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Assignment 4:
Final Project

DISCOVERING REQUIREMENTS:

This assignment required to utilize our knowledge of linked lists, class inheritance and polymorphism in order to create a simple a text-based game. We were required to create an abstract space class with three derived classes in order to create all of the spaces for our game. Each of the space class objects will have their own special function as well as four pointes which point to the spaces adjacent to them and any other data members you deem fit. Our game is required to consist of at least 5 spaces that contains at least one space from each derived class.

The player of the game has to have a goal that they need to achieve in order to win the game based on the theme of your game. The player needs to be aware of which space they are inside of at any given time. The player class also needs to have an inventory container to keep track of the items that they collect. The container must have an item limit and at least one of these items must be the "key" to solving the game. There also has to be a time limit the player has to adhere to. Lastly, we are required to change the structure of the object our player is in. This means that we need to add at least one space and delete at least one space.

DESIGN:

For my project I decided to draw some inspiration from one of my favorite authors, H.P. Lovecraft. In order to keep up with this theme I tried to implement a game that was dark, macabre, and that had an ending other than what one would expect. For my three derived classes I ultimately decided to create an ancient town, and abyssal woods, and a shadow realm that the player will have to traverse through to reach their goal. The game will start off by having the player wake up in the ancient town and explore the town to find someone to tell them where they are. When they finally find someone in the town they are then sent on a quest to find 4 ancient relics to prevent a great disaster from unfolding.

After the dialogue sequence with this strange man the player will spawn in the woods where they need to search in each space for one of the 4 relics. The player will be given 20 steps (which is generous) in order to find all 4 of the items. If they are unable to find all the items it triggers the lose sequence of the game.

Once all 4 items are found the player's world collapses around them and they are transported to the vale of shadows where they need to find the alter to place the items on as instructed by the mysterious old man. After entering the space with the alter the player will place their inventory items on the alter and trigger the win sequence of the game.

After much trial and error I decided to have the player class contain/compose objects of the space classes. This way the player will always have a reference to their current location using the map data member which consists of a space class pointer. My

class hierarchy is listed below. Once again the inheritance structure goes as follow, derived space classes(room, chamber, and secret) -> abstract Space class -> Player class.

PLAYER CLASS:
```
class Player{
public:
        moveForward();
        moveBackward();
        moveLeft();
        moveRight();
        taskMenu();
        moveMenu();
        stepsTaken();
        playerTurn();
        viewInventory();
        itemName(int);
        startLevel();
        isSpecial();
        itemSearch();
        foundItem();
        iFoundAll();
        didLose();
private:
        int realmCount;
        int findCount;
        Item inventory[4]
        Item available[4]
        Space *map
}
```

ABSTRACT SPACE CLASS:
```
class Space{
protected:
        struct Node{
        bool itemFound;
        Node *next;
        Node *prev;
         Node *left;
         Node *right;
        Node(bool i = false, Node *n = NULL,
                Node *p = NULL , Node *l = NULL, Node *r = NULL){
                itemFound = i;
                next = n;
                prev = p;
                left = l;
                right = r;
```

```cpp
                    }
            };
            Node *head;
            Node *back;
             int stepCount;
             int fCount, lCount, rCount;
            bool foundAll;

public:
    Space();
    virtual ~Space()=0;
    int forward();
    int backward();
    void right();
    void left();
    int getSteps();
    void setSteps(int);
    bool complete(bool);
    virtual int special();
    bool itemFound();
    void mLeft();
    void mRight();
    int mForward();
    int mBack();
};
```

DERIVED ROOM CLASS:
```cpp
class Room : public Space{
private:
    Node *main,*one,*two,*three,*four;
public:
    Room();
    ~Room();
    int special();
};
```

DERIVED CHAMBER CLASS:
```cpp
class Chamber : public Space {
public:
    Chamber(int zero);
    ~Chamber();
    int special();
};
```

DERIVED SECRET CLASS:

```
class Secret : public Space {
public:
    Secret(int stepsTaken);
    ~Secret();
    int special();
};
```

TESTING:

       In order to test everything properly I needed worked up incrementally starting from the base space class, then the derived space classes, and lastly I started working on the player class. The way I designed my structure was in the form of levels. When the user first spawns in the city they are free to explore 5 pre-existing rooms. After taking 4 valid steps they trigger a dialogue sequence and are transported to the woods. From this point on the player is in another realm and so I decided a traditional map structure just wouldn't do. So instead I have the player create the woods and shadows map as they move. In order to prevent any circuitous routes I kept track of the players forward, left, and right step counts. This way the player cannot take more than 2 steps left or right before reaching a dead end, which prevents them from looping around in circles. The game keeps track of the total steps taken by the player, as well as their left, right, and forward step counts in order to prevent any newly implemented spaces from overlapping pre-existing spaces on the map (the physical map and not the memory locations of each space, I know those don't overlap!).

       Once the player reaches the woods their step count resets to zero and they are told that they cannot take more than 15 steps before losing their mind in the woods. The step count from the woods is then carried over to the shadow realm when the player spawns there after finding all the necessary items.

TEST PLAN:
1) Make sure players step count is accurate.
2) Make sure player cannot move out of map range in the town.
3) Make sure players cannot take more than two steps right.
4) Make sure that player cannot take more than 2 steps left.
5) Make sure that the lose sequence is properly implemented.
6) Make sure that the win sequence is properly implemented.
7) Test input validation measures for player choice menus.
8) Make sure that the about game menu works.
9) Make sure the special functions for the derived room class works.
10) Make sure the special functions for the derived chamber class works .
11) Make sure the special functions for the derived secret class works.
12) Make sure the players inventory properly stores items.

TEST RESULTS:
1) **Make sure players step count is accurate.**
   (Made sure step counts were accurately incremented)

Step Count: 9

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

What on earth have I gotten myself into!

Step Count: 10

2) **Make sure player cannot move out of map range in the town(cannot move forward twice in any direction).**

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

...Wh-what? Where am I?

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

This appears to be a dead end...

Step Count: 1

Press ENTER to continue

3) Make sure players cannot take more than two steps left in woods/shadows.

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 3

So according to that old man there are
some useful items in these woods. I
wonder why he never ventured here to
find them himself...

Step Count: 11

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 3

The fog here is so thick, I can hardly
see anything! Oh, what I would do for a
cold pint right now...

Step Count: 12

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 3

It appears to be a dead end...

Step Count: 12

4) Make sure that player cannot take more than 2 steps right in woods/shadows.

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 4

So according to that old man there are some useful items in these woods. I wonder why he never ventured here to find them himself...

Step Count: 11

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 4

The fog here is so thick, I can hardly see anything! Oh, what I would do for a cold pint right now...

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 4

It appears to be a dead end...

Step Count: 12

5) Make sure that the win sequence is properly implemented.
Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

I would wish this place on no man...

Step Count: 8

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

Alright, something is definitely not
right... Have I died, is this dreaded
place my own personal hell?! It is just
so dark here, wherever here is....

<mark>There's a mysterious green glow emanating from
some unknown source directly ahead of you...</mark>

<mark>Step Count: 9</mark>

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

Alright, just find the alter, nothing
else matters! The old man said that if I
placed the relics on the alter then I
would be free of this wretched place!

<mark>You approach an alter surrounded with a green
flame-like aura. The items in your inventory
become imbued with a similar aura...</mark>

<mark>Step Count: 10</mark>

Press ENTER to continue

6) Make sure that the lose sequence is properly implemented.

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

So according to that old man there are
some useful items in these woods. I
wonder why he never ventured here to
find them himself...

Step Count: 19

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards

3 - Move to the Left
4 - Move to the Right
Choice: 1

The fog here is so thick, I can hardly
see anything! Oh, what I would do for a
cold pint right now...

Step Count: 20

Press ENTER to continue

You are unable to move any further, as it being
held hostage by some unseen force...

(This is the only the beginning of the lose dialogue sequence)

7) Test input validation measures for player choice menus.
Please select one of the following options
1 - Start Game
2 - About Game
3 - Exit Game
Choice: 9
Please enter a number from 1 to 3:
8
7
6
5
4
2 (valid choice for about game page)

The Calling is a text-based adventure game
that takes you on a mysterious journey in
order to free yourself from your unearthly
tormentors and return to your beloved home.

Press ENTER to continue

8) Make sure that the about game menu works.
Welcome to The Calling

Please select one of the following options
1 - Start Game
2 - About Game
3 - Exit Game
Choice: 2

Press ENTER to continue

9) Make sure the special functions for the derived room class works.

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 3

Alright, don't panic, just think...
I mean this architecture seems rather
archaic, yet vaguely familiar...
Almost as if I saw it in a dream...

You hear someone nearby...

Step Count: 3

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards

4 - Move to the Right

I think I heard someone call out my name. No, it was probably just my imagination...

You are approached by the mysterious old figure...

Step Count: 4

Press ENTER to continue

OLD MAN:
Oh, its you! We have been trying to summon you here for quite some time now! I know you must have a lot of questions, but those are going to have to wait as we have more pressing matters to attend to...

Press ENTER to continue

10) Make sure the special functions for the derived chamber class works .
What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 3

Your inventory contains the following Items:
1 - Radiant Gem
2 - Tome of Shadows
3 - Nazar Amulet
4 - Empty Slot

Step Count: 8

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 2

You feel the hairs on the back of your neck stand on end. This feeling intensifies as you approach the withered bush to your left. You reach inside the bush and pull out a mysterious orb emanating a dark aura of sorts. The Dark Energy Orb has been added to your inventory!

After placing the fourth and final item in your inventory time itself appeared to stop. Your inventory bag begins emitting a strange glow. Before you have time to react the ground beneath your feet disappears and you fall into a deep black void...

Step Count: 8

Press ENTER to continue

11) **Make sure the special functions for the derived secret class works.**
What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

Wait, that almost sounded like laughter off in the distance... No, no, it can't be. No one could experience joy in such a place...

There's a mysterious green glow emanating from
some unknown source directly ahead of you...

Step Count: 12

Press ENTER to continue

What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 1

Where would you like to go?
1 - Move Forwards
2 - Move Backwards
3 - Move to the Left
4 - Move to the Right
Choice: 1

Dear God, it's me, I am not sure if this
was part of your grand plan for little
old me, but please God, just make it stop!

You approach an alter surrounded with a green
flame-like aura. The items in your inventory
become imbued with a similar aura...

Step Count: 13

Press ENTER to continue

12) **Make sure the players inventory properly stores items.**
    (Tested after 2 Items were found)
    What would you like to do?
    1 - Explore
    2 - Search for Items
    3 - View Inventory
    4 - View Goal
    5 - Quit
    Choice: 3

Your inventory contains the following Items:
1 - Nazar Amulet
2 - Radiant Gem
3 - Empty Slot
4 - Empty Slot

Step Count: 6

Press ENTER to continue

(Tested again after 3 Items found)
What would you like to do?
1 - Explore
2 - Search for Items
3 - View Inventory
4 - View Goal
5 - Quit
Choice: 3

Your inventory contains the following Items:
1 - Nazar Amulet
2 - Radiant Gem
3 - Tome of Shadows
4 - Empty Slot

Step Count: 9

Press ENTER to continue

TEST OUTCOMES / REFLECTIONS:
        By running my test suite I was able to make sure that all of the functions were working properly and that the output printed from main was presentable to the user. The area that caused me to experience the most difficulty was formatting the output to the screen. Initially I had all of the special functions print their own dialogue when its conditions were met. However, this caused the output from main to have too many or too few new lines. I eventually decided to change the special functions to return integer variable flags that then let the main function know what to print when each condition was met. After doing that I was able to better format the output of my game.
        Due to our past few labs being on linked list, I did not find implementing the map structure to be too difficult a task at all. In fact the only valgrind error that I ever got while testing my program was during my first run where I forgot to delete the pointer to Player at the end of my main function.
        After using integer flags in the derived class special functions, I really got comfortable with implementing them and used them in several of the Player class functions which deal with movement, finding/storing items, and that implement each turn for the

player. I initially had my nodes store their name and a description to print for player dialogue, but once again that got scrapped as I found it much easier to use main to handle and format any dialogue sequences.

       I really, thoroughly, enjoyed working on this lab. In fact, I wish we had more time/less secondary assignments so that I could further develop my game! Initially I had several lofty ideas of including enemies and a combat system, but I quickly realized that it would be unfeasible with the time I had to write the program. After several difficult assignments (I'm looking at you circular queue lab and assignment 3) I really have a solid grasp of the concepts associated with class inheritance, polymorphism, and linked lists. I would like to end with saying that I intend on spending some of my time in between terms to tweak my current game or write one of my own to help add to my programming portfolio. Overall I thought that this assignment was the perfect blend of challenging and fun to keep me going.