);
}
/*                  Draw the figure                   */
void DrawFigure(int(*Table)[10], int(*MarkTable)[10], int *DT, bool flag)
{
    int arr = DT[Array], col = DT[Column];
    int Boarder_x = 4 + col * 2 * 3 + flag * (col - 1) * 2;
    int Boarder_y = 3 + arr * 3 + flag * (arr - 1);
    int cur_x, cur_y;
    setconsoleborder(Boarder_x + 1, Boarder_y + 5);
    setcursor(CURSOR_INVISIBLE);
    cout << "屏幕当前设置为:" << Boarder_y + 5 << "行" << Boarder_x + 2 << "列" << endl;
    DrawBoarder(0, 1, col, arr, 4, flag);
    for (int i = 0; i < arr; i++) {
        for (int j = 0; j < col; j++) {
            cur_x = 2 + j * 3 * 2 + flag * j * 2;
            cur_y = 2 + i * 3 + flag * i;
            DrawBox(cur_x, cur_y, Table[i][j], 0);
        }
    }
    DT[Bottom] = Boarder_y + 3;
    setcolor(COLOR_BLACK, COLOR_HWHITE);
    gotoxy(0, Boarder_y + 2);
}

#include "90-b2.h"
/*          judge the validity of character           */
bool JudgeCommand(char *command, int *DT)
{
    if (strlen(command) < 2)
        return false;
    if (command[0] >= 'a' && command[0] <= 'a' + DT[Array] - 1)
        command[0] -= 32;
    if (command[0] < 'A' || command[0] > 'A' + DT[Array] - 1)
        return false;
    if (command[1] < '0' || command[1] > '0' + DT[Column] - 1)
        return false;
    return true;
}
/*              choice == 1 0r 2 Command              */
void ExecuteCommand(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
    int cur_x, cur_y;
    char command[10];
    while (true) {
        std::cout << "请以字母+数字形式[例：c1]输入矩阵坐标：";
        getxy(cur_x, cur_y);
        while (true) {
            std::cin >> command;
            if (JudgeCommand(command, DT))
                break;
            showstr(cur_x, cur_y, "          ", COLOR_BLACK, COLOR_HWHITE);
            std::cout << "\n 输入错误，请重新输入.";
            gotoxy(cur_x, cur_y);
        }
        showch(0, cur_y + 1, ' ', COLOR_BLACK, COLOR_HWHITE, CLEAR);
        gotoxy(0, cur_y + 1);
        std::cout << "输入为" << command[0] << "行" << command[1] << "列\n";
        DT[Orig_y] = command[0] - 'A';
        DT[Orig_x] = command[1] - '0';
        DT[Count] = 0;
        MarkTable[DT[Orig_y]][DT[Orig_x]] = SIGNED;
        for (int i = 0; i < 4; i++) {
            DT[Tmp_y] = DT[Orig_y] + MOVE_XY[i][0];
            DT[Tmp_x] = DT[Orig_x] + MOVE_XY[i][1];
            DFS_recursion(Table, MarkTable, DT);
        }
        if (DT[Count])
            break;
        std::cout << "输入的矩阵坐标位置处无连续相同值，请重新输入\n";
    }
    putchar('\n');
}
/*          Print Table according to the option              */
void PrintTable(int(*Table)[10], int(*MarkTable)[10], int *DT, int option)
{
    if (option == 1)
        std::cout << "当前数组：\n";
    else if (option == 2)
        std::cout << "寻找结果数组：\n";
    else if (option == 3)
        std::cout << "当前数组(不同色标识)：\n";
    else if (option == 4)
        std::cout << "相同值归并后的数组(不同色标识)：\n";
    else if (option == 5)
        std::cout << "除 0 后的数组(不同色标识)：\n";
    else if (option == 6)
        std::cout << "新值填充后的数组(不同色标识)：\n";

    std::cout << "    |";
    for (int i = 0; i < DT[Column]; i++)
        std::cout << " " << i << " ";
    std::cout << "\n--+";
    for (int i = 0; i < DT[Column]; i++)
        std::cout << "---";
    putchar('\n');
    for (int i = 0; i < DT[Array]; i++) {
        std::cout << char('A' + i) << " |";
        for (int j = 0; j < DT[Column]; j++) {
            if (option == 1)
                std::cout << " " << Table[i][j] << " ";
            else if (option == 2) {
                if (MarkTable[i][j] == SIGNED)
                    std::cout << " * ";
                else
                    std::cout << " 0 ";
            }
            else if (option == 3 || option == 6) {
                if (MarkTable[i][j] == SIGNED) {
                    setcolor(COLOR_BLACK, COLOR_HYELLOW);
                    std::cout << " " << Table[i][j] << " ";
                    setcolor(COLOR_BLACK, COLOR_HWHITE);
                }
                else
                    std::cout << " " << Table[i][j] << " ";
            }
            else if (option == 4) {
                if (MarkTable[i][j] == SIGNED) {
                    setcolor(COLOR_BLACK, COLOR_HYELLOW);
                    if (i == DT[Orig_y] && j == DT[Orig_x])
                        std::cout << " " << Table[i][j] << " ";
                    else
                        std::cout << " 0 ";
                    setcolor(COLOR_BLACK, COLOR_HWHITE);
                }
                else
                    std::cout << " " << Table[i][j] << " ";
            }
            else if (option == 5) {
                if (MarkTable[i][j] == SIGNED) {
                    setcolor(COLOR_BLACK, COLOR_HYELLOW);
                    std::cout << " 0 ";
                    setcolor(COLOR_BLACK, COLOR_HWHITE);
                }
                else
                    std::cout << " " << Table[i][j] << " ";
            }
        }
        putchar('\n');
    }
    putchar('\n');
}
/*                  Generate one Table              */
void GenerateTable(int(*Table)[10], int *DT)
{
    for (int i = 0; i < DT[Array]; i++)
        for (int j = 0; j < DT[Column]; j++)
            if (!Table[i][j])
                Table[i][j] = GenerateRandom(DT[Level]);
}
/*    Calculate TotalGrade accroding to the command  */
bool CombineNumber(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
```

装 订 线

```
    int X = DT[Orig_x], Y = DT[Orig_y], tmp = 0;
    char c;
    cout << "请确认是否把相邻的相同值合并到 A2 中(Y/N/Q)：";
    while (true) {
        c = _getch();
        if (c == 'Y' || c == 'y') {
            cout << c << endl;
            for (int i = 0; i < DT[Array]; i++)
                for (int j = 0; j < DT[Column]; j++)
                    if (MarkTable[i][j] == SIGNED) {
                        tmp += 3 * Table[i][j];
                        if (i == Y && j == X)
                            Table[Y][X]++;
                        else
                            Table[i][j] = 0;
                    }
            DT[TotalGrade] += tmp;
            PrintTable(Table, MarkTable, DT, 4);
            cout << "本次得分：" << tmp << "  总得分：" << DT[TotalGrade] << "  合成目标：" <<
DT[Goal] << endl;
            putchar('\n');
            UpdateTable(Table, MarkTable, DT);
            PrintTable(Table, MarkTable, DT, 5);
            InputEnter(5);
            GenerateTable(Table, DT);
            PrintTable(Table, MarkTable, DT, 6);
            if (DT[Choice] == 3)
                return false;
            InputEnter(8);
            memset(MarkTable, UNSIGNED, sizeof(int) * 10 * 10);        //important!
            return true;
        }
        else if (c == 'n' || c == 'N') {
            cout << c << endl;
            if (DT[Choice] == 3)
                return false;
            PrintTable(Table, MarkTable, DT, 1);
        }
        else if (c == 'q' || c == 'Q') {
            cout << c << endl;
            return false;
        }
    }
}
/*                    Draw the Boarder of the graph              */
void DrawBoarder(int x, int y, int col, int arr, int interval, bool flag)
{
    setcolor(COLOR_HWHITE, COLOR_BLACK);
    gotoxy(x, y);
    int end_i = 2 + 3 * arr + flag * (arr - 1);
    int end_j = 2 + 3 * col + flag * (col - 1);
    int t = interval;
    for (int i = 1; i <= end_i; i++) {
        for (int j = 1; j <= end_j; j++) {
```

装 订 线

装

订

线

```
            if (i == 1 && j == 1)
                cout << " ╔";
            else if (i == 1 && j == end_j)
                cout << "╗ ";
            else if (i == end_i && j == 1)
                cout << " ╚";
            else if (i == end_i && j == end_j)
                cout << "╝ ";
            else if (i == 1) {
                if (flag && j % t == 1)
                    cout << "╤";
                else
                    cout << "═";
            }
            else if (j == 1) {
                if (flag && i % t == 1)
                    cout << " ╟";
                else
                    cout << " ║ ";
            }
            else if (j == end_j) {
                if (flag && i % t == 1)
                    cout << "╢ ";
                else
                    cout << " ║ ";
            }
            else if (i == end_i) {
                if (flag && j % t == 1)
                    cout << "╧";
                else
                    cout << "═";
            }
            else if (flag && j % t == 1 && i % t == 1)
                cout << "┼";
            else if (flag && i % t == 1)
                cout << "━";
            else if (flag && j % t == 1)
                cout << " ┃ ";
            else
                cout << "    ";
        }
        putchar('\n');
        Sleep(30);
    }
}
/*                    Draw or change the figure                    */
void DrawBox(int x, int y, int num, int flag)
{
    if (flag == 0)
        setcolor(ColorNumber[num], COLOR_BLACK);
    else if (flag == 1)
        setcolor(COLOR_HYELLOW, COLOR_HRED);
    else if (flag == 2)
```

```
        setcolor(COLOR_HYELLOW, COLOR_HBLUE);
    else if (flag == 3)
        setcolor(COLOR_YELLOW, COLOR_BLACK);
    else if (flag = 9)
        setcolor(COLOR_HWHITE, COLOR_HWHITE);
    gotoxy(x, y);
    cout << " ╔══╗ ";
    gotoxy(x, y + 1);
    cout << " ║ " << setw(2) << num << " ║ ";
    gotoxy(x, y + 2);
    cout << " ╚══╝ ";
    Sleep(30);
}
/*                  Falling Movement of Box                  */
void FallingMovement(int(*Table)[10], int *DT, int i, int j, int k)
{
    int x = 2 + i * 6 + 2 * i;
    int y = 2 + k * 3 + k;
    int end = 2 + j * 3 + j;
    int counter = 0;
    while (y < end) {
        counter++;
        DrawBox(x, y, Table[k][i], 9);
        if (!(counter % 4)) {
            showstr(x, y, "────────", COLOR_HWHITE, COLOR_BLACK);
        }
        y++;
        DrawBox(x, y, Table[k][i], 0);
    }
}
/*                        UpdateTable                        */
void UpdateTable(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
    gotoxy(0, DT[Bottom] - 2);
    setcolor(COLOR_BLACK, COLOR_HWHITE);
    InputEnter(1);
    int k;
    MarkTable[DT[Orig_y]][DT[Orig_x]] = UNSIGNED;
    if (Table[DT[Orig_y]][DT[Orig_x]] == DT[Level])
        DT[Level]++;                              //upgrade
    for (int i = 0; i < DT[Column]; i++)
        for (int j = DT[Array] - 1; j >= 1; j--) {
            if (MarkTable[j][i] == SIGNED) {
                for (k = j - 1; k >= 0; k--) {
                    //if (Table[k][i]) {
                    if (MarkTable[k][i] == UNSIGNED) {
                        Table[j][i] = Table[k][i];
                        MarkTable[j][i] = MarkTable[k][i];
                        if (DT[Choice] == 8 || DT[Choice] == 9)
                            FallingMovement(Table, DT, i, j, k);
                        //Table[k][i] = 0;
                        MarkTable[k][i] = SIGNED;
                        break;
                    }
```

装

订

线

```
                }
                if (k < 0) {
                    Table[k][i] = 0;
                    MarkTable[j][i] = SIGNED;
                }
            }
        }
}
/*                  Falling Movement of Box                  */
void UpdateDrawing(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
    int X = DT[Orig_x], Y = DT[Orig_y], tmp = 0;
    int x, y;
    setcolor(COLOR_BLACK, COLOR_HWHITE);
    gotoxy(0, DT[Bottom] - 1);
    showch(0, DT[Bottom] - 1, ' ', COLOR_BLACK, COLOR_HWHITE, CLEAR);//clear
    for (int i = 0; i < DT[Array]; i++) {
        for (int j = 0; j < DT[Column]; j++) {
            if (MarkTable[i][j] == SIGNED) {
                tmp += 3 * Table[i][j];
                x = 2 + j * 6 + 2 * j;
                y = 2 + i * 3 + i;
                if (i == Y && j == X) {
                    Table[Y][X]++;
                    DrawBox(x, y, Table[Y][X], 0);
                }
                else {
                    Table[i][j] = 0;
                    DrawBox(x, y, 0, 9);
                }
            }
        }
    }
    Sleep(100);
    UpdateTable(Table, MarkTable, DT);
}
#pragma once
/*1651574 1 班  贾昊霖*/
#define _CRT_SECURE_NO_WARNINGS
#include <iostream>
#include <iomanip>
#include <cstring>
#include <conio.h>
#include <windows.h>
#include <stdlib.h>
#include <ctime>
#include <cmath>
#include "cmd_console_tools.h"
using namespace std;
#define INITIAL_X 25
#define INITIAL_Y 50
#define UNSIGNED 0   //unchecked
#define SIGNED 1 //checked
#define TIMES 6
#define CLEAR 40
```

```
void UpdateTable(int(*Table)[10], int(*MarkTable)[10], int *DT);
const int MOVE_XY[4][2] = { { -1,0 },{ 0,-1 },{ 1,0 },{ 0,1 } };
const int ColorNumber[] = { 1,9,3,2,11,10,12,13,4,5,8,7,15 };//the order of colors
enum DataSet { Choice, Array, Column, Goal, TotalGrade, Level, Tmp_x, Tmp_y, Count, Orig_x, Orig_y, Bottom };
/*                  input Enter                 */
void InputEnter(int x);
/*               generate random numer          */
int GenerateRandom(int MaxNum);
/*               end sentences                  */
void EnterEnd();
/*               DFS_recursion                     */
void DFS_recursion(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*         judge the validity of character      */
bool JudgeCommand(char *command, int *DT);
/*            choice == 1 0r 2 Command          */
void ExecuteCommand(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*      Print Table according to the option     */
void PrintTable(int(*Table)[10], int(*MarkTable)[10], int *DT, int option);
/*               Generate one Table             */
void GenerateTable(int(*Table)[10], int *DT);
/*   Calculate TotalGrade accroding to the command  */
bool CombineNumber(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*            Draw the Boarder of the graph     */
void DrawBoarder(int x, int y, int col, int arr, int interval, bool flag);
/*            Draw or change the figure         */
void DrawBox(int x, int y, int num, int flag);
/*            Falling Movement of Box              */
void FallingMovement(int(*Table)[10], int *DT, int i, int j, int k);
/*                  UpdateTable                    */
void UpdateTable(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*             Falling Movement of Box          */
void UpdateDrawing(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*          Filling the blank of whole Table    */
void ComplementBox(int(*Table)[10], int(*MarkTable)[10], int *DT, bool flag);
/*        Execute order according to the cursor    */
bool GameType(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*               Game Controler                    */
bool GameControl(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*            Choose Box by cursor key          */
void ChooseBox(int(*Table)[10], int(*MarkTable)[10], int *DT);
/*               Draw the figure                   */
void DrawFigure(int(*Table)[10], int(*MarkTable)[10], int *DT, bool flag);
/*choose the solutions according to the main function*/;
/*              Initial Settings                */
void InitialSetting(int(*Table)[10], int(*MarkTable)[10], int *DataTable);
/*choose the solutions according to the main function*/
void Solve(int(*Table)[10], int(*MarkTable)[10], int *DataTable);
/*                 Easter Egg                   */
void PrintEasterEgg();

#include "90-b2.h"
/*                  input Enter                 */
void InputEnter(int x)
{
```

装 订 线

```
	switch (x) {
		case(0):
			std::cout << "\n 按回车键继续\n";
			break;
		case(1):
			cout << "按回车键进行数组下落除 0 操作..." << endl;
			break;
		case(5):
			cout << "按回车键进行新值填充..." << endl;
			break;
		case(8):
			cout << "本次合成结束，按回车键继续新一次的合成..." << endl;
			break;
	}
	while (_getch() != '\r')
		;
}
/*                    generate random numer                    */
int GenerateRandom(int MaxNum)
{
	int tmp = rand() % (20) + 1;
	switch (MaxNum) {
		case(1):case(2):case(3):
			return rand() % 3 + 1;
		case(4):
			for (int i = 1; i <= 3; i++)
				if (tmp <= i * 6)
					return i;
			return 4;
		case(5):
			for (int i = 1; i <= 4; i++)
				if (tmp <= i * 5)
					return i;
			if (tmp <= 18)
				return 4;
			return 5;
		case(6):
			for (int i = 1; i <= 4; i++)
				if (tmp <= i * 4)
					return i;
			if (tmp <= 19)
				return 5;
			return 6;
		default:
			for (int i = 1; i <= MaxNum - 3; i++)
				if (tmp <= i * 16 / (MaxNum - 3))
					return i;
			if (tmp <= 18)
				return MaxNum - 2;
			if (tmp <= 19)
				return MaxNum - 1;
			return MaxNum;
	}
}
```

装 订 线

```
/*                              end sentences                              */
void EnterEnd()
{
	int cur_x, cur_y;
	char tmp[20];
	std::cout << "本小题结束，请输入 End 继续...";
	getxy(cur_x, cur_y);
	while (true) {
		cin >> tmp;
		if (strlen(tmp) == 3 && (tmp[0] == 'e' || tmp[0] == 'E')\
			&& (tmp[1] == 'n' || tmp[1] == 'N')\
			&& (tmp[2] == 'd' || tmp[2] == 'D'))
			break;
		showstr(cur_x, cur_y, "                ", COLOR_BLACK, COLOR_HWHITE);
		std::cout << "\n 输入错误，请重新输入.";
		gotoxy(cur_x, cur_y);
	}
	showch(0, cur_y + 1, ' ', COLOR_BLACK, COLOR_HWHITE, CLEAR);
}
/*                              DFS_recursion                              */
void DFS_recursion(int(*Table)[10], int(*MarkTable)[10], int *DT)
{
	int x = DT[Tmp_x], y = DT[Tmp_y];
	if ((x < 0 || x >= DT[Column] || y < 0 || y >= DT[Array]))
		return;
	//if (Table[x][y] == 0)	//	means to be (x<1 || x>Array || y<1 || y>Column)
	//	return;
	if (Table[DT[Orig_y]][DT[Orig_x]] != Table[y][x] || MarkTable[y][x] != UNSIGNED)
		return;
	MarkTable[y][x] = SIGNED;
	DT[Count]++;					//	counter
	for (int i = 0; i < 4; i++) {
		DT[Tmp_y] += MOVE_XY[i][0];
		DT[Tmp_x] += MOVE_XY[i][1];
		DFS_recursion(Table, MarkTable, DT);
		DT[Tmp_y] -= MOVE_XY[i][0];
		DT[Tmp_x] -= MOVE_XY[i][1];		//	important!
	}
	return;
}
/*choose the solutions according to the main function*/
void Solve(int(*Table)[10], int(*MarkTable)[10], int *DataTable)
{
	int *&DT = DataTable;
	setcolor(COLOR_BLACK, COLOR_HWHITE);
	switch (DT[Choice]) {
		case(1):case(2):
			setconsoleborder(INITIAL_Y, INITIAL_X);
			GenerateTable(Table, DT);
			PrintTable(Table, MarkTable, DT, 1);
			ExecuteCommand(Table, MarkTable, DT);
			PrintTable(Table, MarkTable, DT, 2);
			PrintTable(Table, MarkTable, DT, 3);
			break;
```

```
        case(3):case(4):
            setconsoleborder(INITIAL_Y, INITIAL_X);
            GenerateTable(Table, DT);
            do {
                PrintTable(Table, MarkTable, DT, 1);
                ExecuteCommand(Table, MarkTable, DT);
                PrintTable(Table, MarkTable, DT, 2);
                PrintTable(Table, MarkTable, DT, 3);
            } while (CombineNumber(Table, MarkTable, DT));
            break;
        case(5):
            GenerateTable(Table, DT);
            DrawFigure(Table, MarkTable, DT, false);
            break;
        case(6):
            GenerateTable(Table, DT);
            DrawFigure(Table, MarkTable, DT, true);
            break;
        case(7):
            GenerateTable(Table, DT);
            DrawFigure(Table, MarkTable, DT, true);
            ChooseBox(Table, MarkTable, DT);
            break;
        case(8):case(9):
            GenerateTable(Table, DT);
            DrawFigure(Table, MarkTable, DT, true);
            ChooseBox(Table, MarkTable, DT);
    }
    EnterEnd();
}
/*                    Initial Settings                    */
void InitialSetting(int(*Table)[10], int(*MarkTable)[10], int *DataTable)
{
    int cur_x, cur_y;
    std::cout << "请输入行数(5-8)：";
    while (true) {
        getxy(cur_x, cur_y);
        std::cin >> DataTable[Array];
        if (std::cin.good() && DataTable[Array] >= 5 && DataTable[Array] <= 8)
            break;
        showstr(cur_x, cur_y, "          ", COLOR_BLACK, COLOR_HWHITE);
        std::cin.clear();
        std::cin.ignore(1024, '\n');
        std::cout << "\n 输入不合法，请重新输入\n";
        gotoxy(cur_x, cur_y);
    }
    getxy(cur_x, cur_y);
    showch(cur_x, cur_y, ' ', COLOR_BLACK, COLOR_HWHITE, CLEAR);
    gotoxy(cur_x, cur_y);
    std::cout << "请输入列数(5-10)：";
    while (true) {
        getxy(cur_x, cur_y);
        std::cin >> DataTable[Column];
        if (std::cin.good() && DataTable[Column] >= 5 && DataTable[Column] <= 10)
```

```
                break;
            showstr(cur_x, cur_y, "            ", COLOR_BLACK, COLOR_HWHITE);
            std::cin.clear();
            std::cin.ignore(1024, '\n');
            std::cout << "\n 输入不合法，请重新输入\n";
            gotoxy(cur_x, cur_y);
        }
        getxy(cur_x, cur_y);
        showch(cur_x, cur_y, ' ', COLOR_BLACK, COLOR_HWHITE, CLEAR);
        gotoxy(cur_x, cur_y);
        std::cout << "请输入合成目标(5-20)：";
        if (DataTable[Choice] != 1 && DataTable[Choice] != 5 && DataTable[Choice] != 6)
            while (true) {
                getxy(cur_x, cur_y);
                std::cin >> DataTable[Goal];
                if (std::cin.good() && DataTable[Goal] >= 5 && DataTable[Goal] <= 20)
                    break;
                showstr(cur_x, cur_y, "            ", COLOR_BLACK, COLOR_HWHITE);
                std::cin.clear();
                std::cin.ignore(1024, '\n');
                std::cout << "\n 输入不合法，请重新输入\n";
                gotoxy(cur_x, cur_y);
            }
        memset(Table, 0, sizeof(int) * 10 * 10);
        memset(MarkTable, UNSIGNED, sizeof(int) * 10 * 10);
        DataTable[Level] = 3;
}
/*                              Easter Egg                              */
void PrintEasterEgg()
{
        printf("::\n                                    :;J7, :,                                \
         ::;7:\n                                   ,ivYi, ,                                   ;\
LLLFS:\n                                    :iv7Yi                                   :7ri;j5\
PL\n                                  ,:ivYLvr                                ,ivrrirrY2X,\n\
                                  :;r@Wwz.7r:                          :ivu@kexianli.\n      \
                           :iL7::,:::iiirii:ii;::::,,irvF7rvvLujL7ur\n              \
                    ri::,:,::i:iiiiiii:i:irrv177JX7rYXqZEkvv17\n                    \
         ;i:, , ::::iirrririi:i:::iiir2XXvii;L8OGJr71i\n                           :\
,, ,,:      ,::ir@mingyi.irii:i:::j1jri7ZBOS7ivv,\n                             ,:\
:,       ::rv77iiiriii:iii:i::,rvLq@huhao.Li\n                     ,,          ,, \
,:ir7ir::,:::i;ir:::i:i::rSGGYri712:\n                   :::    ,v7r:: ::rrv7\
7:, ,, ,:i7rrii::::, ir7ri7Lri\n                  ,          2OBBOi,iiir;r::     \
         ,irriiii::,, ,iv7Luur:\n              ,,          i78MBBi,:,:::,:,    :7FSL\
: ,iriii:::i::,,:rLqXv::\n              :            iuMMP: :,:::,:ii;2GY7OBB0v\
iiii:i:iii:i:::iJqL;::\n            ,           ::::i      ,,,,, ::LuBBu BBBBBEri\
i:i:i:i:i:i:i:r77ii\n           ,             :            , ,,:::rruBZ1MBBqi, :,,,\
:::,::::::iiriri:\n          ,                          ,,,,::::i:    @arqiao.            \
,:,, ,:::ii;i7:\n        :,             rjujLYLi      ,,:::::,:::::::::,,      ,:i,\
:,,,,,::i:iii\n        ::             BBBBBBBBB0,        ,,::: , ,:::::: ,            ,,\
,, ,,::::::\n        i,    ,    ,8BMMBBBBBBi         ,,:,,          ,,, , ,       , , ,\
  :,::ii::i::\n        :            iZMOMOMBBM2::::::::::,,,,          ,,,,,,:,,,::\
::i:irr:i:::,\n        i      ,,:;u0MBMOG1L:::i::::::    ,,,::,       ,,, ::::::\
i:i:iirii:i:i:\n        :        ,iuUuuXUkFu7i:iii:i:::, :,:,: ::::::::i:i:\
::::iirr7iiri::\n        :          :rk@Yizero.i:::::, ,:ii:::::::i:::::i::,\
```

装

订

线

```
::::iirrriiiri::,\n          :            5BMBBBBBBSr:,::rv2kuii:::iii::,:i:,,\
 , ,,:,:i@petermu.,\n                    , :r50EZ8MBBBBGOBBBZP7::::i::,:::::,\
: :,:,::i;rrririiii::\n                          :jujYY7LS0ujJL7r::,::i::,:::::\
:::::::::iirirrrrrrr:ii:\n                      ,:    :@kevensun.:,:,,,::::i:i::\
:::,,::::::iir;ii;7v77;ii;i,\n                    ,,,          ,,:,::::::i:iiiii:\
i::::,, ::::iiiir@xingjief.r;7:i,\n              , , ,,,:,,::::::::iiiiii\
iiii:,:,:::::::::iiir;ri7vL77rrirri::\n                 :,, , ::::::::i:::i\
:::i:i::,,,,,:,::i:i:::iir;@Secbone.ii:::\n");
        std::cout << "再次把纯洁、爽朗而又不失礼节的笑容送给您\n";
}
```

装

订

线