Contents

Problem Understanding

Purpose

Design and implement a text-based game or puzzle where the player moves through a series of rooms or compartments. Player needs to gather items to achieve some purpose. The details are open ended.

Specific requirements:

- Create a series of rooms or compartments or spaces for the player to move through.
- Each space will be a class with (at least) four pointer variables that link to other spaces.
- The space will also have appropriate data members. There must be at least 5 spaces of at least 3 different types.
- There will be a space abstract class that will have a special pure virtual function.
- Each type of space will have a special action.
- Must be at least 3 derived classes for different types of spaces.
- There must be a goal for the player. Based on your theme the player must discover the solution.
- Must have some way to keep track of which space the player is in.
- The player will have a container (backpack, knitting bag, or notebook) to carry "items".
- The container must have some limit.
- One or more of these items will be required as part of the solution, such as a "key" to open the locked door.
- The program must change the structure of the spaces. Specifically, add at least one space and remove at least one space.
- The goal may be a puzzle with clues in each space. It does not need to be a physical possession.
- It should not require free-form input.
- There should be a time limit to urge the player on, some way to prevent the 'game' from going on indefinitely.
- The player must interact with parts of the structure, and not just simply collect things.
- Must develop a theme for your game. Make it interesting, if not fun.

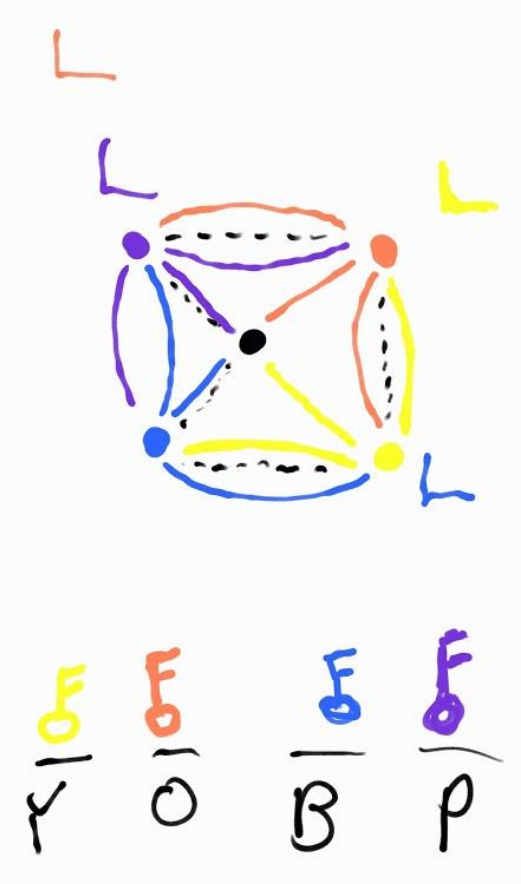
Techniques

- Queues – use Queues for FIFO data management.
- Object Oriented Programming – use classes to encapsulate data and create methods used for the grid and ant classes.
- Data validation – prompt user to re-enter data if data is not appropriate for input.
- Functions – use functions in main program for repeat code, i.e. input validation, menu system.
- Conditional statements, loops, switch statements.
- Base and Derived Classes
- Polymorphism – virtual functions in base class.

Design

Approach

I first sat down and had to come up with an idea. Initially, I was just going to do a space ship themed puzzle game involving fighting aliens and dealing with chaos on the ship. I suspected that it probably wasn't an original idea, but confirmed when I read the theme submissions. This was the nail in the coffin for the idea, but was having difficulty thinking of anything else. After giving up and going to bed in frustration, a random idea came to me to use a theme involving colors.



I immediately grabbed my phone and sketched an idea the involved using various colors boots to cross bridges of matching colors to grab keys and bring them back a center room. To the right is one of those sketches. The L shapes are boots, and the keys need to be placed in the correct location.

The next morning when I woke up, a variant of this idea came to me. It involved using a laser gun that would shoot different colors, with the default color being white.

The player could roam around the different spaces to collect some type of modifier items to change the color of the laser. Then there would be puzzles or challenges the required a specific color laser to complete the challenge.

That was the initial evolution of ideas. The next section is a more detailed description of the design.

Design Details

Theme

The player controls a Hero. The hero must use a laser gun and wit to solve various challenges throughout the rooms in the game. The laser gun is used to neutralize power nodes throughout the game, but often there is a puzzle that has to be solved before the laser gun is effective against the nodes. Power nodes are only vulnerable to laser beams that are of the same color of the power node. Colored crystals are items that need to be collected in various rooms to change the color of the laser beam. Another set of items are colored keys, which are awarded for solving small puzzles, but need to be used for a larger puzzle in one particular room.

Crystals of different colors can be used in combination to shoot a unique laser color. Crystals and keys are used together later in the game together to solve a larger puzzle. Colors in the game use the RGB color model.

Items

Crystals:

- Red Crystal
- Blue Crystal
- Green Crystal

Keys:

- Red Key
- Blue Key
- Green Key

Laser gun:

Class object that hero can carry and shoot.

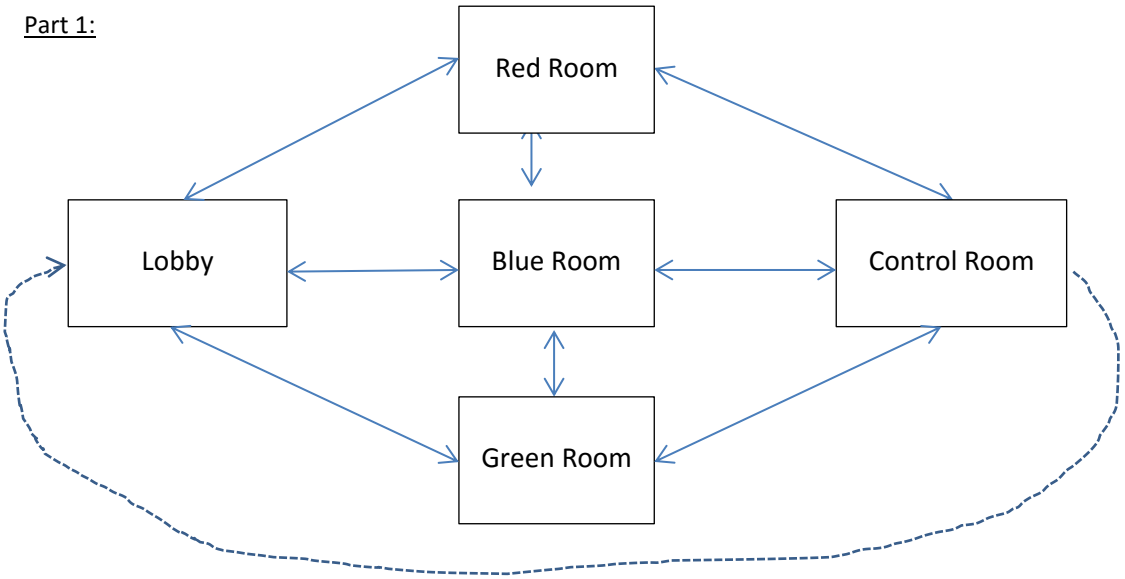
Shoots white laser by default. Can hold a maximum of 2 crystals to change the color of the laser:

Laser Gun Equipped With	**Laser Result**
Red Crystal	Red
Green Crystal	Green
Blue Crystal	Blue
Red Crystal + Green Crystal	Yellow
Red Crystal + Blue Crystal	Magenta
Green Crystal + Blue Crystal	Cyan

Environment Theme

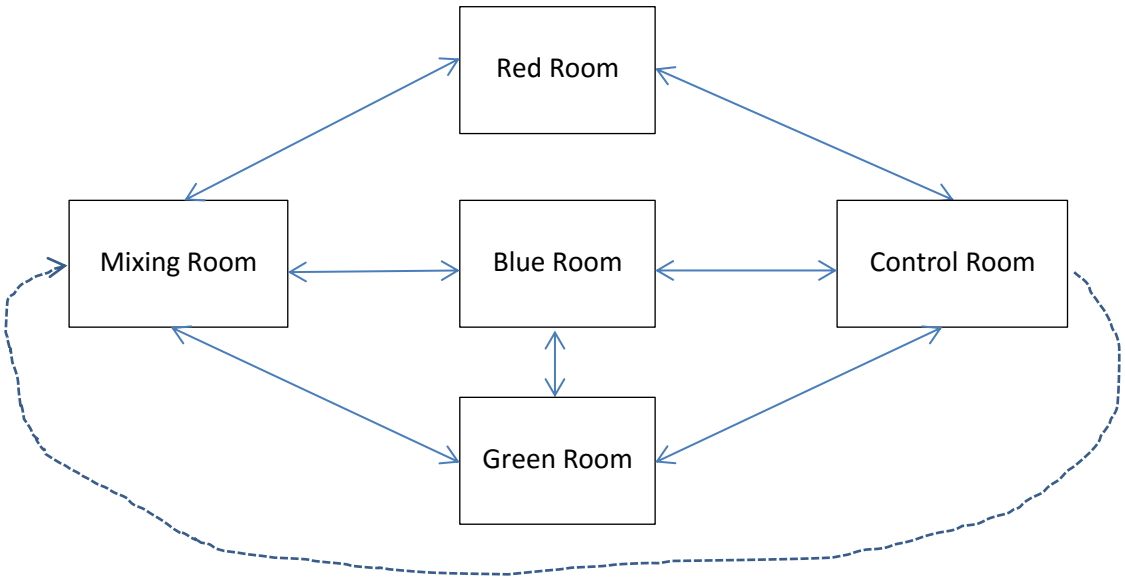
DJ Blasterz Fortress, which has the following layout:

Part 1:



Part 2:

Lobby is destroyed and replaced with the Mixing Room.



Classes

Class	Objects
Item	Crystal, Key, Node
Weapon	Laser Gun
Hero	userHero
Space	(Abstract)
Space->StartRoom	Lobby
Space->ColorRoom	Red Room, Green Room, Blue Room
Space->ControlRoom	Control Room
Space->FinalBossRoom	Mixing Room

Hero Details

- Hero starts in Lobby with no items.
- Player starts with 100 health.
- Every 3 actions by the user, including menu selections, cause -2 to health.
- When hero gets to 0 health, game is over, player loses.

Room Details / Puzzles

Lobby

Items: Laser gun

Starting Conditions:

- Doors to Red, Green and Blue Rooms are locked.
- Laser Gun is locked in a locker.
- 3 lights in the room, all starting as the color red.
- 3 buttons in the room.
- White node.

Puzzle 1:

- Turn 3 lights from red to green using three buttons:

Button	Button Value Toggle	Lights that are toggled when pushed
1	False	1
1	True	1, 3
2	False	1, 2
2	True	2, 3
3	False	3
3	True	3

- When all lights go green, laser gun is unlocked.

Puzzle 2:

- Grab laser gun.
- Shoot white node with laser gun.
- Doors to Red, Green and Blue Rooms unlock.
- Hero can leave room.

Red Room

Items: Red Key, Red Crystal

Starting Conditions:

- Crystal can be equipped in gun.
- Key is locked.
- Node is yellow.

Puzzle:

- Equip laser gun with a red crystal and a green crystal (from green room).
- Shoot yellow node with yellow laser to unlock red key.
- Store red key in backpack.

Green Room

Items: Green Key, Green Crystal

Starting Conditions:

- Crystal can be equipped in gun.
- Key is locked.
- Node is cyan.

Puzzle:

- Equip laser gun with a green crystal and a blue crystal (from blueroom).
- Shoot cyan node with cyan laser to unlock Green key.
- Store Green key in backpack.

Blue Room

Items: Blue Key, Blue Crystal

Starting Conditions:

- Crystal can be equipped in gun.
- Key is locked.
- Node is magenta.

Puzzle:

- Equip laser gun with a blue crystal and a red crystal (from blueroom).
- Shoot magenta node with magenta laser to unlock Blue key.
- Store Blue key in backpack.

Control Room

Items: None.

Starting Conditions:

- Node is white, but protected from the laser.
- Three beams of color: red, green, blue
- Each beam has a holder for a key.
- Each beam has a holder for a crystal.

Puzzle:

- Make each beam go to white by combining beam color + key color + crystal color.
    - Combine red, blue and green to create a white beam.
- When all 3 beams turn white, node is unprotected.
- Shoot white node with white laser (no crystals)

- Neutralizing node causes lobby to be destroyed and replaced with Mixing Room.

Mixing Room

Items: None.

Starting Conditions:

- 5 lights are in the room, all start as the color red.
- 4 buttons in the room to control the lights.
- White node.

Puzzle 1:

- Turn 5 lights from red to green using 4 buttons:

Button	Button Value Toggle	Lights that are toggled when pushed
1	False	1, 3
1	True	4, 5
2	False	5
2	True	2, 3, 5
3	False	1
3	True	1, 3, 4
4	False	1, 3, 5
4	True	1, 2

- When all lights go green, white node is unlocked.

Puzzle 2:

- Shoot white node.
- Game over, player wins.

Story Details

Hero was at a DJ Blasterz concert when DJ Blasterz did the "drop". It caused Hero to black up and wake up outside of DJ Blasterz fortress. He learns that DJ Blasterz is trying to steal all of the color from the world with the set up in his fortress. Hero must use his wit and laser gun to complete the challenges in all 6 rooms. In the last room, Hero faces off against DJ Blasterz in a DJ competition. When Hero wins the competition he has to use the laser gun to neutralize the node on DJ Blasterz and forever stop him from trying to steal the world's color.

Testing

The test plan below tests every input that the user can enter a value for. Bounds checking is performed below, equal to and above limit values, if applicable. In some cases values in between were tested, such as verifying the correct output was obtained from the menu system.

There are tests for outputs of the menu, such as adding creature objects, having players fight to the death, turning off and on round stream, and exiting the program.

Test Plan

Test	Test Description	Expected Results
1	Validate Input: Function Pre-Conditions: showOptions from a class returns 3. Enter: Letter 0 1 2 3 4	 Letter: Prompt for value from 1 to 3 0: Prompt for value from 1 to 3 1: Value accepted 2: Value accepted 3: Value accepted, program ends 4: Prompt for value from 1 to 3
2	Color Room: Pre-conditions: light puzzle not solved. User Input: Go to red room. Go to green room. Go to blue room. Grab weapon.	 Red room door locked. Green room door locked. Blue room door locked. Weapon locked.
3	Color Room Pre-conditions: 2 of 3 lights on. Go to red room. Go to green room. Go to blue room. Grab weapon.	 Red room door locked. Green room door locked. Blue room door locked. Weapon locked.
4	Color Room Pre-conditions: light puzzle solved. User Input: Go to red room. Go to green room. Go to blue room. Grab weapon.	 Red room door locked. Green room door locked. Blue room door locked. Hero has weapon.
5	Color Room Pre-conditions: light puzzle solved. User Input (in order): Go to red room. Go to green room. Go to blue room. Shoot node.	 Red room door locked. Green room door locked. Blue room door locked. Node neutralized, doors unlocked.

6	Red/Green/Blue Rooms Pre-conditions: laser color does not match node. No more than 1 crystal in weapon. User Input: Grab Key Shoot Node Grab crystal	 Key locked. Node is unaffected by different laser color. Crystal can be equipped.
7	Red/Green/Blue Rooms Pre-conditions: laser color matches node. User Input: Shoot Node Grab Key Return crystal	 Node neutralized, key unlocked. Key placed in backpack. Crystal removed from gun.
8	Control Room Pre-conditions: at least two beams, including beam 1, are not white and have no items. User Input: Shoot node. Beam1: place green key Beam1: place blue crystal	 Node is unaffected. Beam turns yellow Beam turns white.
9	Control Room Pre-conditions: Beam3 is blue, rest are white. User Input: Beam3: place red key Beam3: place green crystal Shoot node.	 Beam turns magenta. Beam turns white. Node is unlocked. Node neutralized. Lobby removed. Mixing room appears.
10	Mixing Room Pre-conditions: lights are all red. User input: Shoot node. Press button 4 once. Press button 3 twice. Press button 2 twice. Shoot Node.	 Node is unaffected. Lights 1, 3, 5 on. Lights 3, 5 on, then 1, 4, 5 on. Lights 1, 4 on, then 1, 2, 3, 4, 5 on. Node is unlocked. Node destroyed. Game over.
11	Health Repeatedly move through menus without completing puzzles until health gets to 0.+	 Game ends. Player loses.

Reflection

Design versus Implementation

I somehow totally forgot to implement a health system originally, but luckily it was an easy addition. I modified all of the showOptions functions in each class to update the players health. Every time the health updates, a move is added to the player. When the move gets to 3, the player loses 2 health, then the moves are reset back to 0. I decided on these values after doing various testing and feeling confident that a first time player could still complete the game, but feel the pressure of the health system dwindling.

Most Challenging

The most challenging part was working with the colors of the console. Since my design heavily uses colors, I wanted to be able to show those colors to the user while they played to give them a more immersive experience. I had to learn about console colors and the write new functions to provide the output that I needed.

Final Thoughts

I am very proud of this. It was my first really creative project that was of my own design, as opposed to just writing code to more specific requirements provided by the instructor. I hope you enjoy it!