

CS162 400 S2015
Final Project
2015-6-7
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Final Project: MarsOne



1.0 Requirements:

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| 1.0 | General |
| 1.1 | Design and implement a text-based game where the player moves through a room or compartment based structure |
| 1.2 | The user will need to gather items to achieve some purpose |
| 1.3 | There must be a goal for the user, such as solve a crime or build something. Based on the theme of the game the user must discover what the solution is. |
| 1.4 | The program must have a time limit of some sort to urge the player on. |
| 2.0 | Rooms |
| 2.1 | Create a series of rooms for the player to move through. |
| 2.2 | Each room will be a class with four pointer variables that link to other rooms. |
| 2.3 | The room structure can be linear (e.g. train) or 2-dimensional (building) |
| 2.4 | Create at least 10 rooms |

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| 2.5 | Start with a Room super class that is not implemented |
| 2.6 | Create at least 3 derived classes from Room with unique characteristics or functions other than just a different name |
| 2.7 | The program must have some way to keep track of which room the player is in. |
| 3.0 | Player |
| 3.1 | You are not required to have a class just for the player but that is one solution to holding all information for the player in the game. |
| 3.2 | In addition to the location, the player will have a bag (backpack, attaché, or knitting bag) to carry items. The bag must have some limit. It can be simply the number of items or you can include size. |
| 3.3 | The items the player collects should be required as part of the solution, such as a key to the mysterious room (which may not be a physical key or even a single item). You can have more items than will fit in the bag. |

Design:

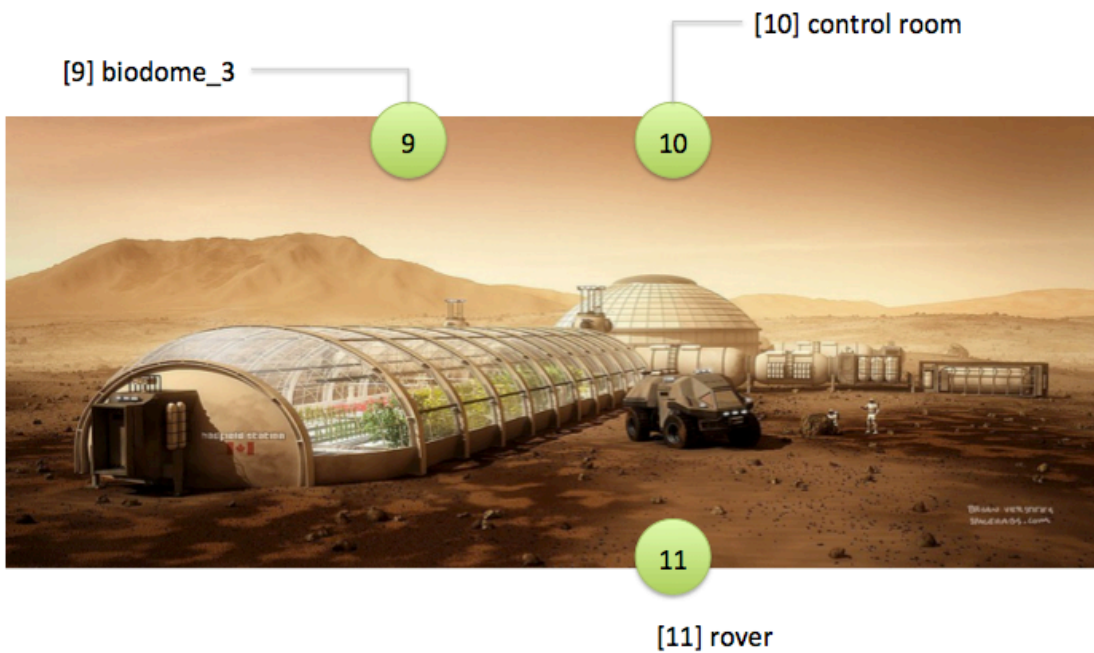
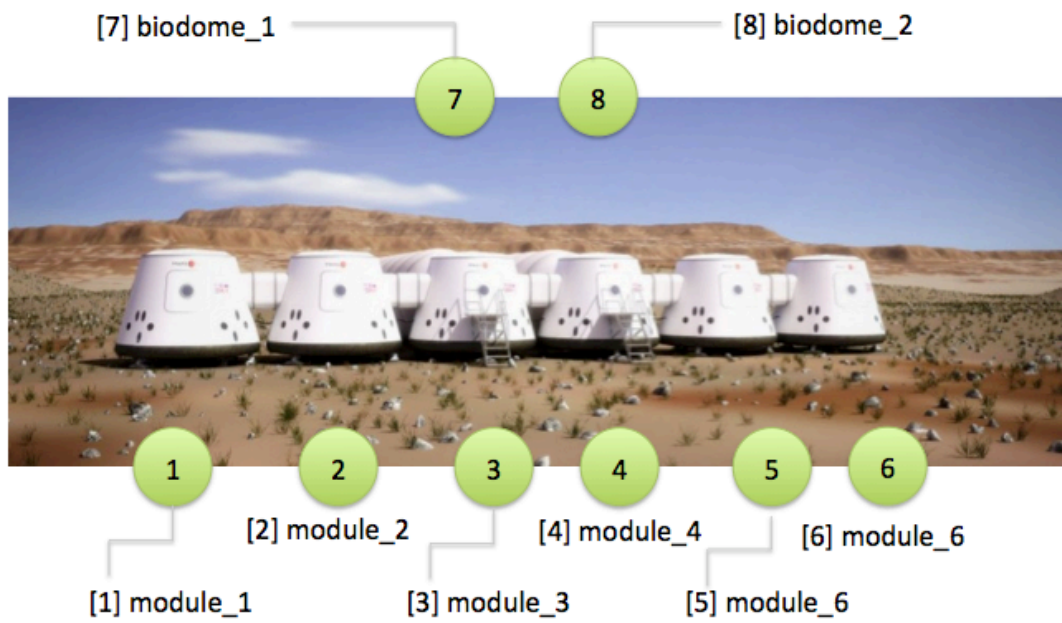
2.0 Objective overview

The player is an inhabitant of the Mars One Outpost, the first human habitat on Mars. The game begins with the player awakening to the sound of an alarm in module_1. The alarm indicates low oxygen levels in the living quarters.

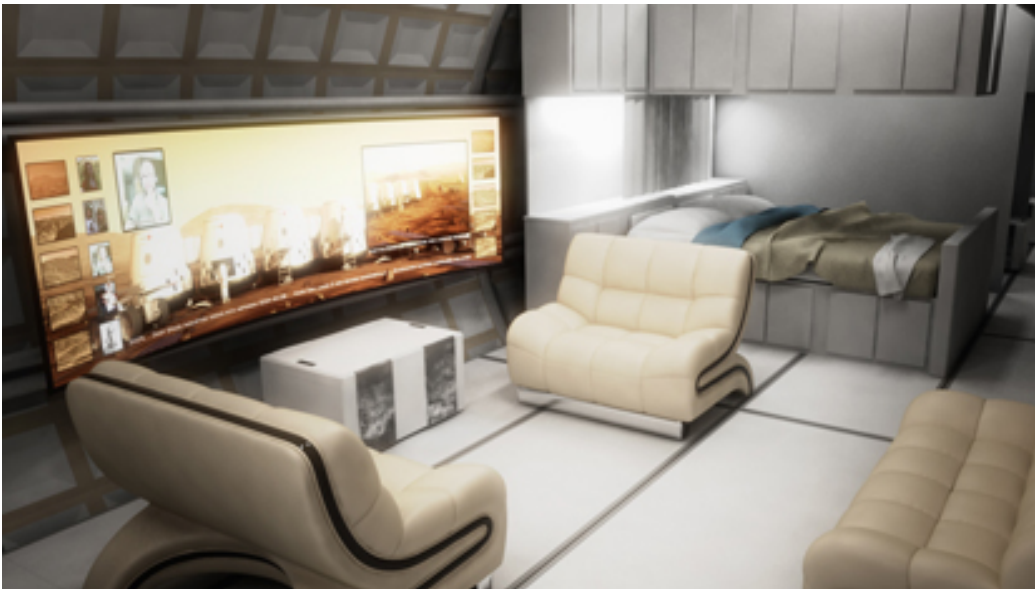
The player must gather the necessary gear to assemble a complete space suit. The player will find pieces of the suit in module_3, 4 and 5. The player must also find their keycard to access the controls in the Control Room and duct tape to mend the damaged air duct. The keycard can be found in module_1, where the player woke up initially. The duct tape is found in biodome_1. Before the player can collect items they must first have a pack. The pack is found in module_2. The pack cannot carry more than 6 items at a time.

When the player finds all the items of the space suit they must suit up and head outside. The rover will take the player to the Control Room, where the player will fix the air duct and check the console in the control room. The player must solve the problem in 10 minutes or less, otherwise the player will be terminated and the game will be over.

2.2 Rooms



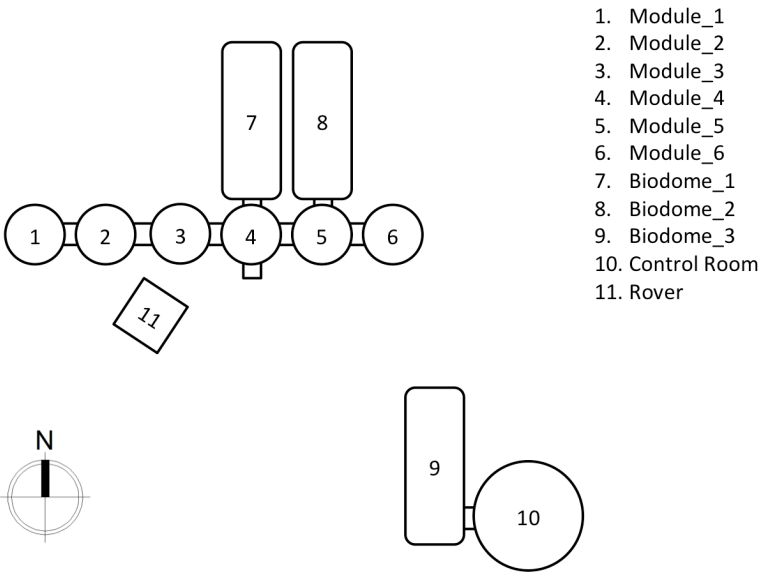
Module Interior:



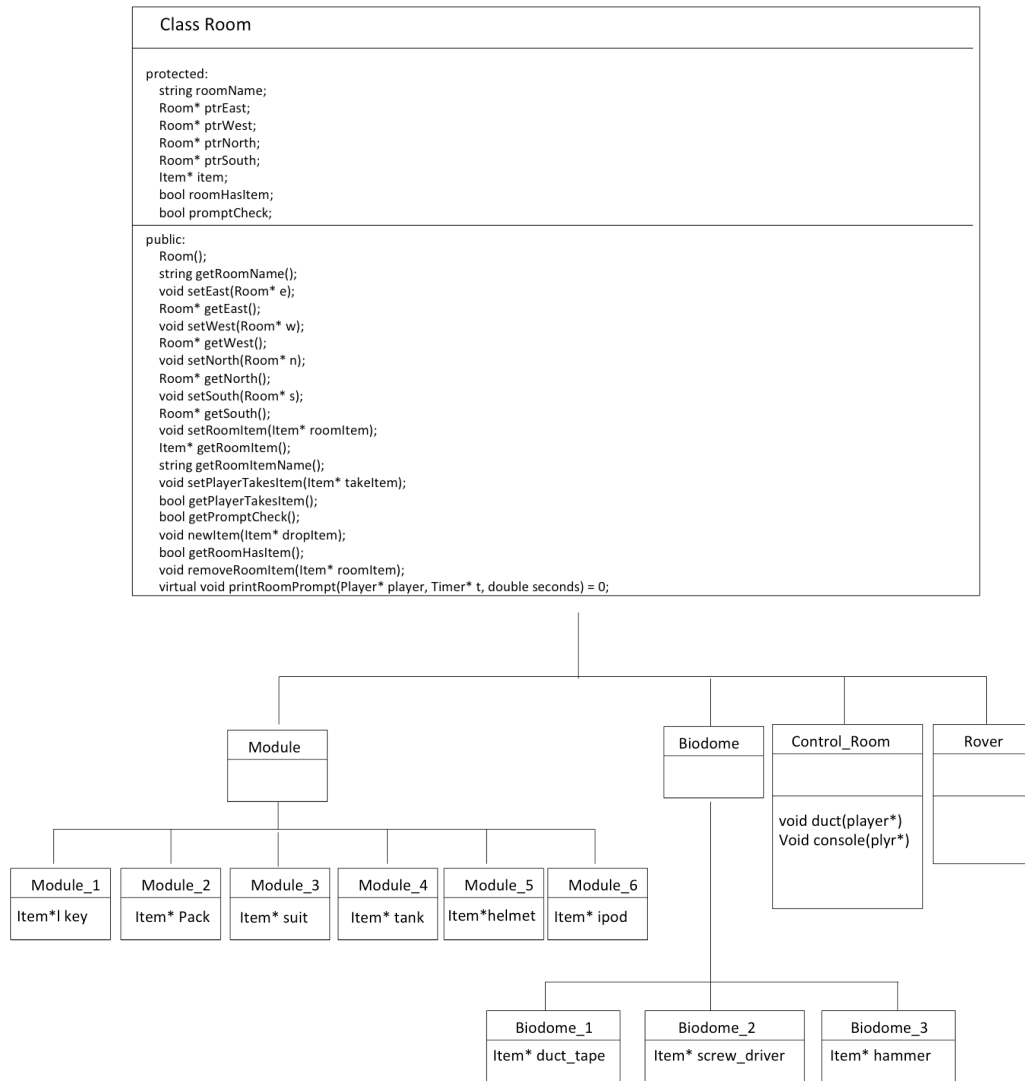
Biodome Interior:



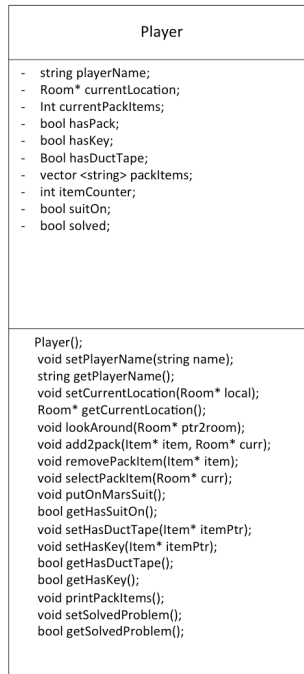
Gameplay Map:



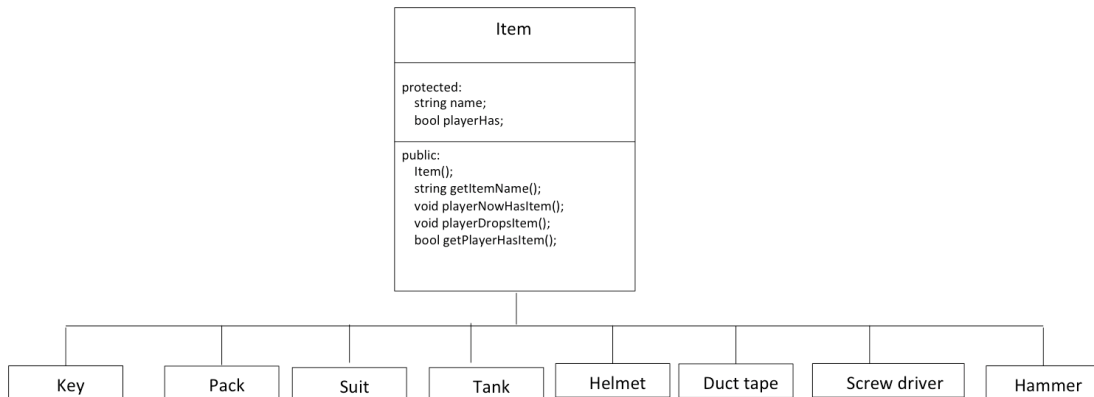
Room Class Hierarchy: Variables and Methods



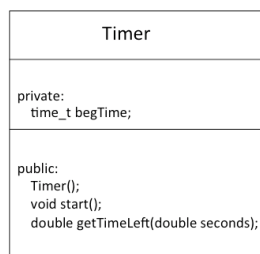
2.3 Player Class: Variables and Methods



2.4 Items Class Hierarchy: Variables and Methods



2.5 Timer Class: Variables and Methods



3.0 Testing

| No. | Description | Expected Outcome | Actual Outcome |
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| 1.1 | Enter player name: (TestName) | TestName is an inhabitant of the Mars One Outpost, the first human habitation on Mars. While sleeping in their bunk TestName awakens to the sound of an alarm sounding. TestName gets out of bed to see what is causing the alarm and realizes they are having trouble breathing | TestName is an inhabitant of the Mars One Outpost, the first human habitation on Mars. While sleeping in their bunk TestName awakens to the sound of an alarm sounding. TestName gets out of bed to see what is causing the alarm and realizes they are having trouble breathing |
| 1.2 | Player moves from Module_1 to Module_2 | You are currently in Module_2. Module_2 contains storage shelves, with gear and supplies. There is a door to Module_1 and there is a door to another room. | You are currently in Module_2. Module_2 contains storage shelves, with gear and supplies. There is a door to Module_1 and there is a door to another room. |
| 1.3 | Player moves from Module_2 to Module_3 | You are currently in Module_3. Inside Module_3 there lockers and a rack with hanging Mars suits. All astronauts must wear Mars suits when exposed to the Mars atmosphere. Mars suits protect astronauts from extreme temperatures and the very thin, non-breathable atmosphere. You notice that the hanging suits do not have all of the required components, and they are missing air tanks and helmets There is a door to Module_2 and you see a door to another room. | You are currently in Module_3. Inside Module_3 there lockers and a rack with hanging Mars suits. All astronauts must wear Mars suits when exposed to the Mars atmosphere. Mars suits protect astronauts from extreme temperatures and the very thin, non-breathable atmosphere. You notice that the hanging suits do not have all of the required components, and they are missing air tanks and helmets There is a door to Module_2 and you see a door to another room. |
| 1.4 | Player moves from Module_3 to Module_4 | You are currently in Module_4. Inside Module_4 equipment racks with oxygen tanks. This room has four doors. To the west there is a door to Module_3 and to the north you can see an open door that leads to a biodome. To the south you see a door that leads outside. To the east there is a door to another room. | You are currently in Module_4. Inside Module_4 equipment racks with oxygen tanks. This room has four doors. To the west there is a door to Module_3 and to the north you can see an open door that leads to a biodome. To the south you see a door that leads outside. To the east there is a door to another room. |
| 1.5 | Player moves from Module_4 to Module_5 | You are currently in Module_5. Inside Module_5 there is a dining area, with a table and chairs. | You are currently in Module_5. Inside Module_5 there is a dining area, with a table and chairs. There is also a small rack with |

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| | | <p>There is also a small rack with helmets for the Mars suits. This room has three doors. One door leads back to Module_4. To the north you see a door that leads to a biodome. To the east you see a door that leads to another</p> | <p>helmets for the Mars suits. This room has three doors. One door leads back to Module_4. To the north you see a door that leads to a biodome. To the east you see a door that leads to another</p> |
| 1.6 | Player moves from Module_5 to Module_6 | <p>You are currently in Module_6.</p> <p>Inside Module_6 there bunk beds and a you see a large monitor mounted on the wall. The monitor is displaying a map of the Mars One Outpost. You see that there is a portion of the Outpost that is disconnected from the portion of the outpost where you are currently located. The remote section of the Outpost is where the Control_Room is located, which is where the controls for the Outpost oxygen levels can be controlled</p> | <p>You are currently in Module_6.</p> <p>Inside Module_6 there bunk beds and a you see a large monitor mounted on the wall. The monitor is displaying a map of the Mars One Outpost. You see that there is a portion of the Outpost that is disconnected from the portion of the outpost where you are currently located. The remote section of the Outpost is where the Control_Room is located, which is where the controls for the Outpost oxygen levels can be controlled</p> |
| 1.7 | Player moves from Module_6 to Module_5 | <p>You are currently in Module_5.</p> <p>Inside Module_5 there is a dining area, with a table and chairs. There is also a small rack with helmets for the Mars suits. This room has three doors. One door leads back to Module_4. To the north you see a door that leads to a biodome. To the east you see a door that leads to another room.</p> | <p>You are currently in Module_5.</p> <p>Inside Module_5 there is a dining area, with a table and chairs. There is also a small rack with helmets for the Mars suits. This room has three doors. One door leads back to Module_4. To the north you see a door that leads to a biodome. To the east you see a door that leads to another room.</p> |
| 1.8 | Player moves from Module_5 to Module_4 | <p>You are currently in Module_4.</p> <p>Inside Module_4 equipment racks with oxygen tanks. This room has four doors. To the west there is a door to Module_3 and to the north you can see an open door that leads to a biodome. To the south you see a door that leads outside. To the east there is a door to another room.</p> | <p>You are currently in Module_4.</p> <p>Inside Module_4 equipment racks with oxygen tanks. This room has four doors. To the west there is a door to Module_3 and to the north you can see an open door that leads to a biodome. To the south you see a door that leads outside. To the east there is a door to another room.</p> |

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| 1.9 | Player moves from Module_4 to Module_3 | <p>You are currently in Module_3.</p> <p>Inside Module_3 there lockers and a rack with hanging Mars suits. All astronauts must wear Mars suits when exposed to the Mars atmosphere. Mars suits protect astronauts from extreme temperatures and the very thin, non-breathable atmosphere. You notice that the hanging suits do not have all of the required components, and they are missing air tanks and helmets There is a door to Module_2 and you see a door to another room.</p> | <p>You are currently in Module_3.</p> <p>Inside Module_3 there lockers and a rack with hanging Mars suits. All astronauts must wear Mars suits when exposed to the Mars atmosphere. Mars suits protect astronauts from extreme temperatures and the very thin, non-breathable atmosphere. You notice that the hanging suits do not have all of the required components, and they are missing air tanks and helmets There is a door to Module_2 and you see a door to another room.</p> |
| 1.10 | Player moves from Module_3 to Module_2 | <p>You are currently in Module_2.</p> <p>Module_2 contains storage shelves, with gear and supplies. There is a door to Module_1 and there is a door to another room.</p> | <p>You are currently in Module_2.</p> <p>Module_2 contains storage shelves, with gear and supplies. There is a door to Module_1 and there is a door to another room.</p> |
| 1.11 | Player moves from Module_2 to Module_1 | <p>You are currently in Module_1.</p> <p>Inside Module_1 there are bunk beds, a few chairs, and a large monitor displaying information about the Mars One Outpost. You approach the monitor and see a warning message flashing, indicating that the oxygen levels base station and they are levels are continuing to drop even further. If oxygen levels dip to low you and the other inhabitants will be terminated. You see a door to the east that goes to another room.</p> | <p>You are currently in Module_1.</p> <p>Inside Module_1 there are bunk beds, a few chairs, and a large monitor displaying information about the Mars One Outpost. You approach the monitor and see a warning message flashing, indicating that the oxygen levels base station and they are levels are continuing to drop even further. If oxygen levels dip to low you and the other inhabitants will be terminated. You see a door to the east that goes to another room.</p> |

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| 1.12 | Player moves from Module_4 to Biodome_1 | <p>You are currently in Biodome_1.</p> <p>Inside Biodome_1 there are long rows of racks, containing</p> <p>hydroponic plants, with large LED lights suspended over the racks.</p> <p>It appers that in this biodome the current harvest is snow peas.</p> <p>There are two doors in this room. One door leads to Module_4, and another door leads to what appears to be another biodome.</p> | <p>You are currently in Biodome_1.</p> <p>Inside Biodome_1 there are long rows of racks, containing</p> <p>hydroponic plants, with large LED lights suspended over the racks.</p> <p>It appers that in this biodome the current harvest is snow peas.</p> <p>There are two doors in this room. One door leads to Module_4, and another door leads to what appears to be another biodome.</p> |
| 1.13 | Player moves from Biodome_1 to Biodome_2 | <p>You are currently in Biodome_2.</p> <p>Inside Biodome_2 there are long rows of racks, containing hydroponic plants, with large LED lights suspended over the racks.</p> <p>It appers that in this biodome the current harvest is soy beans and you see processing equipment for making tofu. There are two doors in this room. One door leads to Biodome_1, and another door leads to another room.</p> | <p>You are currently in Biodome_2.</p> <p>Inside Biodome_2 there are long rows of racks, containing hydroponic plants, with large LED lights suspended over the racks.</p> <p>It appers that in this biodome the current harvest is soy beans and you see processing equipment for making tofu. There are two doors in this room. One door leads to Biodome_1, and another door leads to another room.</p> |
| 1.14 | Player moves from Biodome_1 to Module_4 | <p>You are currently in Module_4.</p> <p>Inside Module_4 equipment racks with oxygen tanks. This room has four doors. To the west there is a door to Module_3 and to the north you can see an open door that leads to a biodome. To the south you see a door that leads outside. To the east there is a door to another room.</p> | <p>You are currently in Module_4.</p> <p>Inside Module_4 equipment racks with oxygen tanks. This room has four doors. To the west there is a door to Module_3 and to the north you can see an open door that leads to a biodome. To the south you see a door that leads outside. To the east there is a door to another room.</p> |
| 1.15 | Player moves from Biodome_2 to Module_5 | <p>You are currently in Module_5.</p> <p>Inside Module_5 there is a dining area, with a table and chairs.</p> <p>There is also a small rack with helmets for the Mars suits. This room has three doors. One door leads back to Module_4. To the the north you see a door that leads to a biodome. To the east you see a door that leads to another room.</p> | <p>You are currently in Module_5.</p> <p>Inside Module_5 there is a dining area, with a table and chairs.</p> <p>There is also a small rack with helmets for the Mars suits. This room has three doors. One door leads back to Module_4. To the the north you see a door that leads to a biodome. To the east you see a door that leads to another room.</p> |

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| 1.16 | Collect six items and print pack items | Pack Items: ----- 1) key 2) suit 3) tank 4) helmet 5) ipod 6) duct tape | Pack Items: ----- 1) key 2) suit 3) tank 4) helmet 5) ipod 6) duct tape |
| 1.17 | Collect six items and attempt to collect one additional item | Your pack is full. Please remove an item to pick up something else. Select the item you want to remove from your pack: Pack Items: ----- 1) key 2) suit 3) tank 4) helmet 5) ipod 6) duct tape | Your pack is full. Please remove an item to pick up something else. Select the item you want to remove from your pack: Pack Items: ----- 1) key 2) suit 3) tank 4) helmet 5) ipod 6) duct tape |
| 1.18 | Attempt to drop an item in a room that already has an item | You cannot drop an item in a room that already has an item in it. Please find another | You cannot drop an item in a room that already has an item in it. Please find another |
| 1.19 | First attempt to move from Module_4 to Outside | You will die if you go outside without wearing a Mars suit. Do you want to put on your Mars suit? 1) Yes. 2) No. | You will die if you go outside without wearing a Mars suit. Do you want to put on your Mars suit? 1) Yes. 2) No. |
| 1.20 | Once Mars suit is on, move from Module_4 to Outside | You are currently Outside. As you exit the Mars One Outpost and step onto the surface of Mars You notice that Mars has about one-third the gravity of Earth. Red dust covers the surface and you feel the loose sand move under Your boots as you walk lightly on the surface. You look look south and see Biodome_3 and the Control_Room. The Control_Room is connected to Biodome_3, and can only access the Control_Room through Biodome_3. To the west you see a Rover, which would greatly increase your speed in traveling to the Control_Room. | You are currently Outside. As you exit the Mars One Outpost and step onto the surface of Mars You notice that Mars has about one-third the gravity of Earth. Red dust covers the surface and you feel the loose sand move under Your boots as you walk lightly on the surface. You look look south and see Biodome_3 and the Control_Room. The Control_Room is connected to Biodome_3, and can only access the Control_Room through Biodome_3. To the west you see a Rover, which would greatly increase your speed in traveling to the Control_Room. |

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| 1.21 | Move from Outside to Rover | <p>You are currently in Rover.</p> <p>You climb into the Rover and start the engine. you can see mountain ranges and volcanoes in the distance, and To the south, you can see Biodome_3 and the Control_Room.</p> <p>To the west you see a vast desert, with a sand storm churning in the distance. To the east you see a mountain range, plus a large volcano. To the north is the Outpost.</p> | <p>You are currently in Rover.</p> <p>You climb into the Rover and start the engine. you can see mountain ranges and volcanoes in the distance, and To the south, you can see Biodome_3 and the Control_Room.</p> <p>To the west you see a vast desert, with a sand storm churning in the distance. To the east you see a mountain range, plus a large volcano. To the north is the Outpost.</p> |
| 1.22 | Move from Rover to Outside_south | <p>You are currently Outside.</p> <p>You arrive outside of the Southern Outpost and see Biodome_3 to the east. Attached to Biodome_3 you see the Control_Room.</p> | <p>You are currently Outside.</p> <p>You arrive outside of the Southern Outpost and see Biodome_3 to the east. Attached to Biodome_3 you see the Control_Room.</p> |
| 1.23 | Move from Outside_south to Biodome_3 | <p>You are currently in Biodome_3.</p> <p>Inside Biodome_3 it is filled with rows of tall trees, towering over you. You look up and see that the trees are fruit trees of many different varieties. Apples, oranges and limes hang from their branches. Above the trees there are massive LED lights that illuminate each tree. You look around the room and see that there is a door that leads into another room. As you approach the room you hear a computerized voice proclaim:</p> <p>'OXYGEN LEVELS DANGEROUSLY LOW! --- OXYGEN LEVELS DANGEROUSLY LOW!</p> | <p>You are currently in Biodome_3.</p> <p>Inside Biodome_3 it is filled with rows of tall trees, towering over you. You look up and see that the trees are fruit trees of many different varieties. Apples, oranges and limes hang from their branches. Above the trees there are massive LED lights that illuminate each tree. You look around the room and see that there is a door that leads into another room. As you approach the room you hear a computerized voice proclaim:</p> <p>'OXYGEN LEVELS DANGEROUSLY LOW! --- OXYGEN LEVELS DANGEROUSLY LOW!</p> |

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| 1.23 | Move from Biodome_3 to Control_Room | <p>You are currently in Control_Room.</p> <p>As you enter the Control_Room you see objects whirling around the room. An air duct has come loose on the wall and is leaking large amounts of pressurized air into the room. This is surely what has caused the issues with the low oxygen levels in the Outpost.</p> <p>There is a large control console in the center of the room, with several display monitors mounted on it. There is also communications equipment for communicating with mission control. The only door in the room leads back to Biodome_3</p> <p>Select how you would like to proceed: 1) Walk over to busted air duct. 2) Walk to control console. 3) Leave control room.</p> | <p>You are currently in Control_Room.</p> <p>As you enter the Control_Room you see objects whirling around the room. An air duct has come loose on the wall and is leaking large amounts of pressurized air into the room. This is surely what has caused the issues with the low oxygen levels in the Outpost.</p> <p>There is a large control console in the center of the room, with several display monitors mounted on it. There is also communications equipment for communicating with mission control. The only door in the room leads back to Biodome_3</p> <p>Select how you would like to proceed: 1) Walk over to busted air duct. 2) Walk to control console. 3) Leave control room.</p> |
| 1.24 | Select to head a west when there is no linked room in the west direction. | There is no way to move west from here. | There is no way to move west from here. |
| 1.25 | Select to head a east when there is no linked room in the east direction. | There is no way to move east from here. | There is no way to move east from here. |
| 1.26 | Select to head a north when there is no linked room in the north direction. | There is no way to move north from here. | There is no way to move north from here. |
| 1.27 | Select to head a south when there is no linked room in the south direction. | There is no way to move south from here. | There is no way to move south from here. |
| 1.28 | Attempt to mend duct without having the duct tape in your pack | You do not have the necessary items in your pack to repair the duct. | You do not have the necessary items in your pack to repair the duct. |
| 1.29 | Attempt to access console without having the key card in your pack | You do not have the necessary items in your pack to access the console. | You do not have the necessary items in your pack to access the console. |

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| 1.30 | Player has duct tape and key card and mends to duct | <p>You reconnect the separated ducting, which has an immediate impact on the air that was blasting out of the duct. You remove the duct tape from your pack and secure the duct in place.</p> <p>Now that the duct is repaired you walk over to the console to check the oxygen levels in the Outpost. You enter your keycard into the console and gain access to the controls. The air pressure gauges begin to return to a safe level and the alarm stops sounding. You have effectively solved this problem and saved the Mars One Outpost mission. NICE WORK.</p> <p>You receive a personal video message from Elon Musk congratulating you your courage and resolve under pressure * * GAME OVER * *</p> | <p>You reconnect the separated ducting, which has an immediate impact on the air that was blasting out of the duct. You remove the duct tape from your pack and secure the duct in place.</p> <p>Now that the duct is repaired you walk over to the console to check the oxygen levels in the Outpost. You enter your keycard into the console and gain access to the controls. The air pressure gauges begin to return to a safe level and the alarm stops sounding. You have effectively solved this problem and saved the Mars One Outpost mission. NICE WORK.</p> <p>You receive a personal video message from Elon Musk congratulating you your courage and resolve under pressure * * GAME OVER * *</p> |
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4.0 Reflection:

4.1 Overview

This assignment was my most enjoyable programming assignment to date. The open ended nature of the assignment really allowed for creativity and enabled an exhibition of the skills that were acquired throughout CS161 and CS162.

Also, I thoroughly enjoyed researching Mars One during the planning and design portion of this assignment. I found that I put more into this design than any other program I had create, and this effort paid dividends during implementation. Although arduous, this was one of the most efficient implementations I have experienced. There were small issues throughout the process but typically I was able to easily identify the root cause and try a new approach expeditiously.

4.2 Issues during implementation

During my first tests I was getting segmentation faults anytime I attempted to navigate a direction that did not have a linked room. In other words, if I attempted to go north, but there was not a room to the north, then the program would seg fault. Initially I had the ptrs to directions that were inaccessible in a NULL. I revised this to have the rooms point to themselves and provide an error message in instances when it was not possible to move a particular direction. So instead of having `module1.setNorth(NULL)`, I have `module1.setNorth(&module1)`.

I also neglected to see the timer requirement in my initial read of the assignment. I went back after implementation and created the timer class.

4.1 Key takeaways

Although I had written about the importance of design throughout CS161 and CS162 I hadn't really spent any meaningful time on my designs for either course. During this assignment I really felt as though I was designing a "real" program, that could be used from something more than obtaining a grade. Due to this, I put a lot of effort into my design and I was able to finally feel the satisfaction of having a design conceptualized on paper turn into functioning code.

I leave this assignment and this course with appreciation for both our Professor and my TA, for making the course so enjoyable and rewarding. I am excited to continue on in the OSU program and I am seriously impressed with how much we have learned thus far in the program.