國立交通大學 National Chiao Tung University

109-2 1177 資料結構與物件導向程式設計

Homework 1 – Dungeon

Paper Report

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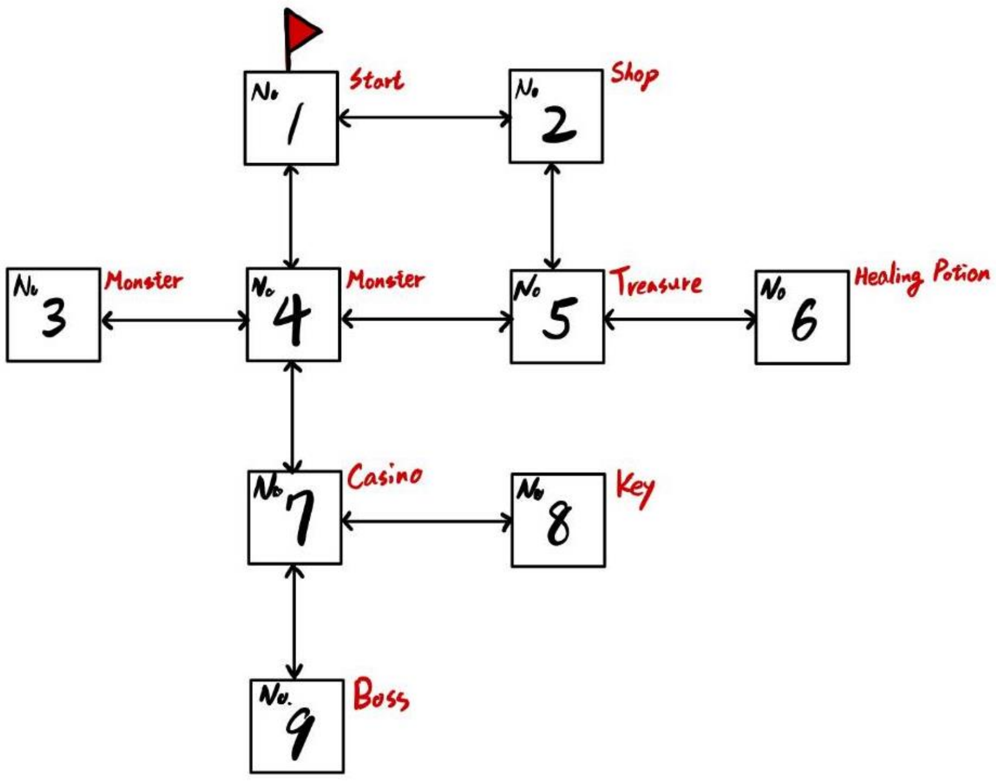
1. Outline

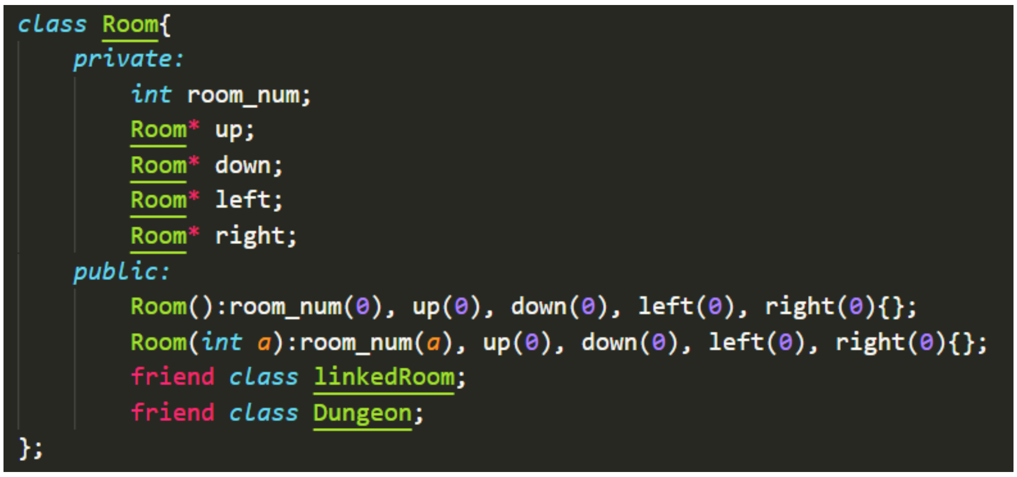
1.1. Dungeon Map



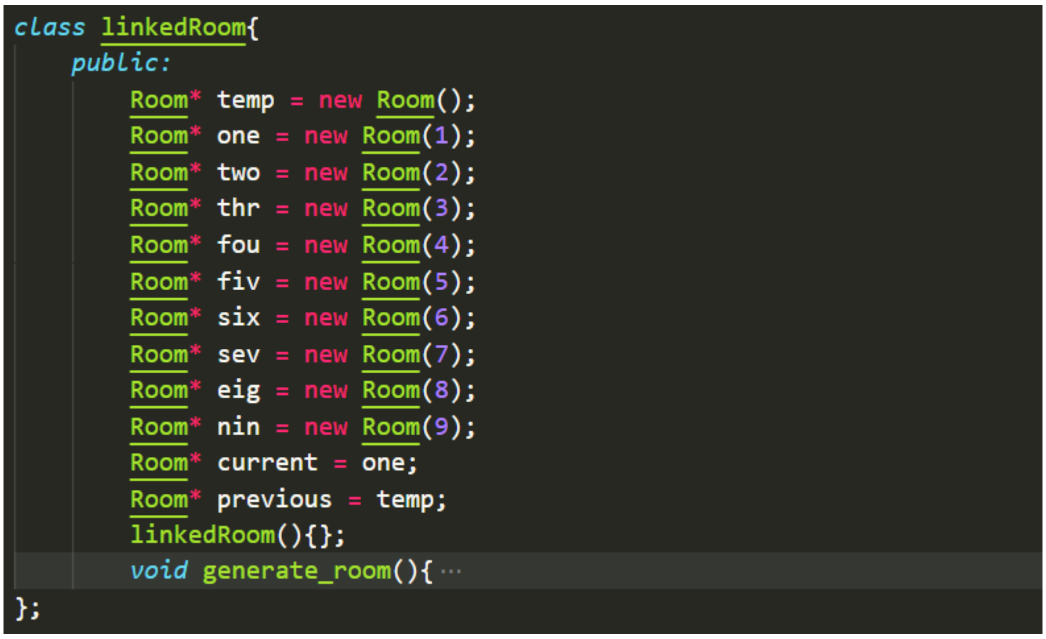
1.2. Libraries

```
#include <iostream>
#include <string>
#include <vector>
#include <algorithm>
#include <cstdlib>
#include <ctime>
#include <fstream>
```

1.3. Class Room / linkedRoom

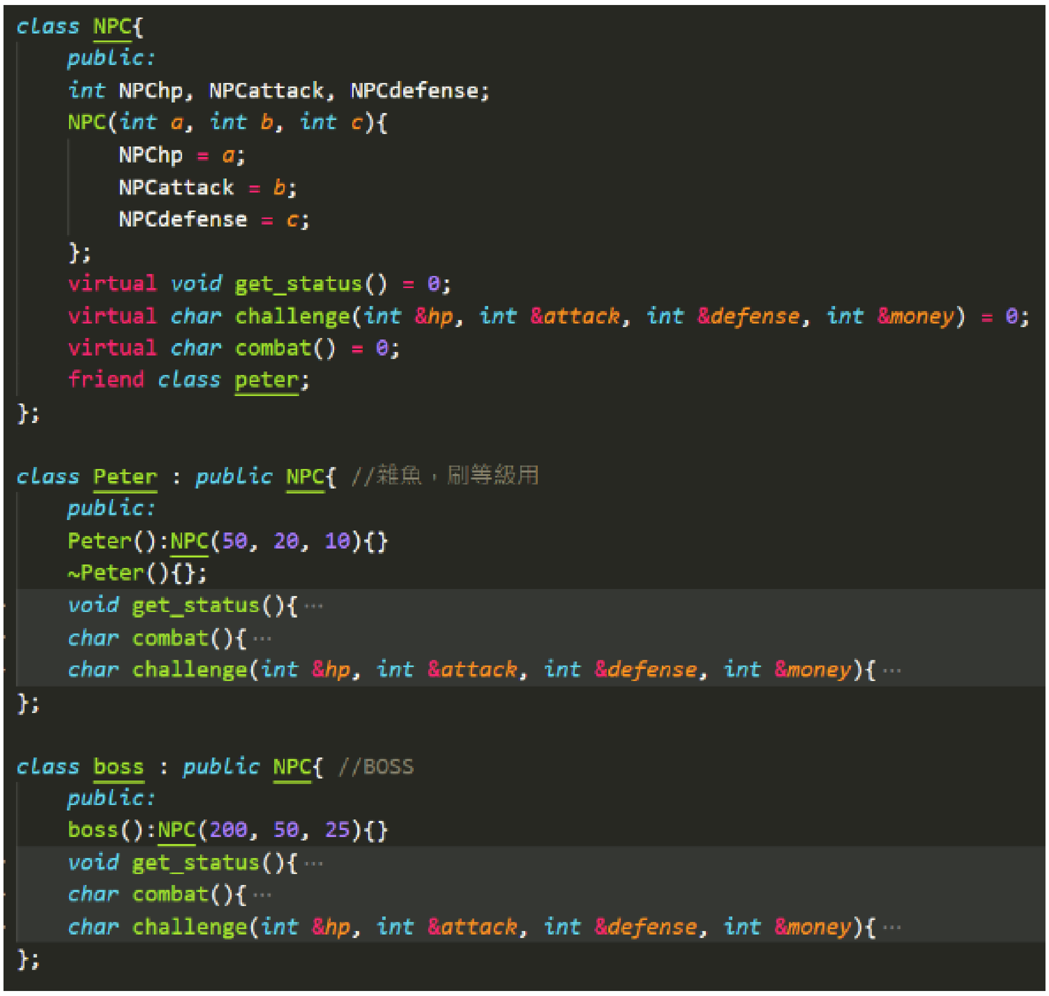


```
class Room{
    private:
        int room_num;
        Room* up;
        Room* down;
        Room* left;
        Room* right;
    public:
        Room():room_num(0), up(0), down(0), left(0), right(0){};
        Room(int a):room_num(a), up(0), down(0), left(0), right(0){};
        friend class linkedRoom;
        friend class Dungeon;
};
```



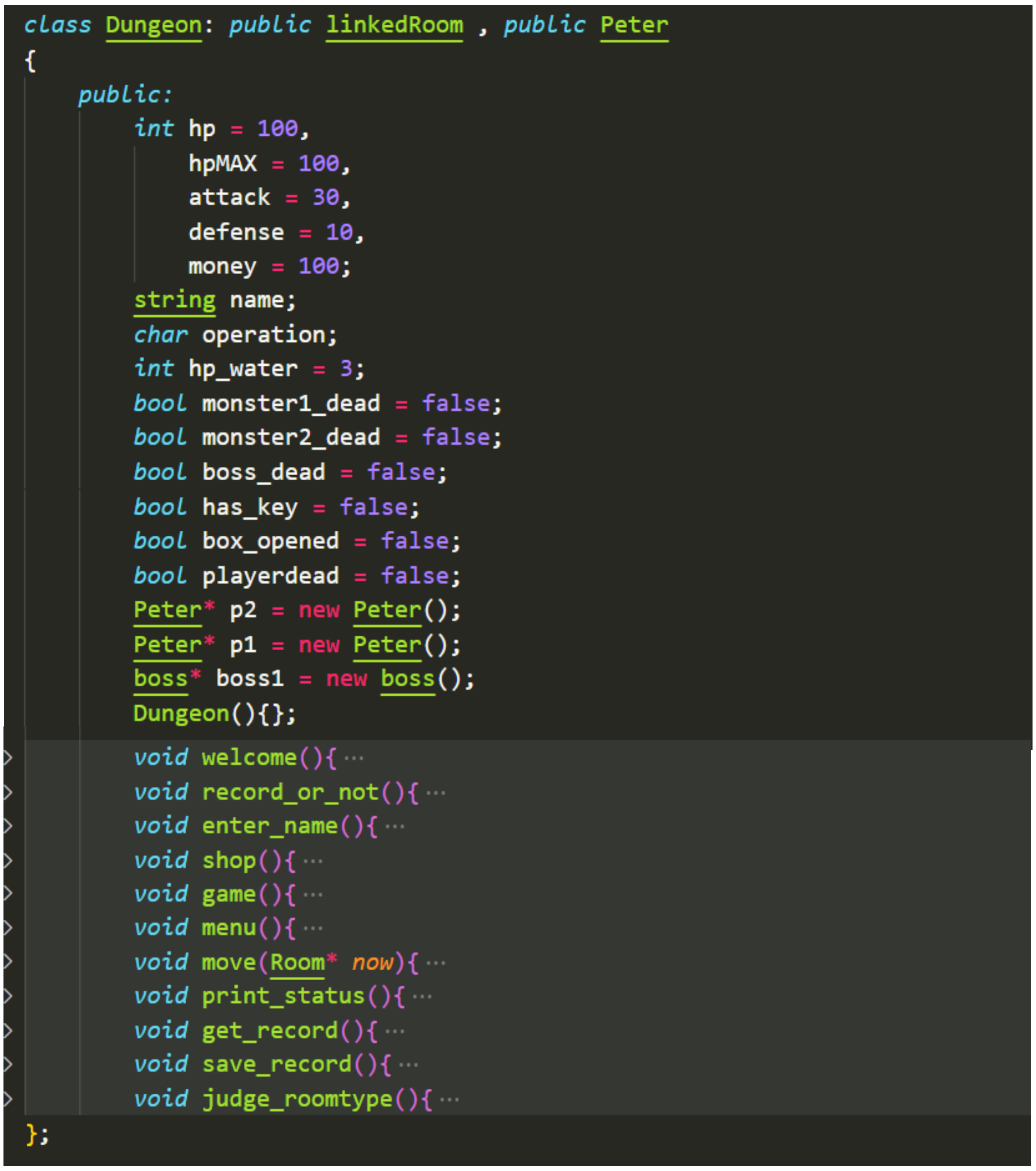
```
class linkedRoom{
    public:
        Room* temp = new Room();
        Room* one = new Room(1);
        Room* two = new Room(2);
        Room* thr = new Room(3);
        Room* fou = new Room(4);
        Room* fiv = new Room(5);
        Room* six = new Room(6);
        Room* sev = new Room(7);
        Room* eig = new Room(8);
        Room* nin = new Room(9);
        Room* current = one;
        Room* previous = temp;
        linkedRoom(){};
        void generate_room(){…
};
```

1.4. Class NPC / Peter / boss



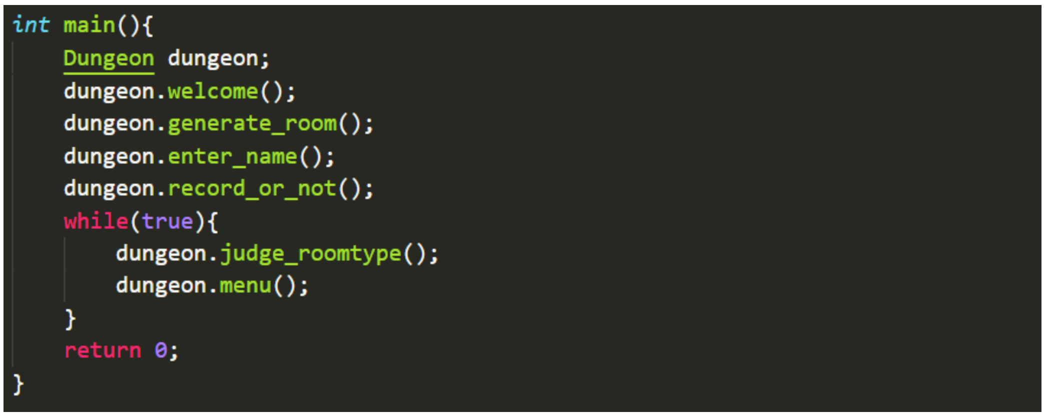
```
class NPC{
    public:
    int NPChp, NPCattack, NPCdefense;
    NPC(int a, int b, int c){
        NPChp = a;
        NPCattack = b;
        NPCdefense = c;
    };
    virtual void get_status() = 0;
    virtual char challenge(int &hp, int &attack, int &defense, int &money) = 0;
    virtual char combat() = 0;
    friend class peter;
};

class Peter : public NPC{ //雜魚，刷等級用
    public:
    Peter():NPC(50, 20, 10){}
    ~Peter(){};
    void get_status(){…
    char combat(){…
    char challenge(int &hp, int &attack, int &defense, int &money){…
};

class boss : public NPC{ //BOSS
    public:
    boss():NPC(200, 50, 25){}
    void get_status(){…
    char combat(){…
    char challenge(int &hp, int &attack, int &defense, int &money){…
};
```

1.5. Class Dungeon



```
class Dungeon: public linkedRoom , public Peter
{
    public:
        int hp = 100,
            hpMAX = 100,
            attack = 30,
            defense = 10,
            money = 100;
        string name;
        char operation;
        int hp_water = 3;
        bool monster1_dead = false;
        bool monster2_dead = false;
        bool boss_dead = false;
        bool has_key = false;
        bool box_opened = false;
        bool playerdead = false;
        Peter* p2 = new Peter();
        Peter* p1 = new Peter();
        boss* boss1 = new boss();
        Dungeon(){};
        void welcome(){ ···
        void record_or_not(){ ···
        void enter_name(){ ···
        void shop(){ ···
        void game(){ ···
        void menu(){ ···
        void move(Room* now){ ···
        void print_status(){ ···
        void get_record(){ ···
        void save_record(){ ···
        void judge_roomtype(){ ···
};
```

1.6. Main Function



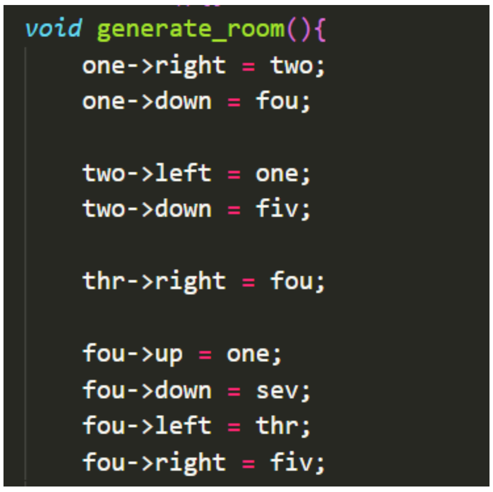
```
int main(){
    Dungeon dungeon;
    dungeon.welcome();
    dungeon.generate_room();
    dungeon.enter_name();
    dungeon.record_or_not();
    while(true){
        dungeon.judge_roomtype();
        dungeon.menu();
    }
    return 0;
}
```

2. Basic Functions

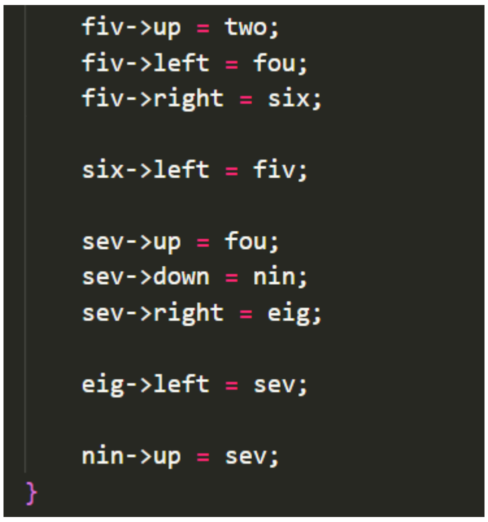
2.1. Dungeon Generate and Movement

我的 dungeon 宣告及數量是由 Class Dungeon / linkedRoom 來完成的，

在 Class Room 裡我先宣告好每一個 dungeon 都會有它的 up, down, right, left 的 pointer 及它的號碼(詳情可見 1.3)，然後再由 Class linkedRoom 裡的 void generate()來把各個生成的 dungeon 串聯在一起:

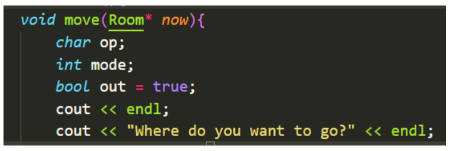


```cpp
void generate_room(){
    one->right = two;
    one->down = fou;

    two->left = one;
    two->down = fiv;

    thr->right = fou;

    fou->up = one;
    fou->down = sev;
    fou->left = thr;
    fou->right = fiv;
```

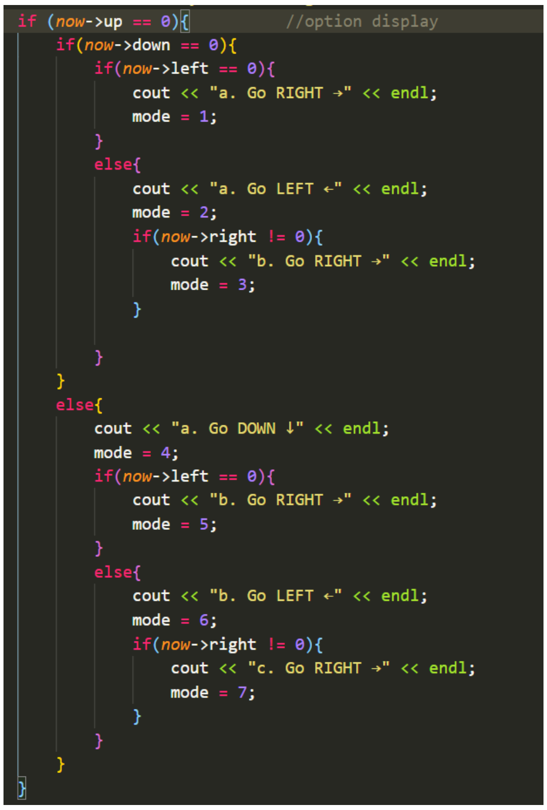


```cpp
    fiv->up = two;
    fiv->left = fou;
    fiv->right = six;

    six->left = fiv;

    sev->up = fou;
    sev->down = nin;
    sev->right = eig;

    eig->left = sev;

    nin->up = sev;
}
```

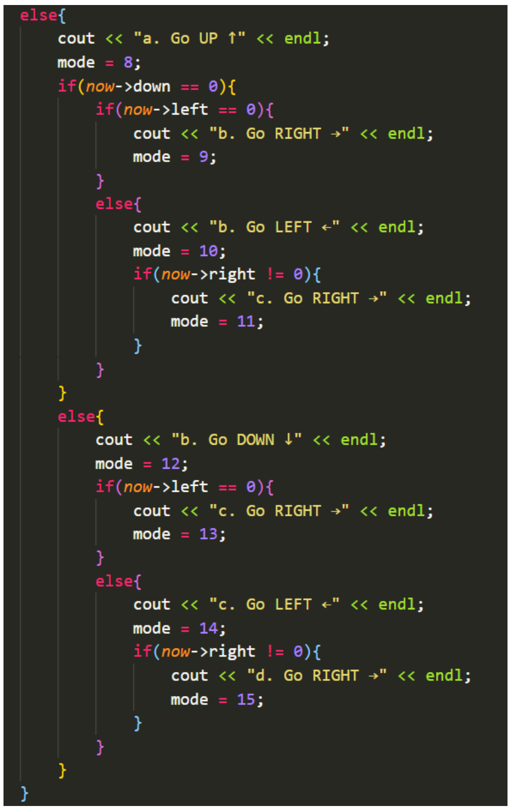
而至於玩家在 dungeon 中的移動，我是藉由 Class Dungeon 裡的方程式 void move(Room* now)來完成，方程一開始先判別現在所在的 dungeon 上下左右有沒有路可走，如果有才顯示出選項，最後再根據使用者輸入選項來讓玩家在地窖內移動:



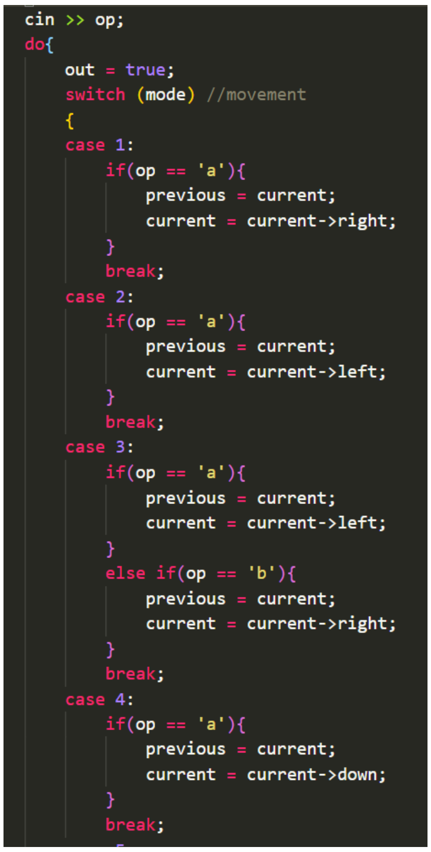
```cpp
void move(Room* now){
    char op;
    int mode;
    bool out = true;
    cout << "Where do you want to go?" << endl;
```



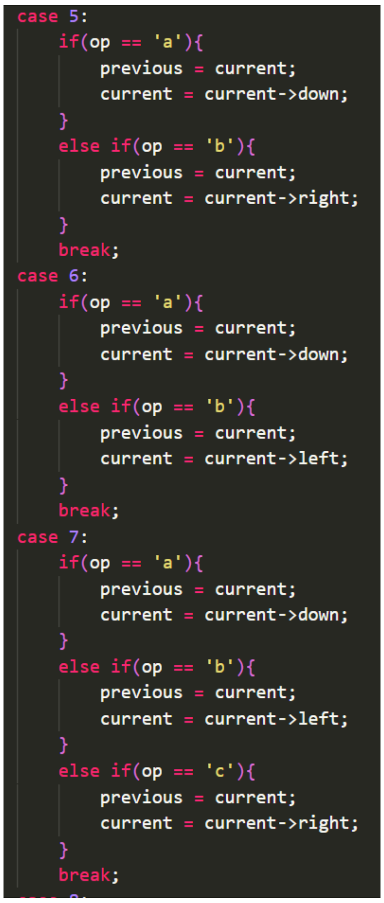
```cpp
if (now->up == 0){          //option display
    if(now->down == 0){
        if(now->left == 0){
            cout << "a. Go RIGHT →" << endl;
            mode = 1;
        }
        else{
            cout << "a. Go LEFT ←" << endl;
            mode = 2;
            if(now->right != 0){
                cout << "b. Go RIGHT →" << endl;
                mode = 3;
            }

        }
    }
    else{
        cout << "a. Go DOWN ↓" << endl;
        mode = 4;
        if(now->left == 0){
            cout << "b. Go RIGHT →" << endl;
            mode = 5;
        }
        else{
            cout << "b. Go LEFT ←" << endl;
            mode = 6;
            if(now->right != 0){
                cout << "c. Go RIGHT →" << endl;
                mode = 7;
            }
        }
    }
}
```



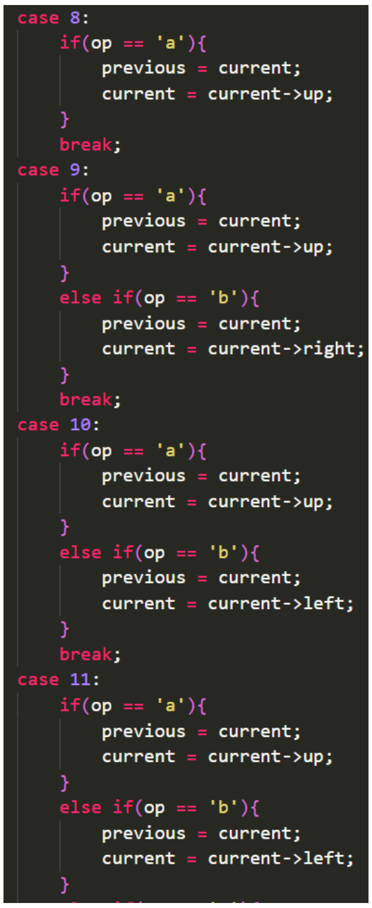
```cpp
else{
    cout << "a. Go UP ↑" << endl;
    mode = 8;
    if(now->down == 0){
        if(now->left == 0){
            cout << "b. Go RIGHT →" << endl;
            mode = 9;
        }
        else{
            cout << "b. Go LEFT ←" << endl;
            mode = 10;
            if(now->right != 0){
                cout << "c. Go RIGHT →" << endl;
                mode = 11;
            }
        }
    }
    else{
        cout << "b. Go DOWN ↓" << endl;
        mode = 12;
        if(now->left == 0){
            cout << "c. Go RIGHT →" << endl;
            mode = 13;
        }
        else{
            cout << "c. Go LEFT ←" << endl;
            mode = 14;
            if(now->right != 0){
                cout << "d. Go RIGHT →" << endl;
                mode = 15;
            }
        }
    }
}
```



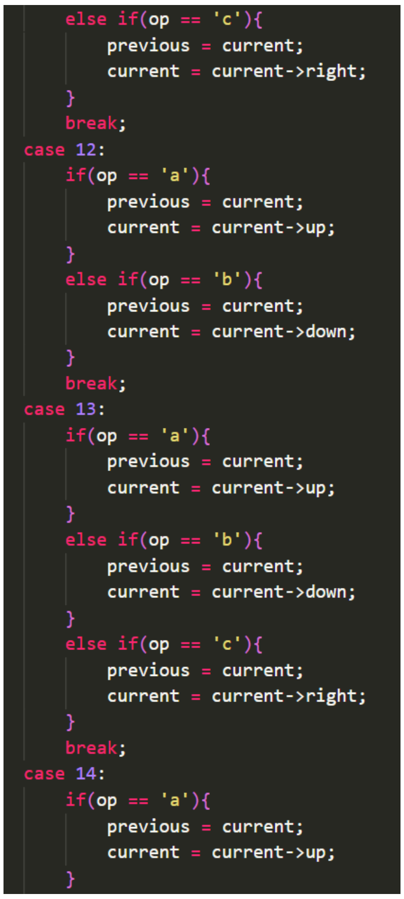
```
cin >> op;
do{
    out = true;
    switch (mode) //movement
    {
    case 1:
        if(op == 'a'){
            previous = current;
            current = current->right;
        }
        break;
    case 2:
        if(op == 'a'){
            previous = current;
            current = current->left;
        }
        break;
    case 3:
        if(op == 'a'){
            previous = current;
            current = current->left;
        }
        else if(op == 'b'){
            previous = current;
            current = current->right;
        }
        break;
    case 4:
        if(op == 'a'){
            previous = current;
            current = current->down;
        }
        break;
```



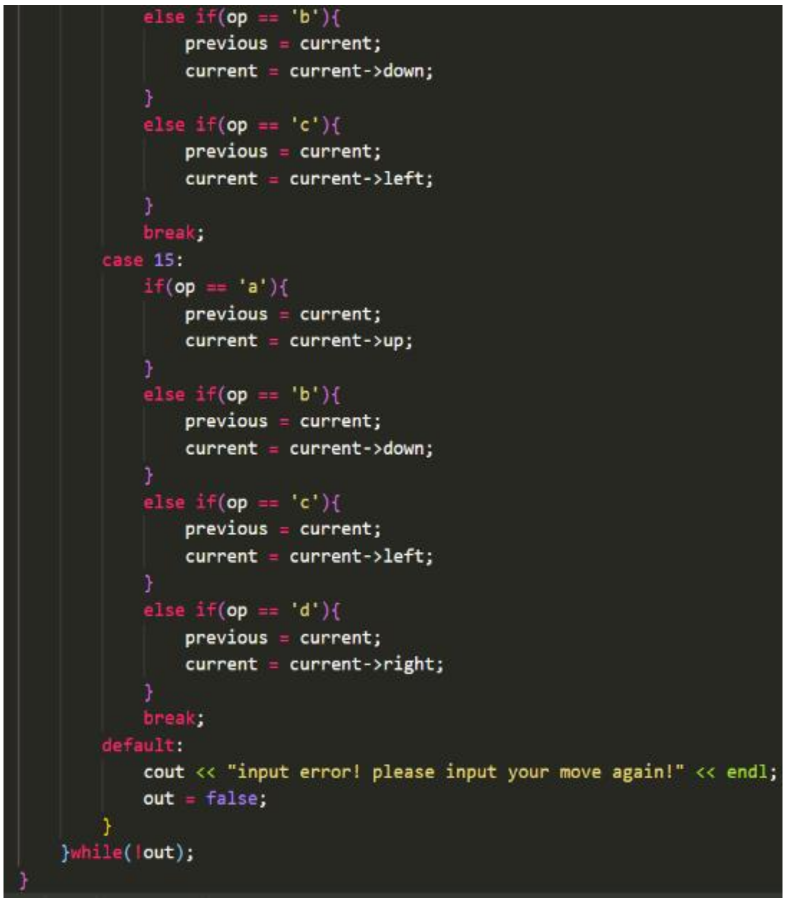
```
case 5:
    if(op == 'a'){
        previous = current;
        current = current->down;
    }
    else if(op == 'b'){
        previous = current;
        current = current->right;
    }
    break;
case 6:
    if(op == 'a'){
        previous = current;
        current = current->down;
    }
    else if(op == 'b'){
        previous = current;
        current = current->left;
    }
    break;
case 7:
    if(op == 'a'){
        previous = current;
        current = current->down;
    }
    else if(op == 'b'){
        previous = current;
        current = current->left;
    }
    else if(op == 'c'){
        previous = current;
        current = current->right;
    }
    break;
```



```
case 8:
    if(op == 'a'){
        previous = current;
        current = current->up;
    }
    break;
case 9:
    if(op == 'a'){
        previous = current;
        current = current->up;
    }
    else if(op == 'b'){
        previous = current;
        current = current->right;
    }
    break;
case 10:
    if(op == 'a'){
        previous = current;
        current = current->up;
    }
    else if(op == 'b'){
        previous = current;
        current = current->left;
    }
    break;
case 11:
    if(op == 'a'){
        previous = current;
        current = current->up;
    }
    else if(op == 'b'){
        previous = current;
        current = current->left;
    }
```



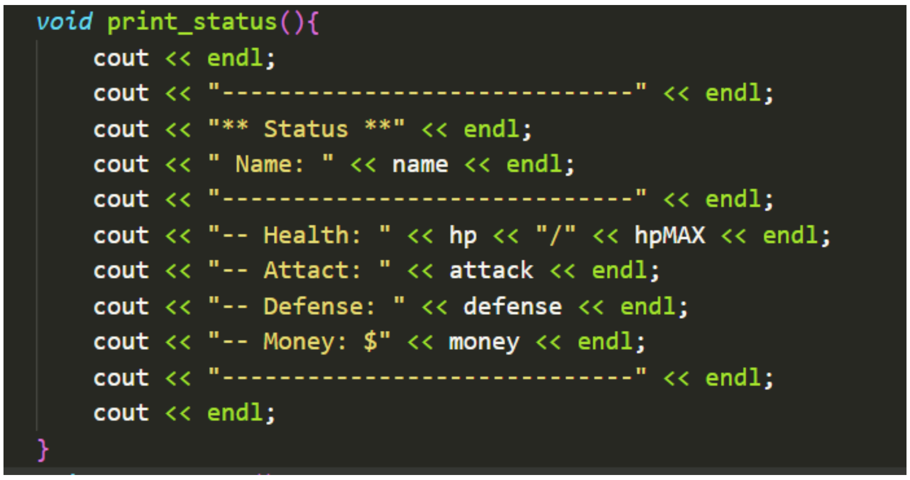
```
    else if(op == 'c'){
        previous = current;
        current = current->right;
    }
    break;
case 12:
    if(op == 'a'){
        previous = current;
        current = current->up;
    }
    else if(op == 'b'){
        previous = current;
        current = current->down;
    }
    break;
case 13:
    if(op == 'a'){
        previous = current;
        current = current->up;
    }
    else if(op == 'b'){
        previous = current;
        current = current->down;
    }
    else if(op == 'c'){
        previous = current;
        current = current->right;
    }
    break;
case 14:
    if(op == 'a'){
        previous = current;
        current = current->up;
    }
```



```
            else if(op == 'b'){
                previous = current;
                current = current->down;
            }
            else if(op == 'c'){
                previous = current;
                current = current->left;
            }
            break;
        case 15:
            if(op == 'a'){
                previous = current;
                current = current->up;
            }
            else if(op == 'b'){
                previous = current;
                current = current->down;
            }
            else if(op == 'c'){
                previous = current;
                current = current->left;
            }
            else if(op == 'd'){
                previous = current;
                current = current->right;
            }
            break;
        default:
            cout << "input error! please input your move again!" << endl;
            out = false;
        }
    }while(!out);
}
```

2.2. Showing Status

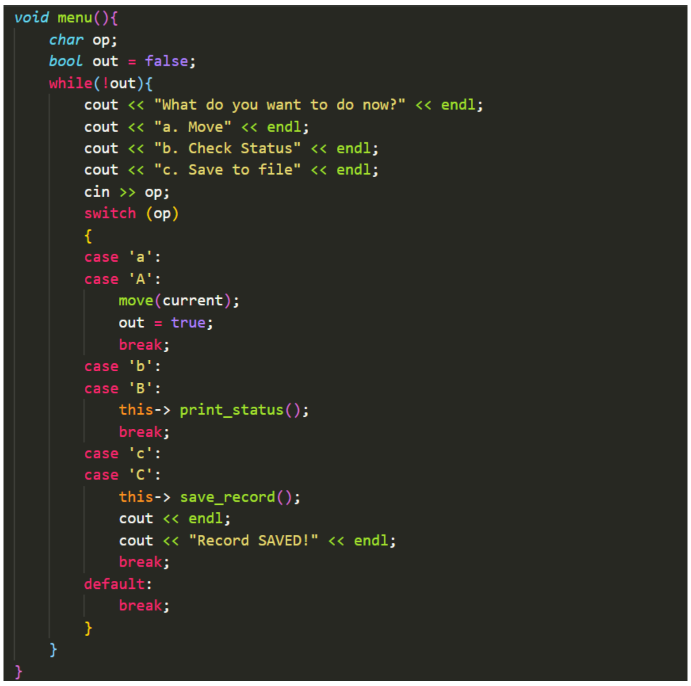
遊戲中有選項可以顯示玩家當下的資訊，包含血量、攻擊力、防禦力、金錢，而顯示是由 Class Dungeon 中的 void print_status()來完成:



```
void print_status(){
    cout << endl;
    cout << "------------------------------" << endl;
    cout << "** Status **" << endl;
    cout << " Name: " << name << endl;
    cout << "------------------------------" << endl;
    cout << "-- Health: " << hp << "/" << hpMAX << endl;
    cout << "-- Attact: " << attack << endl;
    cout << "-- Defense: " << defense << endl;
    cout << "-- Money: $" << money << endl;
    cout << "------------------------------" << endl;
    cout << endl;
}
```

2.3. Action Menu

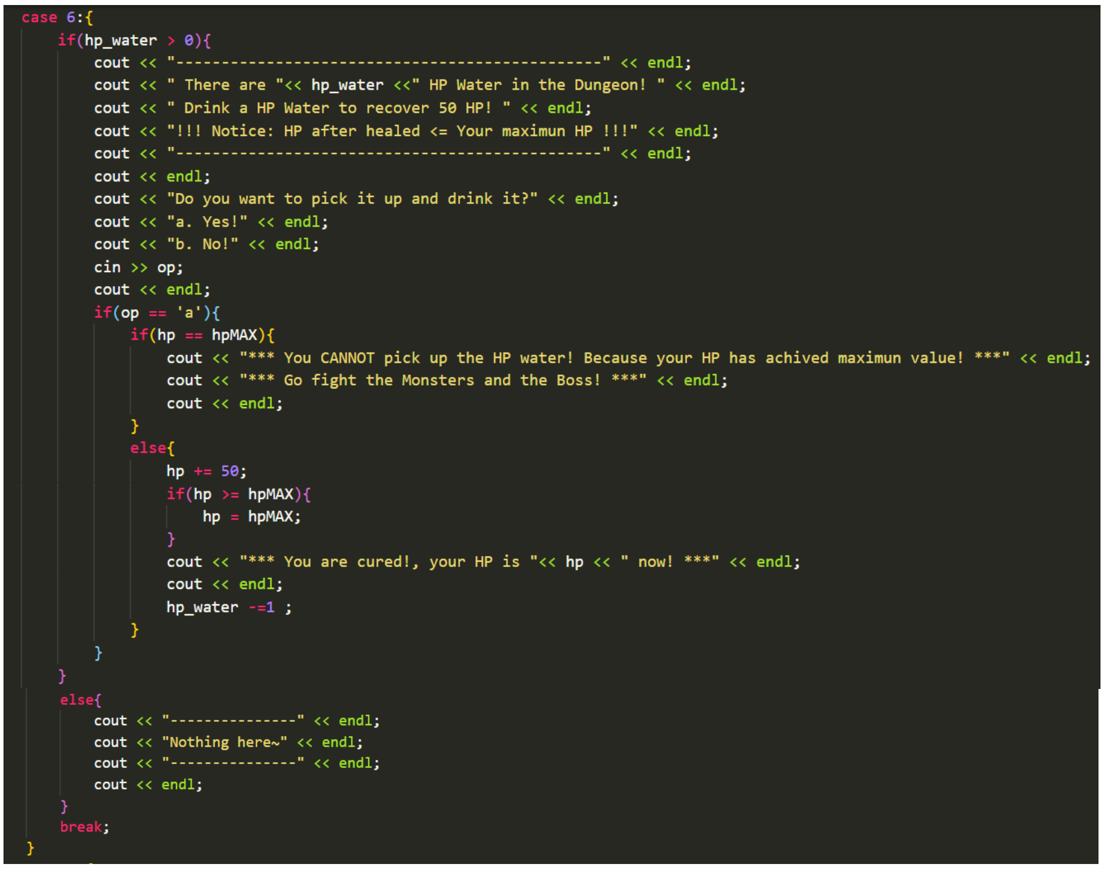
玩家透過選單可以完成基本操作，包含移動、查看自身狀態和存檔，這是由 Class Dungeon 中的 void menu()來完成的:



```
void menu(){
    char op;
    bool out = false;
    while(!out){
        cout << "What do you want to do now?" << endl;
        cout << "a. Move" << endl;
        cout << "b. Check Status" << endl;
        cout << "c. Save to file" << endl;
        cin >> op;
        switch (op)
        {
        case 'a':
        case 'A':
            move(current);
            out = true;
            break;
        case 'b':
        case 'B':
            this-> print_status();
            break;
        case 'c':
        case 'C':
            this-> save_record();
            cout << endl;
            cout << "Record SAVED!" << endl;
            break;
        default:
            break;
        }
    }
}
```

2.4. Pick up Items

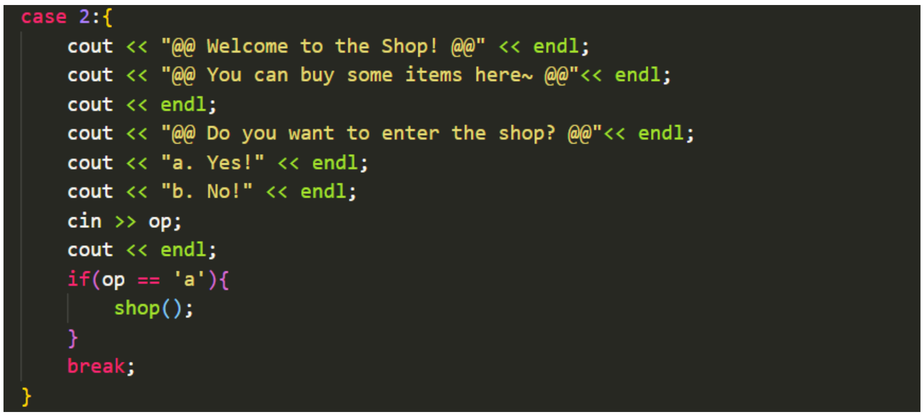
在 6 號 dungeon 中有 3 瓶回血藥水給玩家拿取，每喝一瓶可以恢復 50 點生命值，但回覆的上限為玩家的最大生命值，沒辦法回復到爆表。當三瓶回血藥水都被喝完後，6 號 dungeon 就變成一個空的 dungeon。實作的程式碼位於 Class Dungeon 中的 void judge_roomtype()裡:



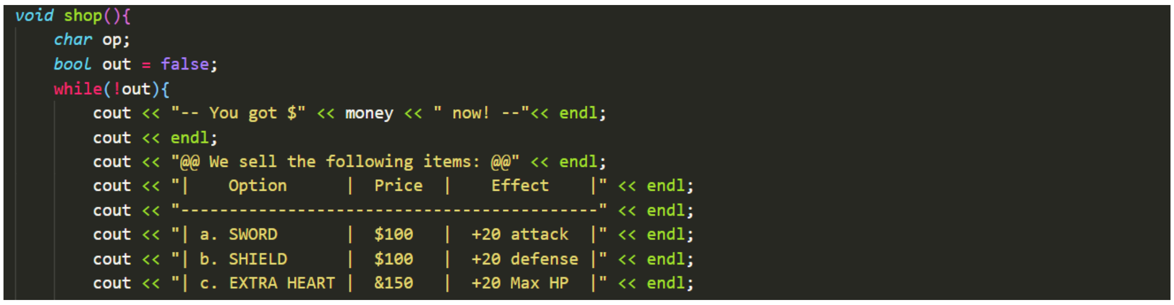
```
case 6:{
    if(hp_water > 0){
        cout << "-------------------------------------------------" << endl;
        cout << " There are "<< hp_water <<" HP Water in the Dungeon! " << endl;
        cout << " Drink a HP Water to recover 50 HP! " << endl;
        cout << "!!! Notice: HP after healed <= Your maximun HP !!!" << endl;
        cout << "-------------------------------------------------" << endl;
        cout << endl;
        cout << "Do you want to pick it up and drink it?" << endl;
        cout << "a. Yes!" << endl;
        cout << "b. No!" << endl;
        cin >> op;
        cout << endl;
        if(op == 'a'){
            if(hp == hpMAX){
                cout << "*** You CANNOT pick up the HP water! Because your HP has achived maximun value! ***" << endl;
                cout << "*** Go fight the Monsters and the Boss! ***" << endl;
                cout << endl;
            }
            else{
                hp += 50;
                if(hp >= hpMAX){
                    hp = hpMAX;
                }
                cout << "*** You are cured!, your HP is "<< hp << " now! ***" << endl;
                cout << endl;
                hp_water -=1 ;
            }
        }
    }
    else{
        cout << "---------------" << endl;
        cout << "Nothing here~" << endl;
        cout << "---------------" << endl;
        cout << endl;
    }
    break;
}
```

2.5. NPC

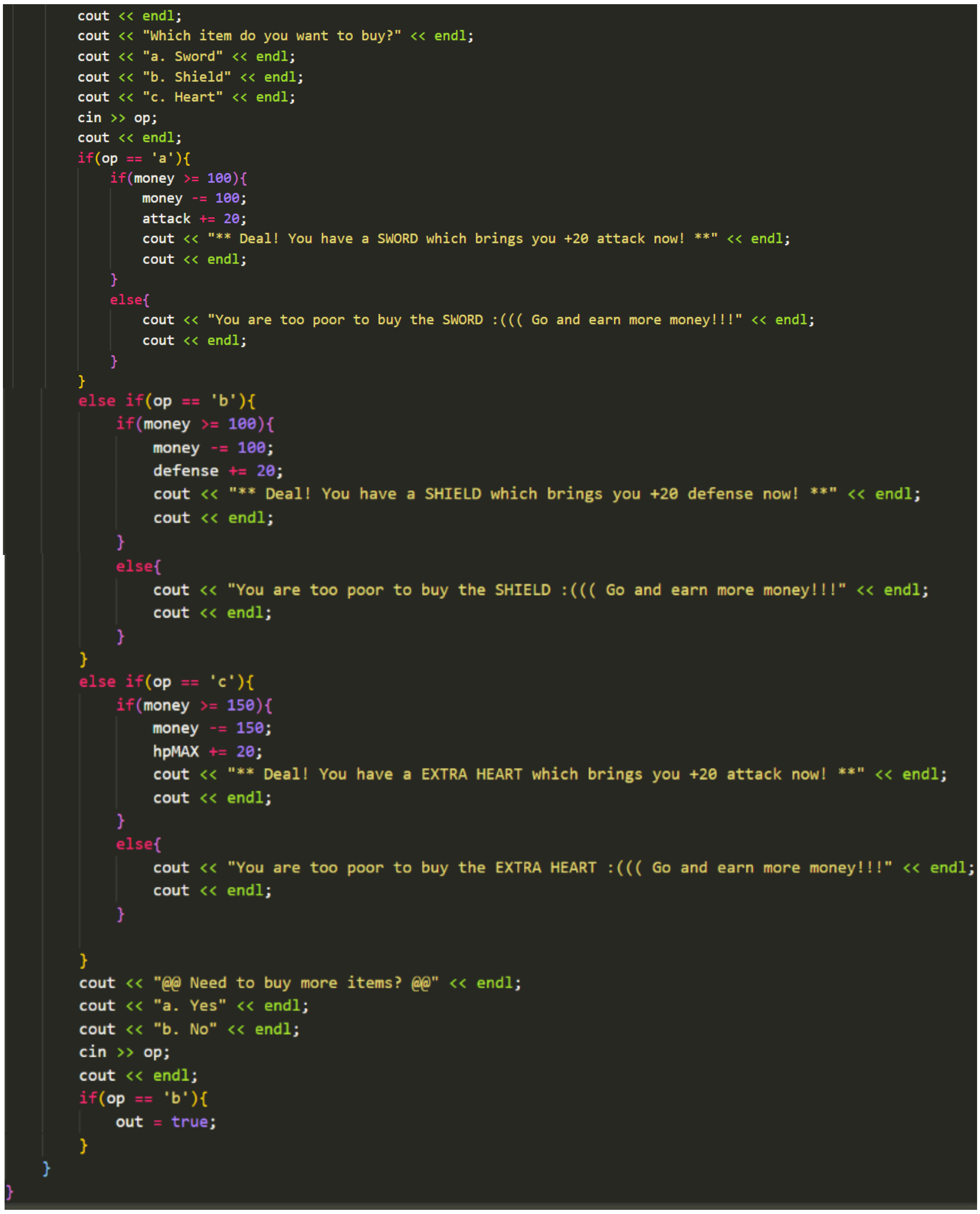
我的dungeon中有三種NPC角色，分別是商人、小怪獸和大Boss。有關商人的部分，它的商店有賣劍、盾牌及額外生命，玩家可以用自己的錢去跟商人買東西，而這部分由 Class Dungeon 中的 void judge_roomtype()和 void shop()來實現:



```
case 2:{
    cout << "@@ Welcome to the Shop! @@" << endl;
    cout << "@@ You can buy some items here~ @@"<< endl;
    cout << endl;
    cout << "@@ Do you want to enter the shop? @@"<< endl;
    cout << "a. Yes!" << endl;
    cout << "b. No!" << endl;
    cin >> op;
    cout << endl;
    if(op == 'a'){
        shop();
    }
    break;
}
```



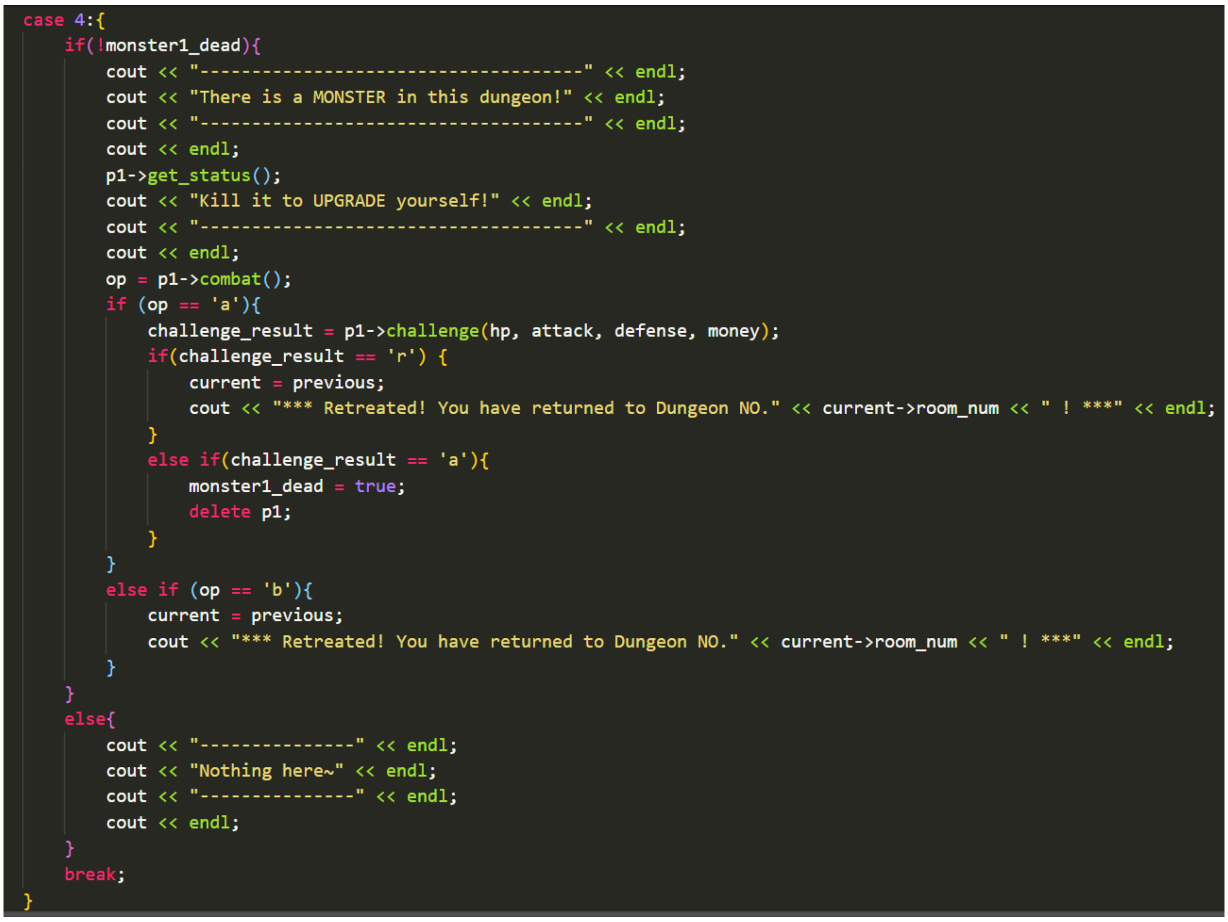
```
void shop(){
    char op;
    bool out = false;
    while(!out){
        cout << "-- You got $" << money << " now! --"<< endl;
        cout << endl;
        cout << "@@ We sell the following items: @@" << endl;
        cout << "|    Option      |  Price  |    Effect    |" << endl;
        cout << "-------------------------------------------" << endl;
        cout << "| a. SWORD       |  $100   |  +20 attack  |" << endl;
        cout << "| b. SHIELD      |  $100   |  +20 defense |" << endl;
        cout << "| c. EXTRA HEART |  &150   |  +20 Max HP  |" << endl;
```



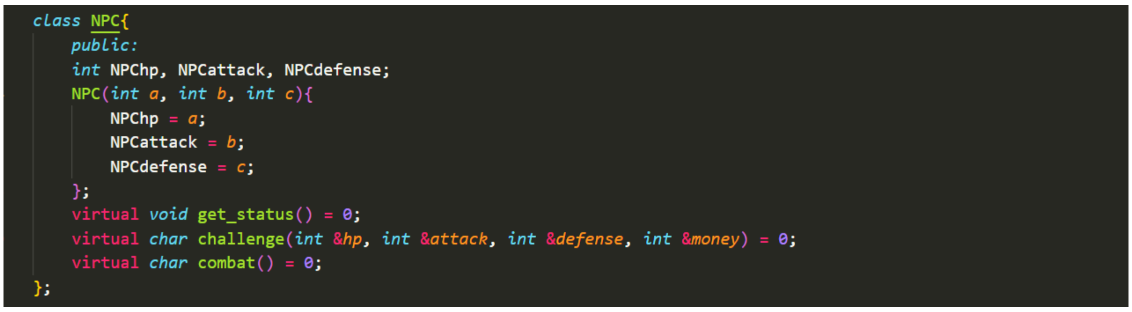
```
                cout << endl;
                cout << "Which item do you want to buy?" << endl;
                cout << "a. Sword" << endl;
                cout << "b. Shield" << endl;
                cout << "c. Heart" << endl;
                cin >> op;
                cout << endl;
                if(op == 'a'){
                    if(money >= 100){
                        money -= 100;
                        attack += 20;
                        cout << "** Deal! You have a SWORD which brings you +20 attack now! **" << endl;
                        cout << endl;
                    }
                    else{
                        cout << "You are too poor to buy the SWORD :((( Go and earn more money!!!" << endl;
                        cout << endl;
                    }
                }
                else if(op == 'b'){
                    if(money >= 100){
                        money -= 100;
                        defense += 20;
                        cout << "** Deal! You have a SHIELD which brings you +20 defense now! **" << endl;
                        cout << endl;
                    }
                    else{
                        cout << "You are too poor to buy the SHIELD :((( Go and earn more money!!!" << endl;
                        cout << endl;
                    }
                }
                else if(op == 'c'){
                    if(money >= 150){
                        money -= 150;
                        hpMAX += 20;
                        cout << "** Deal! You have a EXTRA HEART which brings you +20 attack now! **" << endl;
                        cout << endl;
                    }
                    else{
                        cout << "You are too poor to buy the EXTRA HEART :((( Go and earn more money!!!" << endl;
                        cout << endl;
                    }

                }
                cout << "@@ Need to buy more items? @@" << endl;
                cout << "a. Yes" << endl;
                cout << "b. No" << endl;
                cin >> op;
                cout << endl;
                if(op == 'b'){
                    out = true;
                }
    }
}
```

接下來是小怪獸，遊戲中一共有兩隻小怪獸，分別在兩個不同的 dungeon 中，他們的血量、攻擊力和防禦力都是一樣的，玩家遇到小怪獸時可以選擇跟它戰鬥又或是撤退，在沒有把該 dungeon 中的小怪獸打敗前，玩家是無法通過該 dungeon 的，如果打敗了小怪獸的話，小怪獸就會消失，該 dungeon 內就什麼也不剩了，玩家也就此進入該 dungeon，而小怪獸的功能由 Class Dungeon 的 void judge_roomtype(), Class NPC 和 Class Peter 相輔相成，以

下以在 4 號 dungeon 的小怪獸 monster1 為例:

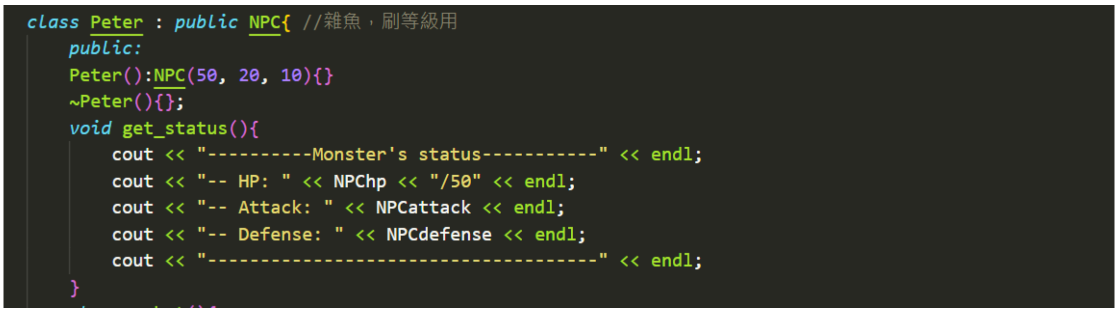


```
case 4:{
    if(!monster1_dead){
        cout << "-------------------------------------" << endl;
        cout << "There is a MONSTER in this dungeon!" << endl;
        cout << "-------------------------------------" << endl;
        cout << endl;
        p1->get_status();
        cout << "Kill it to UPGRADE yourself!" << endl;
        cout << "-------------------------------------" << endl;
        cout << endl;
        op = p1->combat();
        if (op == 'a'){
            challenge_result = p1->challenge(hp, attack, defense, money);
            if(challenge_result == 'r') {
                current = previous;
                cout << "*** Retreated! You have returned to Dungeon NO." << current->room_num << " ! ***" << endl;
            }
            else if(challenge_result == 'a'){
                monster1_dead = true;
                delete p1;
            }
        }
        else if (op == 'b'){
            current = previous;
            cout << "*** Retreated! You have returned to Dungeon NO." << current->room_num << " ! ***" << endl;
        }
    }
    else{
        cout << "---------------" << endl;
        cout << "Nothing here~" << endl;
        cout << "---------------" << endl;
        cout << endl;
    }
    break;
}
```

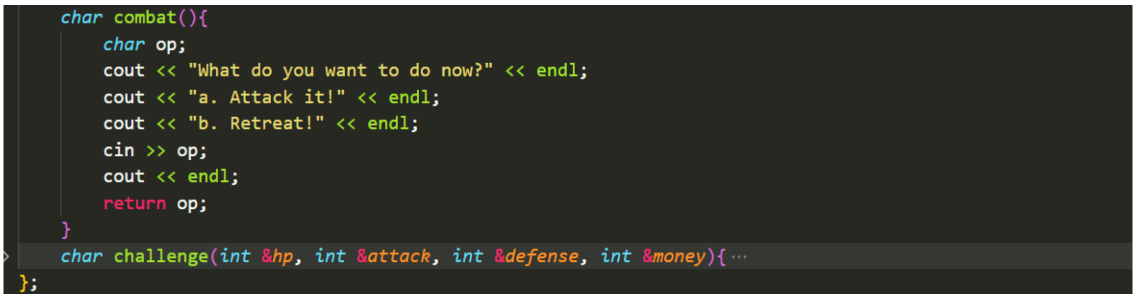


```
class NPC{
    public:
    int NPChp, NPCattack, NPCdefense;
    NPC(int a, int b, int c){
        NPChp = a;
        NPCattack = b;
        NPCdefense = c;
    };
    virtual void get_status() = 0;
    virtual char challenge(int &hp, int &attack, int &defense, int &money) = 0;
    virtual char combat() = 0;
};
```

在 Class Peter 中，void get_status()會顯示出怪獸的狀態，char combat 適用於判斷玩家還想不想跟怪獸戰鬥，如果選擇戰鬥則進入戰鬥系統(詳見 2.6)，如果選擇撤退就退回上一個 dungeon，程式碼如下:

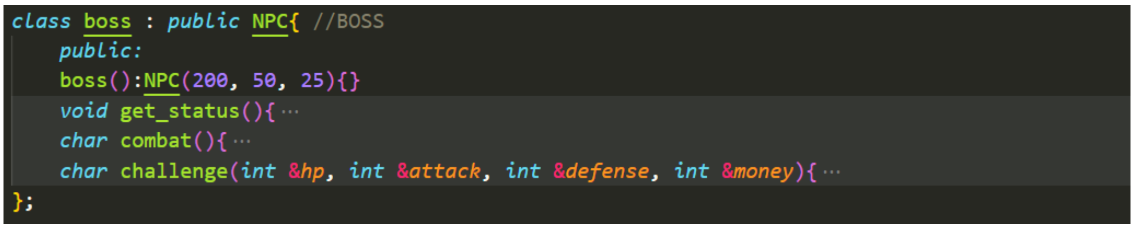


```
class Peter : public NPC{ //雜魚，刷等級用
    public:
    Peter():NPC(50, 20, 10){}
    ~Peter(){};
    void get_status(){
        cout << "----------Monster's status-----------" << endl;
        cout << "-- HP: " << NPChp << "/50" << endl;
        cout << "-- Attack: " << NPCattack << endl;
        cout << "-- Defense: " << NPCdefense << endl;
        cout << "-------------------------------------" << endl;
    }
```



```cpp
    char combat(){
        char op;
        cout << "What do you want to do now?" << endl;
        cout << "a. Attack it!" << endl;
        cout << "b. Retreat!" << endl;
        cin >> op;
        cout << endl;
        return op;
    }
    char challenge(int &hp, int &attack, int &defense, int &money){···
};
```

最後是大 Boss 的部分，基本上所有攻擊和撤退邏輯是和是一樣的，所以這裡我只貼上程式碼的架構:



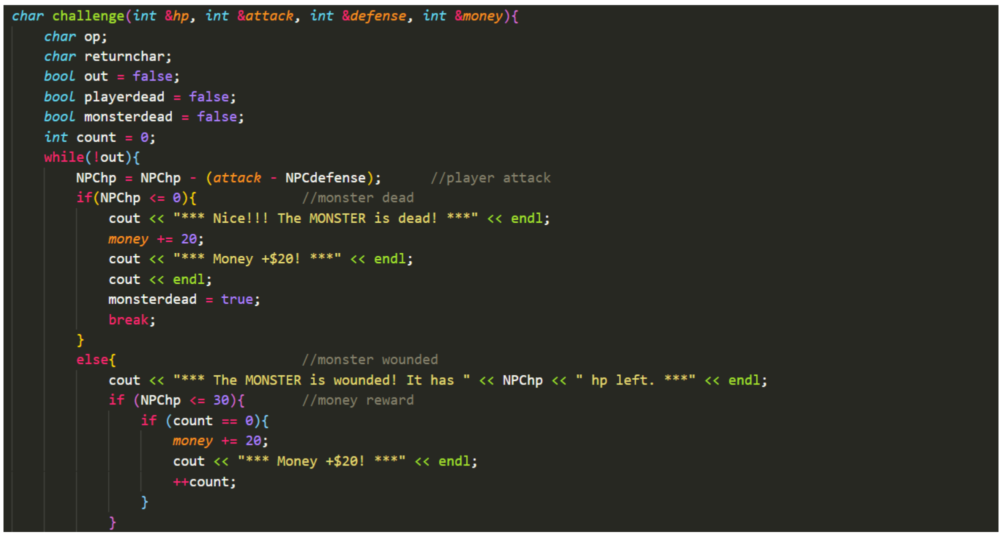
```cpp
class boss : public NPC{ //BOSS
    public:
    boss():NPC(200, 50, 25){}
    void get_status(){···
    char combat(){···
    char challenge(int &hp, int &attack, int &defense, int &money){···
};
```

2.6. Fighting System

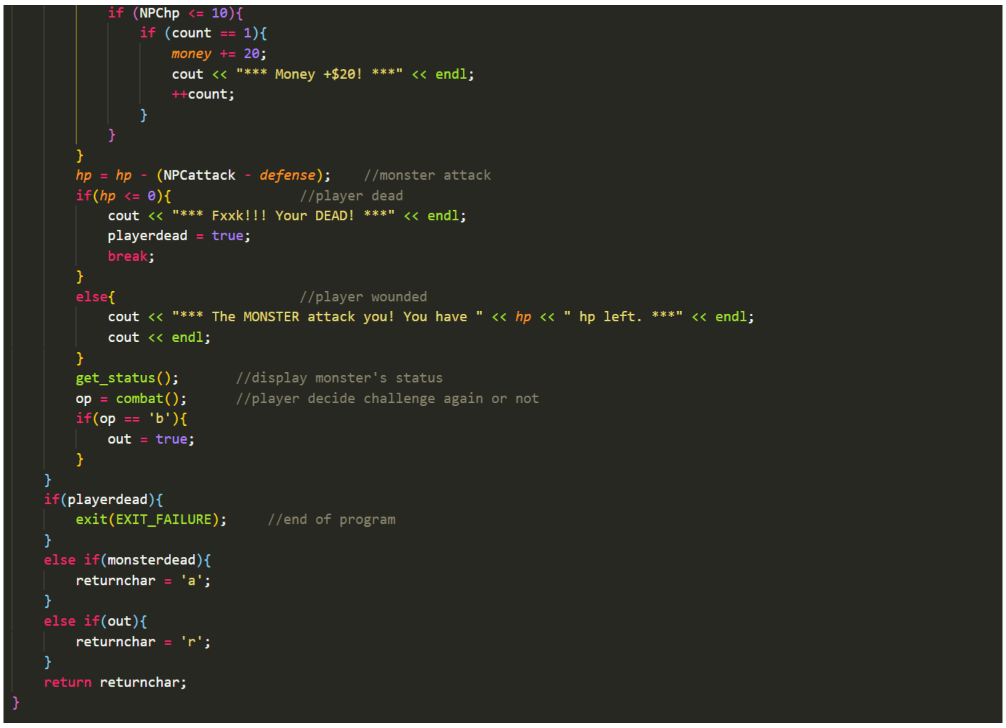
在玩家進入戰鬥系統，選擇攻擊後，NPC 即遭到玩家攻擊，而玩家也會遭到 NPC 的攻擊，兩者扣血的計算邏輯皆為:

$$\boxed{\text{戰鬥後血量} = \text{原有血量} - (\text{敵方攻擊力} - \text{自身防禦力})}$$

在兩方都攻擊完後，遊戲顯示出 NPC 的狀態及玩家的血量，這時玩家可以選擇要不要繼續戰鬥，若選擇繼續則繼續戰鬥，則戰鬥會持續到 NPC 死亡、玩家死亡或玩家選擇撤退為止，若選擇撤退，則玩家退回上一個所在的 dungeon。在戰鬥後，NPC 的血量會一直被保留，直到 NPC 或玩家死亡為止，在程式碼時實作的部份，我們在 Class NPC 中做 Virtual char challenge()的宣告，然後分別在代表小怪獸的 Class Peter 和 Class boss 中實作 char challenge()。由於 Class Peter 和 Class boss 內的 char challenge()邏輯是一樣的，所以這裡只貼上 Class Peter 的 char challenge():



```cpp
char challenge(int &hp, int &attack, int &defense, int &money){
    char op;
    char returnchar;
    bool out = false;
    bool playerdead = false;
    bool monsterdead = false;
    int count = 0;
    while(!out){
        NPChp = NPChp - (attack - NPCdefense);      //player attack
        if(NPChp <= 0){                 //monster dead
            cout << "*** Nice!!! The MONSTER is dead! ***" << endl;
            money += 20;
            cout << "*** Money +$20! ***" << endl;
            cout << endl;
            monsterdead = true;
            break;
        }
        else{                           //monster wounded
            cout << "*** The MONSTER is wounded! It has " << NPChp << " hp left. ***" << endl;
            if (NPChp <= 30){           //money reward
                if (count == 0){
                    money += 20;
                    cout << "*** Money +$20! ***" << endl;
                    ++count;
                }
            }
```



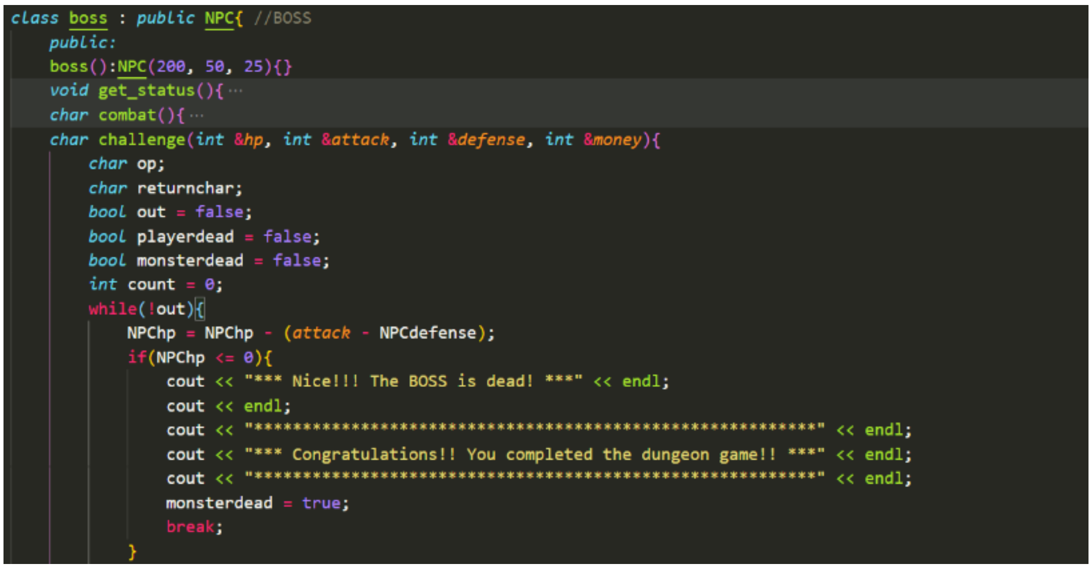
```
                if (NPChp <= 10){
                    if (count == 1){
                        money += 20;
                        cout << "*** Money +$20! ***" << endl;
                        ++count;
                    }
                }
            }
            hp = hp - (NPCattack - defense);    //monster attack
            if(hp <= 0){                //player dead
                cout << "*** Fxxk!!! Your DEAD! ***" << endl;
                playerdead = true;
                break;
            }
            else{                       //player wounded
                cout << "*** The MONSTER attack you! You have " << hp << " hp left. ***" << endl;
                cout << endl;
            }
            get_status();       //display monster's status
            op = combat();      //player decide challenge again or not
            if(op == 'b'){
                out = true;
            }
        }
        if(playerdead){
            exit(EXIT_FAILURE);     //end of program
        }
        else if(monsterdead){
            returnchar = 'a';
        }
        else if(out){
            returnchar = 'r';
        }
        return returnchar;
}
```

2.7. Game Logic

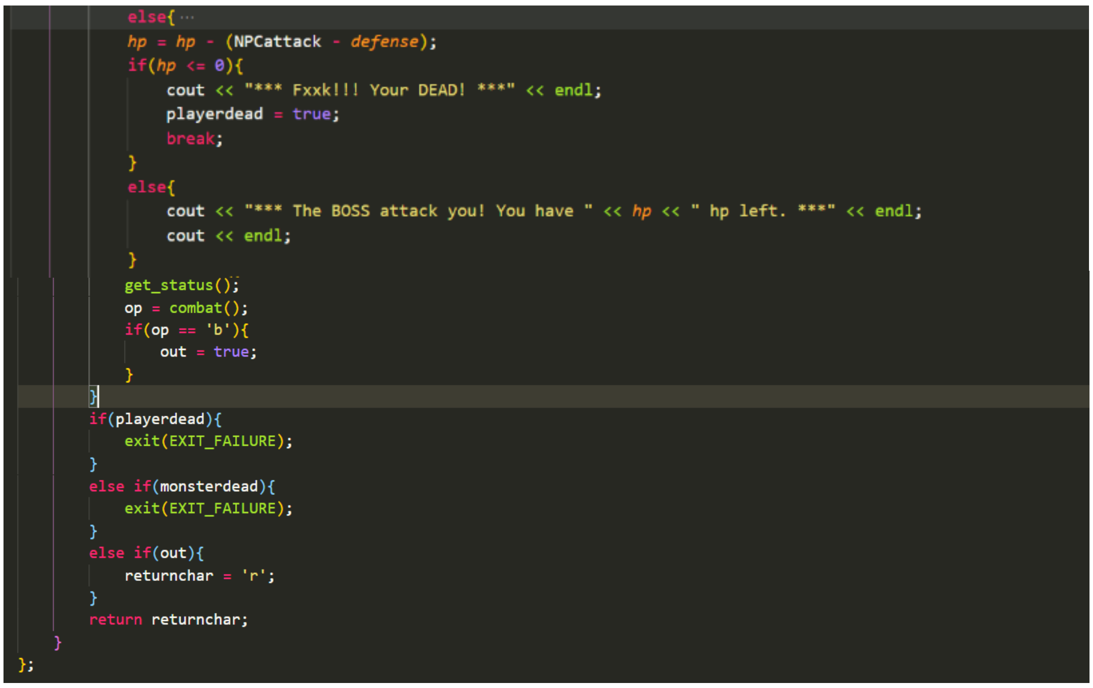
在遊戲中，扣除手動刻意中止程式的情況，能結束或中斷遊戲的情況只有下列三個:

a. 玩家打敗大 Boss
b. 玩家被大 Boss 或小怪獸打死
c. 在賭場(詳見 3.2)賭到輸光生命值

如果玩家打敗 Boss，代表玩家勝利，遊戲會出現恭喜訊息並中止遊戲。如果玩家被打到生命值<0 的話，遊戲會顯示你死了，並中止遊戲。這對應在 Class boss 和 Class Peter 中的 char challenge()，由於兩個 Class 中關於玩家沒血死亡的邏輯幾乎相同，但只有 Class boss 中有打敗 boss 而中止遊戲的情況，所以我們這裡舉 Class boss 中的 char challenge()為例:

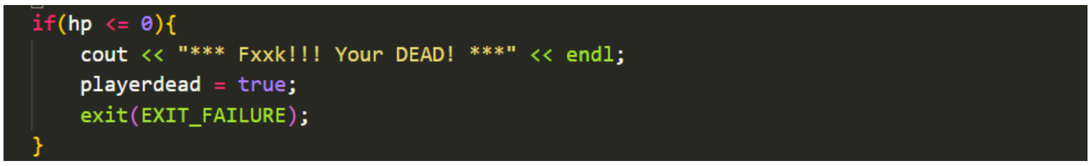


```
class boss : public NPC{ //BOSS
    public:
    boss():NPC(200, 50, 25){}
    void get_status(){…
    char combat(){…
    char challenge(int &hp, int &attack, int &defense, int &money){
        char op;
        char returnchar;
        bool out = false;
        bool playerdead = false;
        bool monsterdead = false;
        int count = 0;
        while(!out){
            NPChp = NPChp - (attack - NPCdefense);
            if(NPChp <= 0){
                cout << "*** Nice!!! The BOSS is dead! ***" << endl;
                cout << endl;
                cout << "************************************************************" << endl;
                cout << "*** Congratulations!! You completed the dungeon game!! ***" << endl;
                cout << "************************************************************" << endl;
                monsterdead = true;
                break;
            }
```



```
            else{…
            hp = hp - (NPCattack - defense);
            if(hp <= 0){
                cout << "*** Fxxk!!! Your DEAD! ***" << endl;
                playerdead = true;
                break;
            }
            else{
                cout << "*** The BOSS attack you! You have " << hp << " hp left. ***" << endl;
                cout << endl;
            }
            get_status();
            op = combat();
            if(op == 'b'){
                out = true;
            }
        }
        if(playerdead){
            exit(EXIT_FAILURE);
        }
        else if(monsterdead){
            exit(EXIT_FAILURE);
        }
        else if(out){
            returnchar = 'r';
        }
        return returnchar;
    }
};
```

最後則是在賭場(詳見 3.2)賭到死亡的情況，對應的程式碼在 Class Dungeon 中的 void game()內:



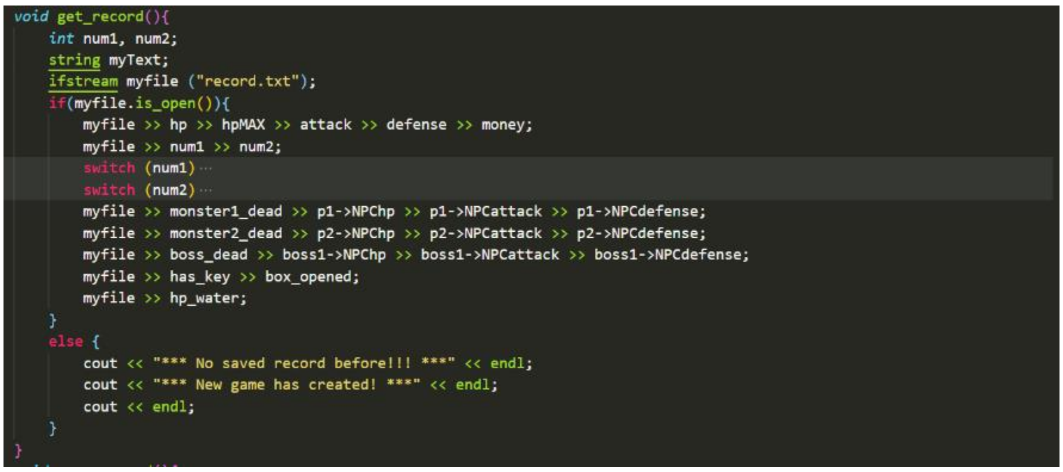
```
if(hp <= 0){
    cout << "*** Fxxk!!! Your DEAD! ***" << endl;
    playerdead = true;
    exit(EXIT_FAILURE);
}
```

2.8. Record System

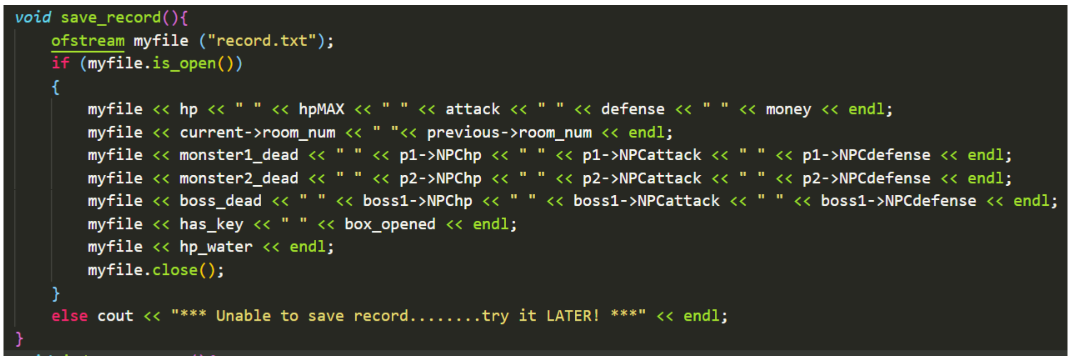
遊戲可以在剛開始時決定要不要載入先前儲存的遊戲紀錄，若沒有之前的遊戲紀錄的話，視窗會顯示無紀錄，並開始新遊戲。若有紀錄的話則會直接跳到記錄內相應的 dungeon 並繼續遊戲。玩家也可以在每進入到一個 dungeon 內時選擇存檔遊戲紀錄，程式會記錄當下的遊戲參數並輸出成文字檔(.txt)。紀錄會記錄的參數有以下幾個:

a. 玩家血量、最大血量、攻擊力、防禦力和金錢
b. 玩家所在 / 前一個所在的 dungeon 號碼
c. 小怪獸 1 / 2 狀態(bool variable)、血量、攻擊力和防禦力
d. 大 Boss 狀態(bool variable)、血量、攻擊力和防禦力
e. 玩家有無鑰匙(詳見 3.3) (bool variable)
f. 寶箱(詳見 3.3)有無被打開(bool variable)
g. 回血藥水剩幾瓶

而存檔及載入紀錄分別由 Class Dungeon 中的 void get_record() 和 void save_record()執行:

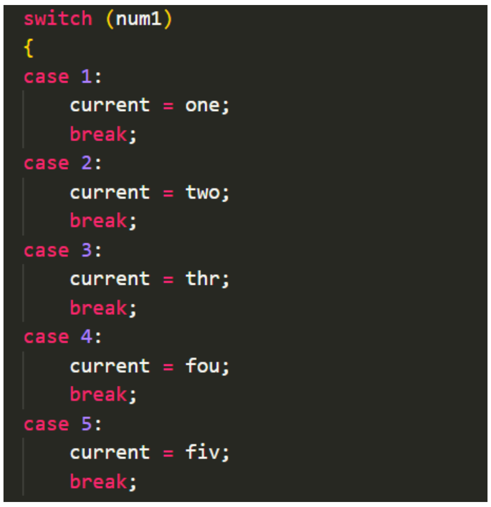


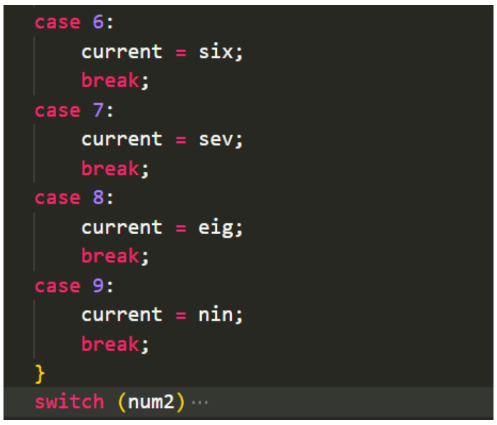
```cpp
void get_record(){
    int num1, num2;
    string myText;
    ifstream myfile ("record.txt");
    if(myfile.is_open()){
        myfile >> hp >> hpMAX >> attack >> defense >> money;
        myfile >> num1 >> num2;
        switch (num1)···
        switch (num2)···
        myfile >> monster1_dead >> p1->NPChp >> p1->NPCattack >> p1->NPCdefense;
        myfile >> monster2_dead >> p2->NPChp >> p2->NPCattack >> p2->NPCdefense;
        myfile >> boss_dead >> boss1->NPChp >> boss1->NPCattack >> boss1->NPCdefense;
        myfile >> has_key >> box_opened;
        myfile >> hp_water;
    }
    else {
        cout << "*** No saved record before!!! ***" << endl;
        cout << "*** New game has created! ***" << endl;
        cout << endl;
    }
}
```



```cpp
void save_record(){
    ofstream myfile ("record.txt");
    if (myfile.is_open())
    {
        myfile << hp << " " << hpMAX << " " << attack << " " << defense << " " << money << endl;
        myfile << current->room_num << " "<< previous->room_num << endl;
        myfile << monster1_dead << " " << p1->NPChp << " " << p1->NPCattack << " " << p1->NPCdefense << endl;
        myfile << monster2_dead << " " << p2->NPChp << " " << p2->NPCattack << " " << p2->NPCdefense << endl;
        myfile << boss_dead << " " << boss1->NPChp << " " << boss1->NPCattack << " " << boss1->NPCdefense << endl;
        myfile << has_key << " " << box_opened << endl;
        myfile << hp_water << endl;
        myfile.close();
    }
    else cout << "*** Unable to save record........try it LATER! ***" << endl;
}
```

其中，void get_record()中的 switch 是用來定位玩家位置用的，num1 定位現在位置，num2 定位上一個所在位置。由於邏輯相似，這裡僅貼上判斷 num1 的程式碼:





```cpp
switch (num1)
{
case 1:
    current = one;
    break;
case 2:
    current = two;
    break;
case 3:
    current = thr;
    break;
case 4:
    current = fou;
    break;
case 5:
    current = fiv;
    break;
case 6:
    current = six;
    break;
case 7:
    current = sev;
    break;
case 8:
    current = eig;
    break;
case 9:
    current = nin;
    break;
}
switch (num2)···
```

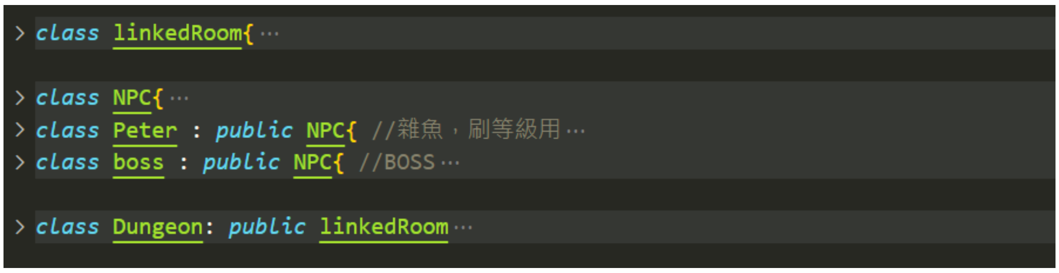
2.9. Inheritance and Virtual Function

本次作業中有要求要使用到 Inheritance 及 Virtual Function 的技巧，我們分開來看:

a. Inheritance

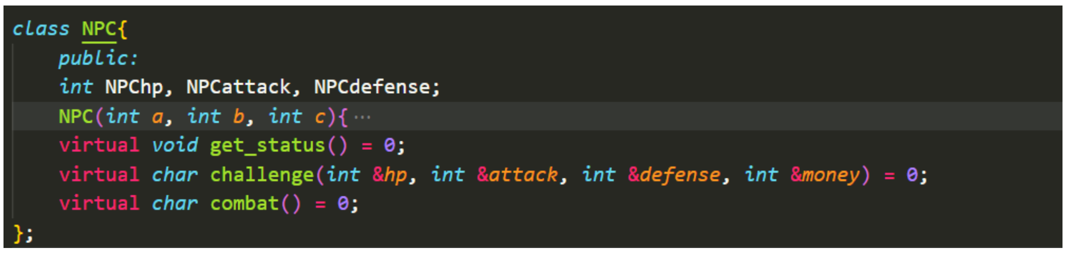
我的程式中有兩處繼承的部分，第一個是 Class Dungeon，繼承了 Class linkedRoom，用於在 Class Dungeon 中移動在 Class linkedRoom 裡宣告的各個 dungeon。第二個是 Class

Peter 和 Class boss，兩個都繼承了 Class NPC，用以使用在 Class NPC 就宣告好了的 hp, attack 和 defense:

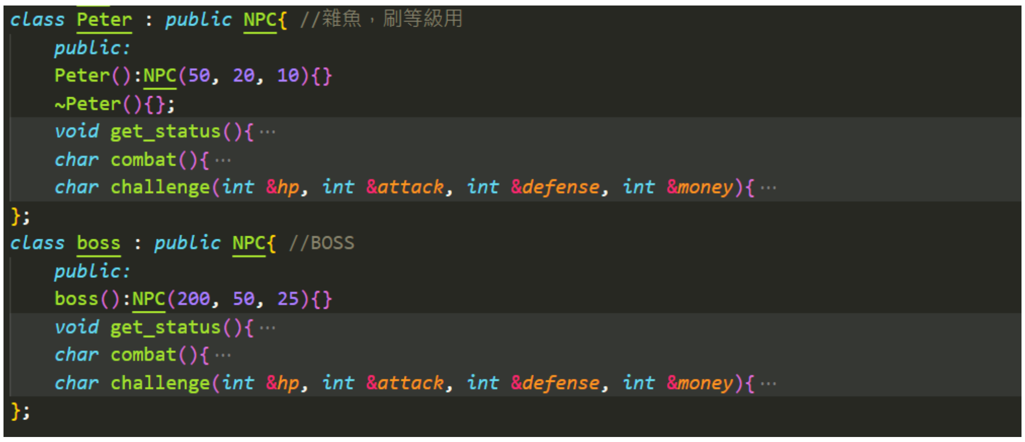

```
> class linkedRoom{…

> class NPC{…
> class Peter : public NPC{ //雜魚，刷等級用…
> class boss : public NPC{ //BOSS…

> class Dungeon: public linkedRoom…
```

b. **Virtual Function**

在 Class NPC 中，我宣告了三個 Virtual Function，分別是 virtual void get_status(), virtual char combat() 和 virtual char challenge():


```
class NPC{
    public:
    int NPChp, NPCattack, NPCdefense;
    NPC(int a, int b, int c){…
    virtual void get_status() = 0;
    virtual char challenge(int &hp, int &attack, int &defense, int &money) = 0;
    virtual char combat() = 0;
};
```

這三個 Virtual Function 分別在 Class Peter 和 Class boss 中得到實作:


```
class Peter : public NPC{ //雜魚，刷等級用
    public:
    Peter():NPC(50, 20, 10){}
    ~Peter(){};
    void get_status(){…
    char combat(){…
    char challenge(int &hp, int &attack, int &defense, int &money){…
};
class boss : public NPC{ //BOSS
    public:
    boss():NPC(200, 50, 25){}
    void get_status(){…
    char combat(){…
    char challenge(int &hp, int &attack, int &defense, int &money){…
};
```

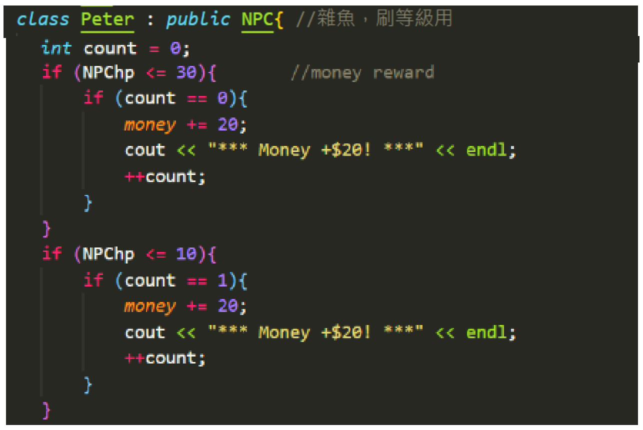
3. Optional Enhancements

3.1. Money System

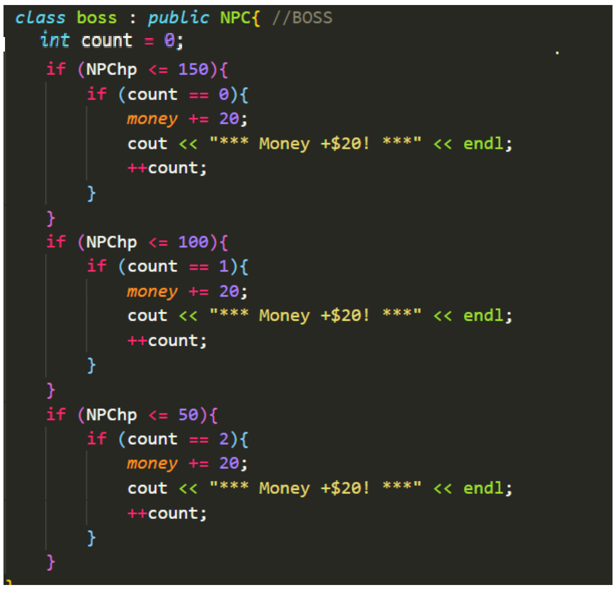
遊戲中有設置金錢系統，玩家在遊戲開始時會預先有 100 元，如果想要賺取金錢，可以透過打小怪獸或大 Boss 來賺，賺錢的機制如下:

a. 小怪獸 -> 每消耗小怪獸 20 滴血即賺取 20 元
b. 大 Boss -> 每消耗大 Boss 50 滴血即賺取 20 元

對應的 code 如下:



```
class Peter : public NPC{ //雜魚，刷等級用
    int count = 0;
    if (NPChp <= 30){        //money reward
        if (count == 0){
            money += 20;
            cout << "*** Money +$20! ***" << endl;
            ++count;
        }
    }
    if (NPChp <= 10){
        if (count == 1){
            money += 20;
            cout << "*** Money +$20! ***" << endl;
            ++count;
        }
    }
```

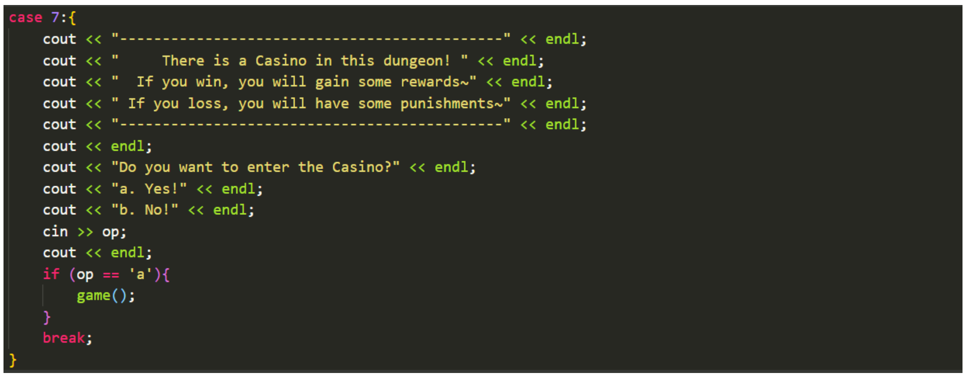


```
class boss : public NPC{ //BOSS
    int count = 0;
    if (NPChp <= 150){
        if (count == 0){
            money += 20;
            cout << "*** Money +$20! ***" << endl;
            ++count;
        }
    }
    if (NPChp <= 100){
        if (count == 1){
            money += 20;
            cout << "*** Money +$20! ***" << endl;
            ++count;
        }
    }
    if (NPChp <= 50){
        if (count == 2){
            money += 20;
            cout << "*** Money +$20! ***" << endl;
            ++count;
        }
    }
```

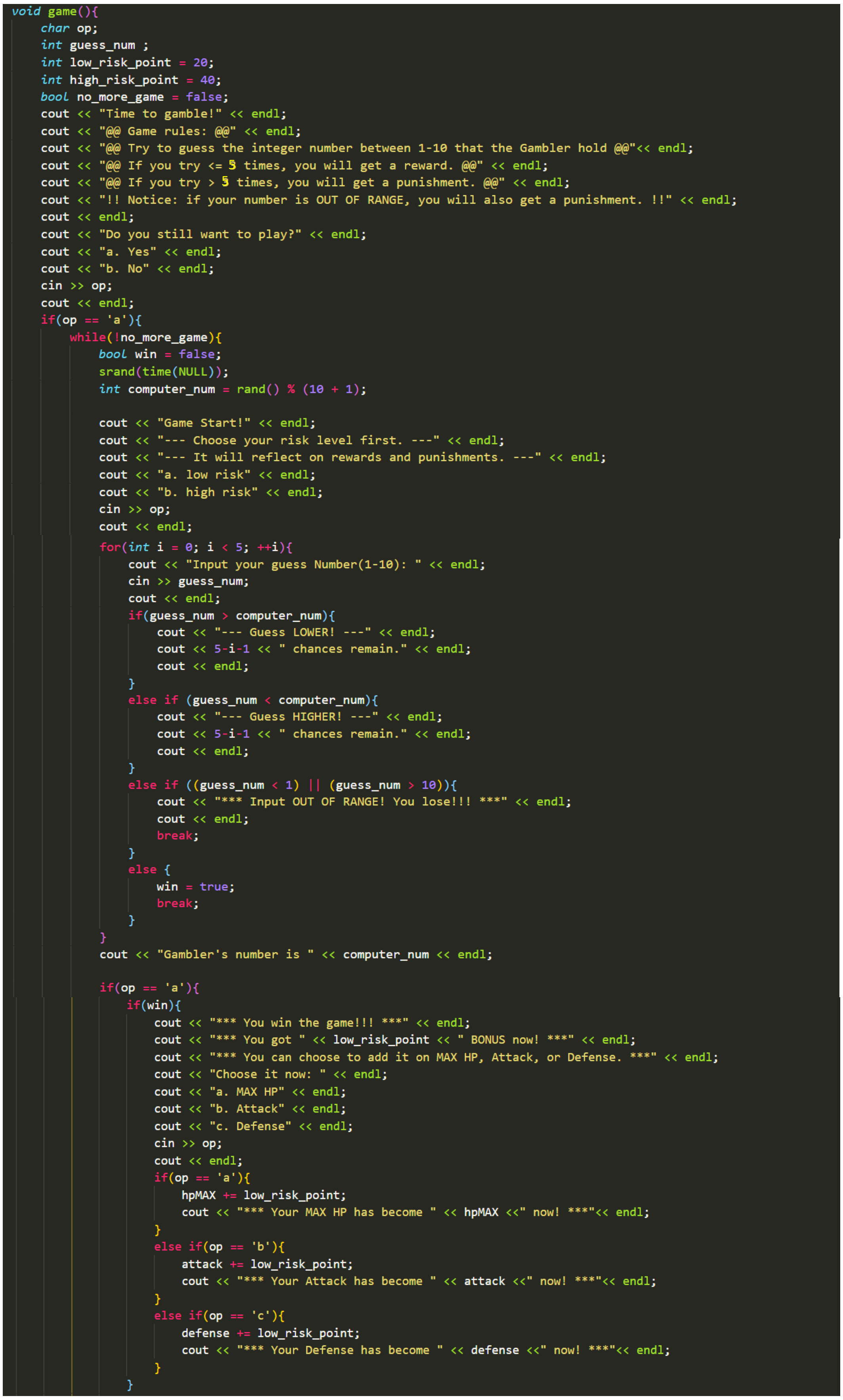
賺了錢後可以去找遊戲中的商店來買裝備(詳見 2.5)，提升玩家的各個攻擊力，防禦力和最大生命。

3.2. Casino

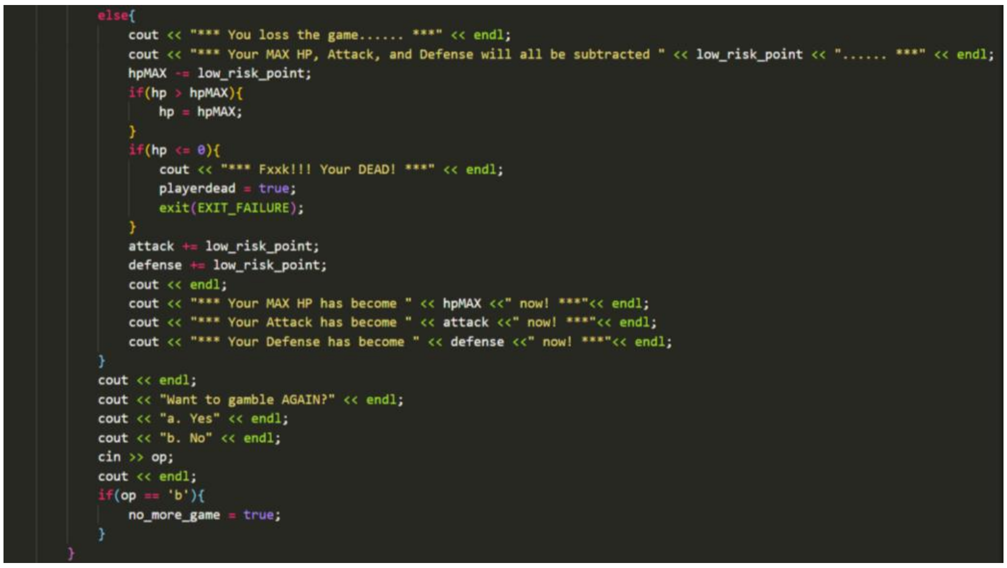
在 7 號 dungeon 中有賭場，贏了有獎勵，輸了有懲罰。玩家可以自由選擇要不要進入賭場，若選擇進入則開始遊戲，不進入則待在該 dungeon 內，不會被迫退到上一個 dungeon 中。開始遊戲後，玩家先選擇他們要參加低風險又或是高風險局，低風險局雖然獎勵較少，但相對的輸了時的懲罰也比較輕微，高風險則是獎勵好但懲罰較重，選擇完後開始遊戲，玩家要在 5 次機會內猜中電腦隨機在 1 到 10 之間生成的數字，5 次內猜中則玩家勝利，可以選擇在攻擊力、防禦力或最大生命加點數，若未猜中，則攻擊力、防禦力和最大生命都會扣點數，低風險局為 20 點，高風險局為 40 點。值得注意的點是，玩家雖然有可能一直贏而獲得很多點數，但也有可能一直輸，甚至把生命值都給輸光了。實作 code 則位於 Class Dungeon 中的 void judge_roomtype()和 void game():



```
case 7:{
    cout << "---------------------------------------------" << endl;
    cout << "     There is a Casino in this dungeon! " << endl;
    cout << "  If you win, you will gain some rewards~" << endl;
    cout << " If you loss, you will have some punishments~" << endl;
    cout << "---------------------------------------------" << endl;
    cout << endl;
    cout << "Do you want to enter the Casino?" << endl;
    cout << "a. Yes!" << endl;
    cout << "b. No!" << endl;
    cin >> op;
    cout << endl;
    if (op == 'a'){
        game();
    }
    break;
}
```



```
void game(){
    char op;
    int guess_num ;
    int low_risk_point = 20;
    int high_risk_point = 40;
    bool no_more_game = false;
    cout << "Time to gamble!" << endl;
    cout << "@@ Game rules: @@" << endl;
    cout << "@@ Try to guess the integer number between 1-10 that the Gambler hold @@"<< endl;
    cout << "@@ If you try <= 5 times, you will get a reward. @@" << endl;
    cout << "@@ If you try > 5 times, you will get a punishment. @@" << endl;
    cout << "!! Notice: if your number is OUT OF RANGE, you will also get a punishment. !!" << endl;
    cout << endl;
    cout << "Do you still want to play?" << endl;
    cout << "a. Yes" << endl;
    cout << "b. No" << endl;
    cin >> op;
    cout << endl;
    if(op == 'a'){
        while(!no_more_game){
            bool win = false;
            srand(time(NULL));
            int computer_num = rand() % (10 + 1);

            cout << "Game Start!" << endl;
            cout << "--- Choose your risk level first. ---" << endl;
            cout << "--- It will reflect on rewards and punishments. ---" << endl;
            cout << "a. low risk" << endl;
            cout << "b. high risk" << endl;
            cin >> op;
            cout << endl;
            for(int i = 0; i < 5; ++i){
                cout << "Input your guess Number(1-10): " << endl;
                cin >> guess_num;
                cout << endl;
                if(guess_num > computer_num){
                    cout << "--- Guess LOWER! ---" << endl;
                    cout << 5-i-1 << " chances remain." << endl;
                    cout << endl;
                }
                else if (guess_num < computer_num){
                    cout << "--- Guess HIGHER! ---" << endl;
                    cout << 5-i-1 << " chances remain." << endl;
                    cout << endl;
                }
                else if ((guess_num < 1) || (guess_num > 10)){
                    cout << "*** Input OUT OF RANGE! You lose!!! ***" << endl;
                    cout << endl;
                    break;
                }
                else {
                    win = true;
                    break;
                }
            }
            cout << "Gambler's number is " << computer_num << endl;

            if(op == 'a'){
                if(win){
                    cout << "*** You win the game!!! ***" << endl;
                    cout << "*** You got " << low_risk_point << " BONUS now! ***" << endl;
                    cout << "*** You can choose to add it on MAX HP, Attack, or Defense. ***" << endl;
                    cout << "Choose it now: " << endl;
                    cout << "a. MAX HP" << endl;
                    cout << "b. Attack" << endl;
                    cout << "c. Defense" << endl;
                    cin >> op;
                    cout << endl;
                    if(op == 'a'){
                        hpMAX += low_risk_point;
                        cout << "*** Your MAX HP has become " << hpMAX <<" now! ***"<< endl;
                    }
                    else if(op == 'b'){
                        attack += low_risk_point;
                        cout << "*** Your Attack has become " << attack <<" now! ***"<< endl;
                    }
                    else if(op == 'c'){
                        defense += low_risk_point;
                        cout << "*** Your Defense has become " << defense <<" now! ***"<< endl;
                    }
                }
```

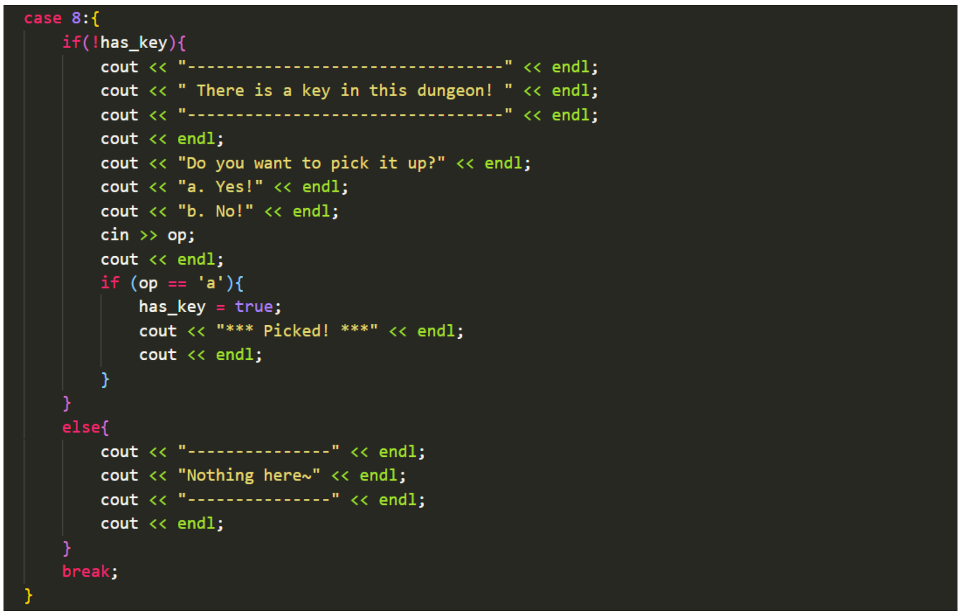


```
        else{
            cout << "*** You loss the game...... ***" << endl;
            cout << "*** Your MAX HP, Attack, and Defense will all be subtracted " << low_risk_point << "...... ***" << endl;
            hpMAX -= low_risk_point;
            if(hp > hpMAX){
                hp = hpMAX;
            }
            if(hp <= 0){
                cout << "*** Fxxk!!! Your DEAD! ***" << endl;
                playerdead = true;
                exit(EXIT_FAILURE);
            }
            attack += low_risk_point;
            defense += low_risk_point;
            cout << endl;
            cout << "*** Your MAX HP has become " << hpMAX <<" now! ***"<< endl;
            cout << "*** Your Attack has become " << attack <<" now! ***"<< endl;
            cout << "*** Your Defense has become " << defense <<" now! ***"<< endl;
        }
        cout << endl;
        cout << "Want to gamble AGAIN?" << endl;
        cout << "a. Yes" << endl;
        cout << "b. No" << endl;
        cin >> op;
        cout << endl;
        if(op == 'b'){
            no_more_game = true;
        }
    }
```

因為太占版面而且邏輯類似，所以上方沒有貼上選擇高風險時對應的 code。

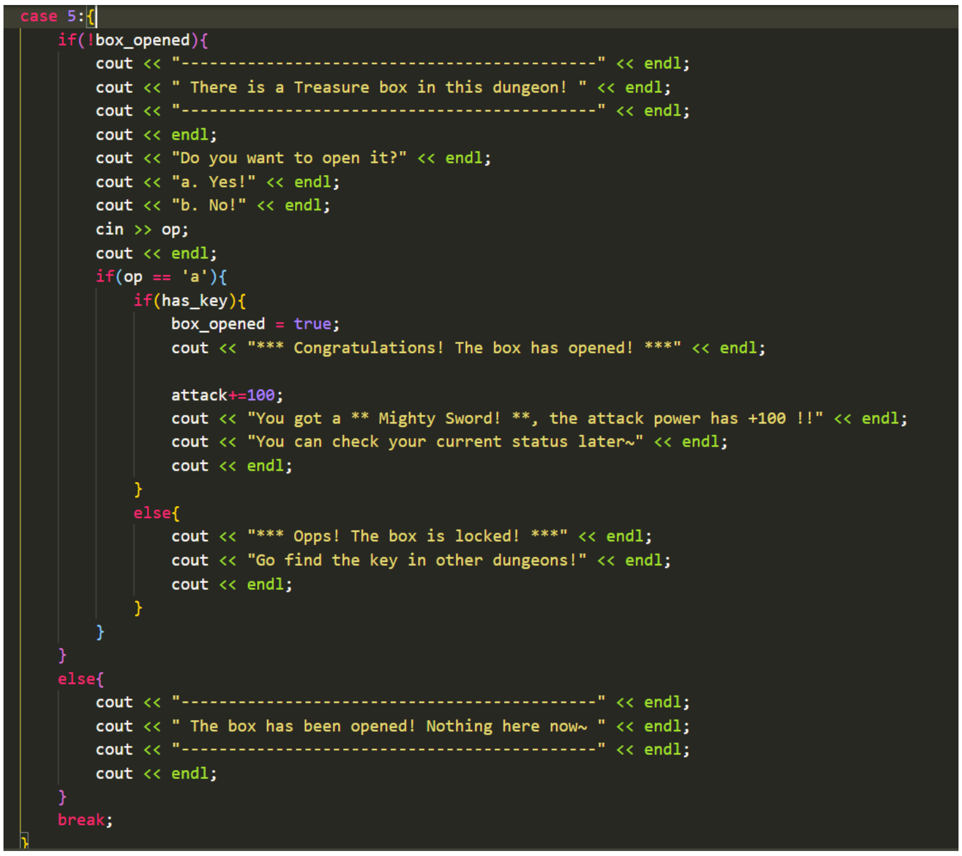
3.3. Treasure Box and Key

在遊戲中，8 號 dungeon 有鑰匙，當玩家進入 8 號 dungeon 時可以自由選擇要不要撿起鑰匙，而鑰匙只有一把，當玩家撿起後，此 dungeon 就沒有剩下任何東西了，而相對的程式碼是在 Class dungeon 的 void judge_roomtype()裡，其中 case 判斷的是使用者在移動後的 dungeon 號碼:



```
case 8:{
    if(!has_key){
        cout << "--------------------------------" << endl;
        cout << " There is a key in this dungeon! " << endl;
        cout << "--------------------------------" << endl;
        cout << endl;
        cout << "Do you want to pick it up?" << endl;
        cout << "a. Yes!" << endl;
        cout << "b. No!" << endl;
        cin >> op;
        cout << endl;
        if (op == 'a'){
            has_key = true;
            cout << "*** Picked! ***" << endl;
            cout << endl;
        }
    }
    else{
        cout << "--------------" << endl;
        cout << "Nothing here~" << endl;
        cout << "--------------" << endl;
        cout << endl;
    }
    break;
}
```

在 8 號 dungeon 中撿到的鑰匙可以用來打開寶箱，寶箱內有超強寶劍可以讓玩家的攻擊力增加 100 點，而寶箱只有一個，沒有鑰匙打不開寶箱，開完後寶箱就消失，此 dungeon 中就沒有東西了，這部分也是由 Class Dungeon 的 void judge_roomtype()來處理:



```cpp
case 5:{
    if(!box_opened){
        cout << "-------------------------------------------" << endl;
        cout << " There is a Treasure box in this dungeon! " << endl;
        cout << "-------------------------------------------" << endl;
        cout << endl;
        cout << "Do you want to open it?" << endl;
        cout << "a. Yes!" << endl;
        cout << "b. No!" << endl;
        cin >> op;
        cout << endl;
        if(op == 'a'){
            if(has_key){
                box_opened = true;
                cout << "*** Congratulations! The box has opened! ***" << endl;

                attack+=100;
                cout << "You got a ** Mighty Sword! **, the attack power has +100 !!" << endl;
                cout << "You can check your current status later~" << endl;
                cout << endl;
            }
            else{
                cout << "*** Opps! The box is locked! ***" << endl;
                cout << "Go find the key in other dungeons!" << endl;
                cout << endl;
            }
        }
    }
    else{
        cout << "-------------------------------------------" << endl;
        cout << " The box has been opened! Nothing here now~ " << endl;
        cout << "-------------------------------------------" << endl;
        cout << endl;
    }
    break;
}
```

4. Discussion and Conclusion

本次作業我決定不用模板而是自己想練練自己寫程式的東西，順便驗證一下自己有沒有融會貫通上課講的東西，最後辛苦的把它完成了。如果說要加強的地方應該是程式的簡潔程度吧，感覺很多部分還可以再簡化，但我現在是很土法煉鋼的把他們全部打出來，邏輯對了就 ok 的狀態，未來要改善一下這個。另外下次也可以嘗試做圖形化的介面，例如顯示地圖、角色在走路之類的，來提升使用者體驗。總而言之，這次作業就這樣啦，掰掰。