

# Design Document

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## **Group 31 Adventure Game Project**

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## **GitLab Repository:**

[https://mcscm.utm.utoronto.ca/csc207\\_20239/group\\_31.git](https://mcscm.utm.utoronto.ca/csc207_20239/group_31.git)

## SECTION 1: PROJECT IDENTIFICATION

We are extending the adventure game from assignment 2. In this extension, we will be adding features to enhance entertainment and make the game more competitive. We found the older version of the game fun, but lacking in competitiveness, since users were too comfortable and did not feel challenged enough. Moreover, we will be adding additional accessibility features for the visually impaired to make this adventure game more friendly to all types of users.

## SECTION 2: USER STORIES

| Name                | ID  | Owner  | Description  | Acceptance Criteria  | Implementation Details   | Priority | Effort |
|---------------------|-----|--------|--|--|--|----------|--------|
| User Health         | 1.1 | Jad    | As a user who loves immersive video games, I want a more interactive and survival element to the adventure game so that I am more entertained. | Given that I am a user who loves immersive video games, my health must be tracked/stored and should be deducted/added to when applicable. When I get to 0 health I should be eliminated. | Store user health and remove/add health whenever required. When health is 0 an eliminated screen should pop up.  | 1        | 5      |
| ColorWay            | 1.2 | Haris  | As a gaming user, I want to be able to pick the color mode for the game, so it is suitable for my color accessibility.                         | Given I am a user who needs color accessibility. There should be a ComboBox where I can pick the color way I want for the game, i.e Dark mode, Light mode, and High Contrast mode.       | Create a ComboBox in the AdventureGameView class and set the action event so whatever colorway the user wants the game will change the color of elements based on that | 1        | 5      |
| Room/ Object Effect | 1.3 | Edward | As a developer, I want to be able to add special effects to rooms and object which so that the game can have more variety                      | Room and object effects should be able to be changed and set through an interface in the class, and every time the player moves rooms, this effect should be called.                     | Implement a strategy design pattern, where the Room and Object class contains an interface that can do special effects to players.                                     | 1        | 3      |

|                             |     |        |  |  |   |   |   |
|-----------------------------|-----|--------|--|--|---|---|---|
| NPC behavior                | 1.4 | Andrew | As a user, I want the NPC to be able to talk and do actions so that I can interact with the NPC.   | Given that I am a user that encounters an NPC, I want the NPC to be able to interact whenever I give commands.   | Create states of NPC that executes an action based on the user's input.   | 1 | 3 |
| Hideable Effect Description | 1.5 | Edward | As a user, I want some objects and room to have hidden descriptions, which adds more strategy and difficulty to the game   | Given, I am a user who loves games that needs strategy, I want some effects to not show the effect in the item description   | Implement a decorator effect that returns a hidden effect description instead of the real effect description.   | 2 | 2 |
| Live Visual Health Bar      | 2.1 | Jad    | As a user who plays games competitively, I need to know when my players health is critical, updated in live time while playing the game so that I can make better game decisions based on my players health. | Given that I am a competitive gamer interacting while playing the adventure game, when I lose or gain health, then I see my health going up or down in real time with a visual representation.                                   | Add a visual long rectangular bar that visually displays the user's health. When a user takes damage the bar should fade red and when the user gains health it should fade green. | 2 | 5 |
| Font Type                   | 2.2 | Haris  | As a user who needs visual accessibility I want to be able to pick the font type of the game   | Given I am a user who has visual accessibility some fonts will be easier to see. There should be a comboBox with a couple options of different fonts. and when i click the font i want the main game to update the font it uses. | Create a ComboBox in the AdventureGameView class and set the action event so that whatever font type the user picks the font will change to that font style.                      | 2 | 3 |
| Room/ Object Damage or heal | 2.3 | Edward | As a user, I want certain rooms and objects to be able to damage or heal the character, so that there can be more strategy and planning involved in the game.  | Entering a room with damaging or healing effects, reduces or increases health. Health should not go past maximum or minimum. Updates the display of health.  | Implement a class that extends the effect interface that can damage or heal players.  | 2 | 1 |

|                      |     |        |   |  |  |   |   |
|----------------------|-----|--------|---|--|--|---|---|
| Room random effects  | 2.4 | Edward | As a user, I want some rooms to be able to have random effects as I enter it, so that there can be variety and challenges in the game                 | Entering a room with random effects, should do a random effect, such as damaging, healing, getting objects, taking objects, etc. Effects should be visible to the players.   | Create a class that implements the effects interface and the decorator pattern, that randomly chooses the effect based on a given list of effects.                                       | 3 | 3 |
| Multiple effects     | 2.5 | Edward | As a user, I want some objects and rooms to be able to have multiple effects, so that there can more variety and challenge in the game.               | Some effects applied to the player should apply multiple effects at once, such as healing and giving items.  | Create a class that implements the effects interface and the decorator pattern, that iterates and applies the effect based on a given list of effects.                                   | 3 | 2 |
| Hint                 | 2.6 | Andrew | As a user, I want to be given some hints so that I can complete the quest comfortably.  | Given that I am a player that struggles to solve the quest, I want to be given with a hint to win the quest  | Create a hint option in the text field within the app and provide a hint on how to win the game, based on the objects available in the room, or the closest path to the end of the game. | 2 | 3 |
| Settings (Font Size) | 3.1 | Jad    | As a user with visual impairment, I need to be able to better read text in the adventure game so that I have the proper information to play the game. | Given I am a user with visual impairment when I increase the font size value in the settings all font sizes should increase/decrease in the gameplay.  | Font size should be stored within the settings. It can be increased and decreased.   | 2 | 2 |
| Game Difficulty      | 3.2 | Jad    | As a user who finds the game too easy, I want a game difficulty so that I can make the game harder/easier to test my skill appropriately.             | Given I am a user who finds the game too easy. There should be a slider before the game with difficulty ratings. When I proceed, my players health should be lowered/raised, damage should increase/decrease and trolls should adjust in difficulty. | Create an input with difficulty ratings that the user can only interact with before the game. When the user proceeds into the game, health should be altered respectively.               | 3 | 2 |

|                             |     |        |  |  |   |   |   |
|-----------------------------|-----|--------|--|--|---|---|---|
| Audio enable                | 3.3 | Haris  | As a gaming user, I want to be able to pick if I want audio features or not so it is suitable for my audio accessibility.  | Given I am a user who has audio accessibility. There should be a button in the main game where when I click it the audio features will be enabled or disabled.   | Create a Button in the AdventureGameView class and set the action event so whenever the user clicks the button it will enable or disable audio.                           | 3 | 3 |
| Settings page View          | 3.4 | Haris  | As a user I want a settings page where I can select what features I want to include in my game like changing colorway and changing font type/size.                   | Given I am a user who wants a settings page at the start of games. The settings page should pop up before the main game so I can input what features I want to change or add before I play the game. The features should change color mode and change font type/size | Make a SettingsPageView class and it will be displayed before the AdventureGameView so that all the settings picked by the user will be set up and shown on the main GUI. | 3 | 5 |
| Room/ Object Effect Factory | 3.5 | Edward | As a developer, I want to be able to set the effects of rooms through the text files without having to change the code directly, so that I can develop more easily   | Given I am a developer who wants to change the layout of rooms and objects, changing the text files of the game, should change the effects loaded into the rooms.  | Create a factory of effect objects that outputs the correct effect based on a given string input.   | 2 | 2 |
| Time Attack                 | 3.6 | Andrew | As a user, I want to have a time attack option to complete the quest so that I feel more challenged to win the game.   | Given that I am a player that wants to play in Time Attack mode, I will be given a limited time countdown, shown at the top of the app, to finish the game.  | Create a timeAttack option in the setting ComboBox and use Timer from JavaFX to show the timer in the AdventureGameView.  | 3 | 3 |
| NPC Side Quest              | 3.7 | Andrew | As a user, I want the NPC to provide me with a side quest in order for it to give me an object that's related to the quest, so that I feel more dynamic in the game. | Given that I am a user that encounters an NPC and wants to obtain an object, the NPC shall provide me with a side quest that is required to take the object.   | Create an implementation of NPCState that allows the NPC to ask questions and the user to answer.   | 3 | 2 |

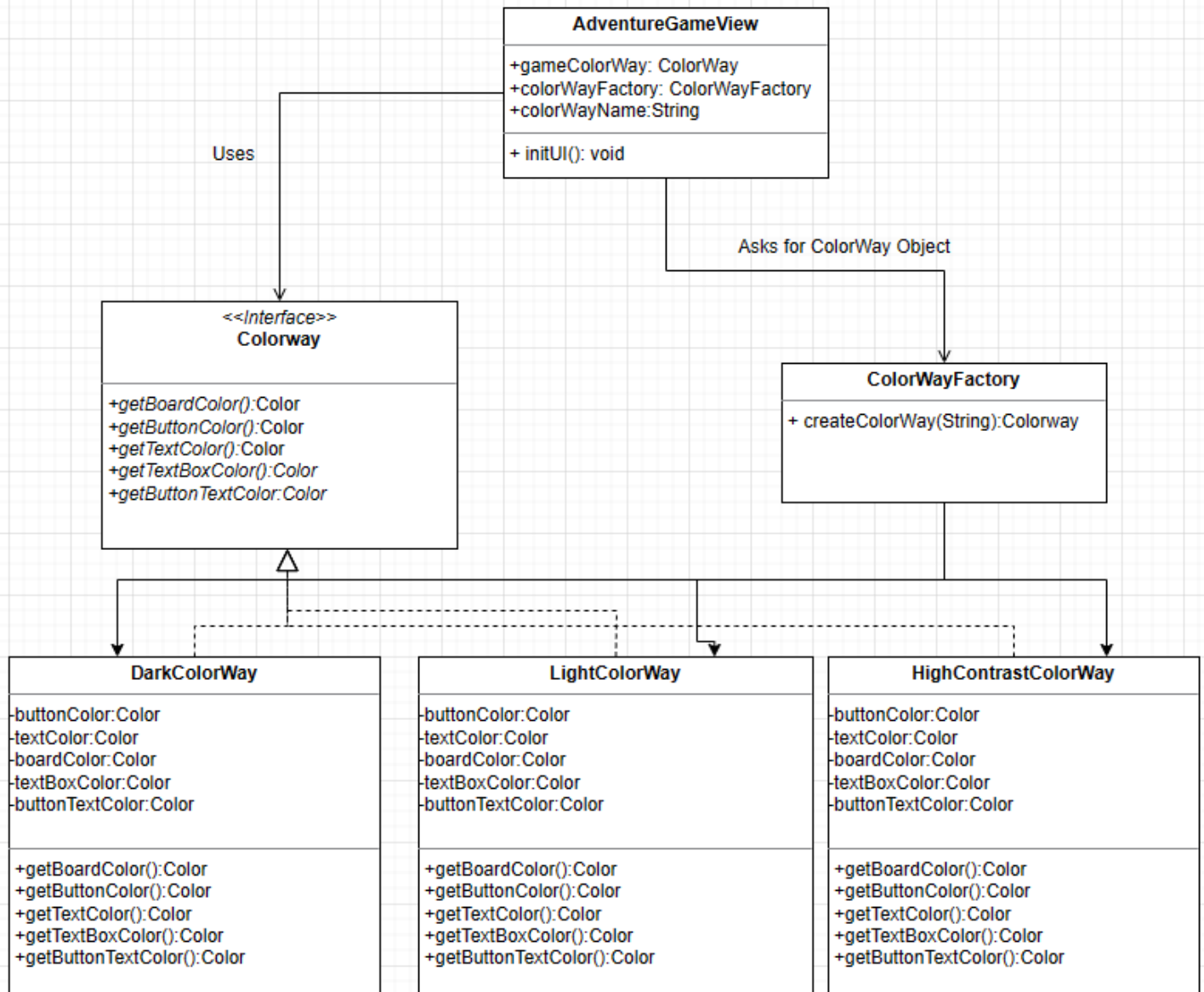
|                       |     |        |   |  |   |   |   |
|-----------------------|-----|--------|---|--|---|---|---|
| Inspect command       | 3.8 | Edward | As a user, I want to be able to inspect the description of an item in my inventory, so that it is easier to organize the items that I have.                                     | Inputting the inspect command, and giving the name of the item to be inspected, should show the full description and effects of the object.  | Add a new action to the interpretAction method which returns the description of the item.   | 3 | 1 |
| Direction Buttons     | 4.1 | Jad    | As a user who enjoys speedrunning games, I would love to have all possible controls/movements as buttons on the screen so that I can get through rooms quicker and set records. | Given I am a user who enjoys speedrunning games. There should be buttons displayed in relation to the moves I can actually make that can be clicked. When I click the buttons I should be moved in the respective direction. | Create a VBox in the AdventureGameView which holds the buttons of all possible moves from a given room.   | 3 | 5 |
| Track users stats     | 4.2 | Haris  | As a user I want to know stats from the current game like objects picked up, objects dropped, trolls fought.  | Given I am a user who enjoys comparing stats. There should be a stats button. Whenever I press the button the current games stats like numbers of objects picked up, number of objects dropped, and number of trolls fought. | Make a stats button in the AdventureGameView class and set the event of the button so that whenever it gets pressed it will display the stats similar to the help button. | 5 | 5 |
| Unhide Hidden effects | 4.3 | Edward | As a user, I want a way to know the effects of hidden effects in objects, so that it is possible to get all the needed information  | Entering a room with the unhideEffect should unhide all effects of objects in player's inventory.  | Implement a class that extends the effect interface that can iterate over all objects in the player's inventory and unhides their effect.                                 | 3 | 3 |
| NPC final boss        | 4.4 | Andrew | As a user, I want the last part of the game to include a final boss so that the entertainment of the game increases.  | Given that I am in the final room of the game before winning, I will play against the final boss with the available objects, and proceed to finish the game if I win.  | Use the NPCState and implement an NPCState that allows it to fight with a player.   | 4 | 5 |

## SECTION 3: SOFTWARE DESIGN

### Design Pattern #1: Factory Pattern - ColorWay

**Overview:** This pattern will be used to implement the Colors functionality

#### UML Diagram:



**Implementation Details:** The UML diagram outlines these main components:

- The *ColourWay* interface, which includes four methods: `GetBoardColor`, `GetTextColor`, `GetButtonTextColor`, `GetTextBoxColor`, and `GetButtonColor`.
- The `DarkColorWay` class implements the methods from the *ColorWay* interface `GetBoardColor`, `GetTextColor`, `GetButtonTextColor`, `GetTextBoxColor`, and `GetButtonColor`. The class instantiates its `ButtonColor`, `TextColor`, `ButtonTextColor`, `TextboxColor`, and `BoardColor` Color objects to the specific colors for Dark mode
- The `LightColorWay` class implements the methods from the *ColorWay* interface `GetBoardColor`, `GetTextColor`, `GetButtonTextColor`, `GetTextBoxColor`, and `GetButtonColor`. The class instantiates its `ButtonColor`, `TextColor`, `TextboxColor`, `BoardColor` Color, and `buttontextColor` objects to the specific colors for Light mode
- The `HighContrastColorWay` class implements the methods from the *ColorWay* interface `GetBoardColor`, `GetTextColor`, `GetButtonTextColor`, `GetTextBoxColor`, and `GetButtonColor`. The class instantiates its `ButtonColor`, `TextColor`, `ButtonTextColor`, `TextboxColor`, and `BoardColor` Color objects to the specific colors for High Contrast mode
- The `ColorWayFactory` class implements the method `CreateColorWay` which takes in a string "dark", "light", or "contrast" and creates the correct *ColorWay* object for that specific input and returns the *ColorWay* object.
- The `AdventureGameView` class instantiates its `gameColorWay` object, `colorWayComboBox`, and its `colorWayFactory` objects. It will also include a method to update the game's colorway which will be the `updateColorWay` method.
- The `AdventureGameView` class will use the `colorWayFactory` to set the game's colorWay by using the `createColorWay` method.

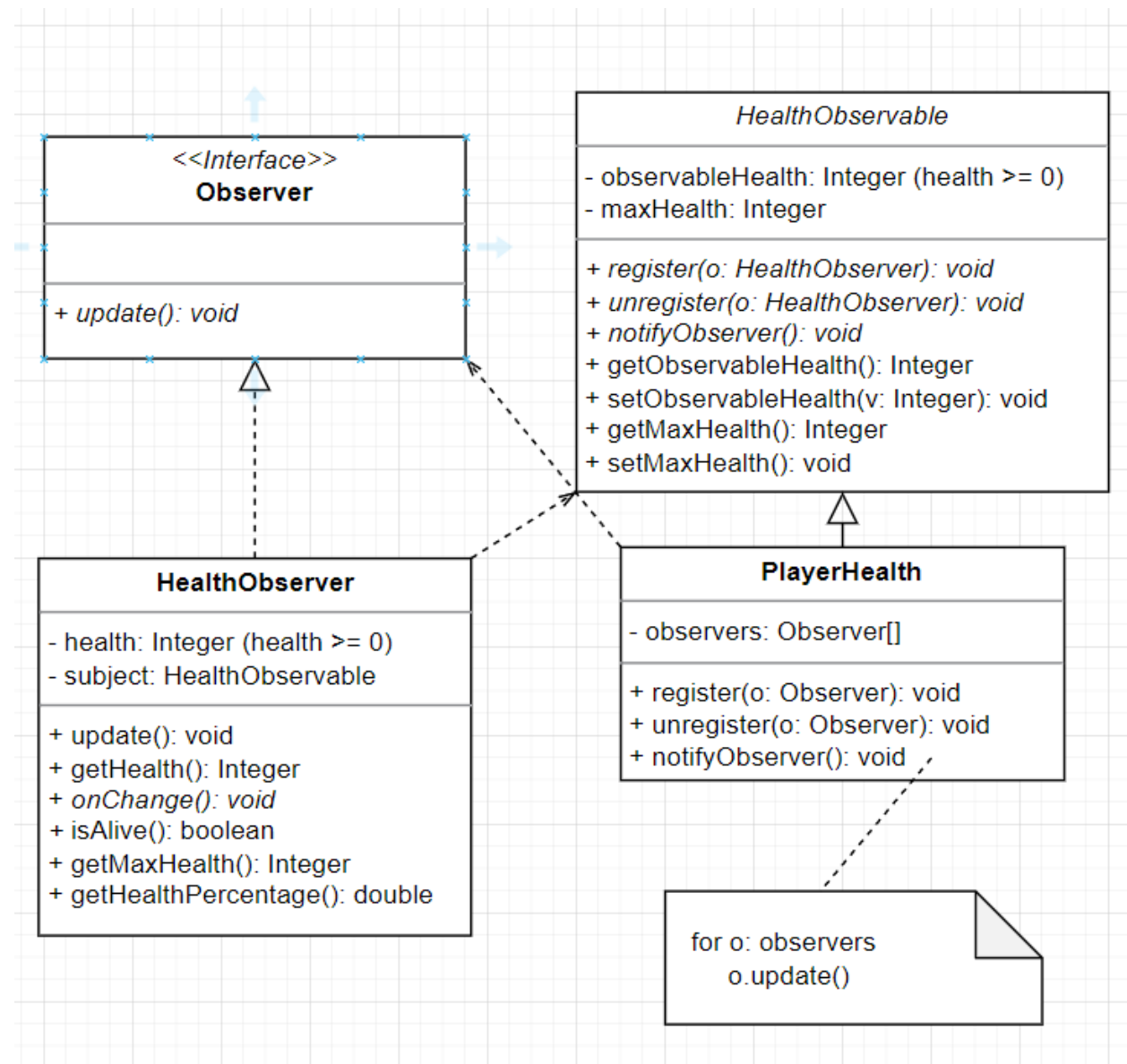
With this implementation users with color accessibility can pick a color mode they want like dark mode, light mode, and high contrast mode. When the user picks any of these modes it will change the game's colors to that specific mode.



## Design Pattern #2: Observer Pattern - Player Health

**Overview:** This pattern will be used to implement the users health into the adventure game.

### UML Diagram:

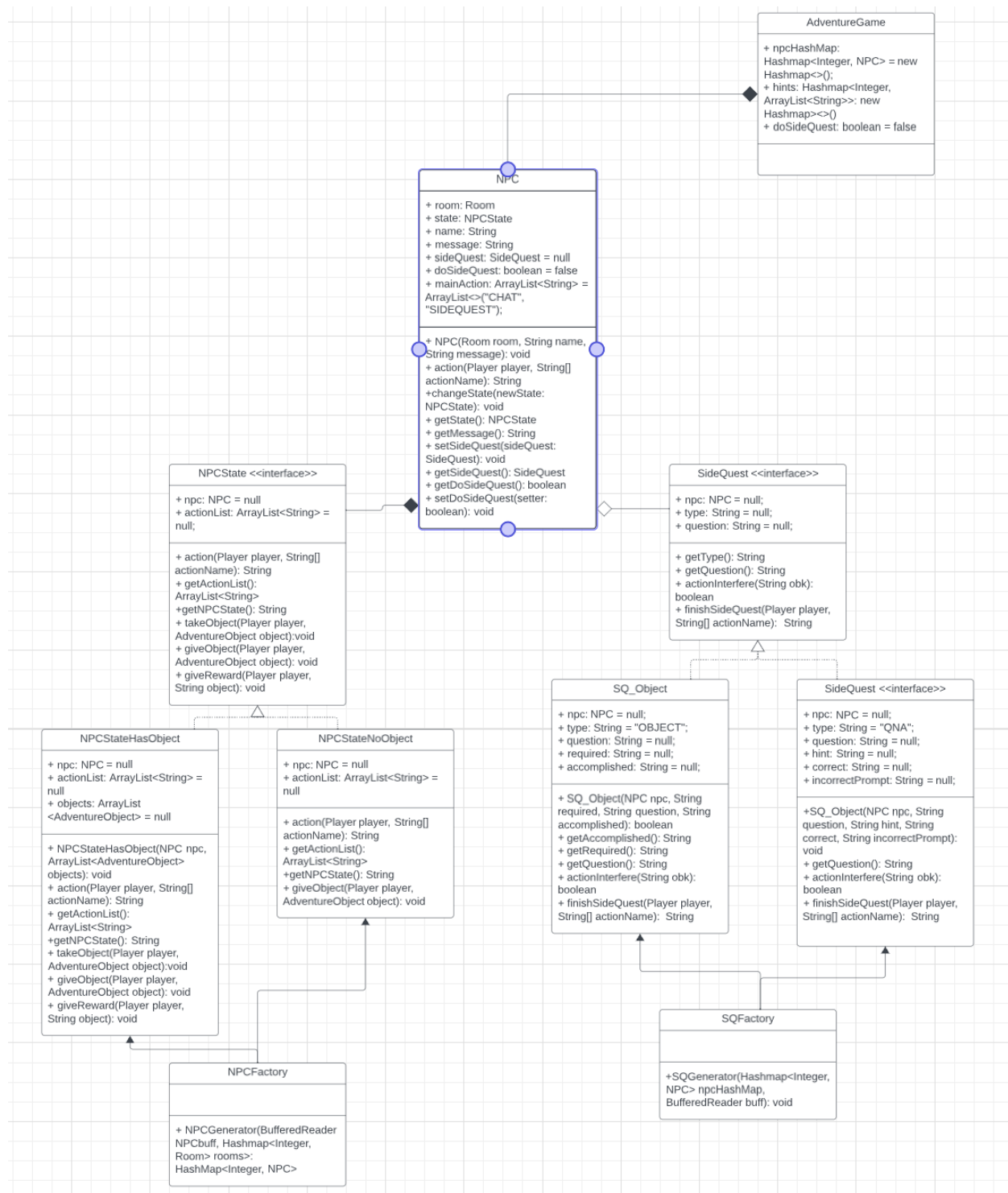


**Implementation Details:** The UML diagram outlines these main components:

- The *Observer* interface, which includes one methods: update.
- The *HealthObserver* class which is an observer that has the ability to update the health state as well as access the health state with *getHealth*.
- The *HealthObservable*, which stores the users health and has public methods *setHealth* and *getHealth*.
- The *PlayerHealth* which implements the *register*, *unregister* and *notifyObserver* methods to allow for real-time health updates to all observers. Notifying observers consists of iterating through all observers and updating them.

With this implementation competitive users and games will be able to see their health updated in real time using the observer pattern. This will allow them to make better decisions and compete in an entertaining way.

## Design Pattern #3: State Pattern - NPCState



**Implementation Details:** The UML diagram outlines these main components:

- The *NPCState* interface, which includes two attributes: `npc` and `actionList`.

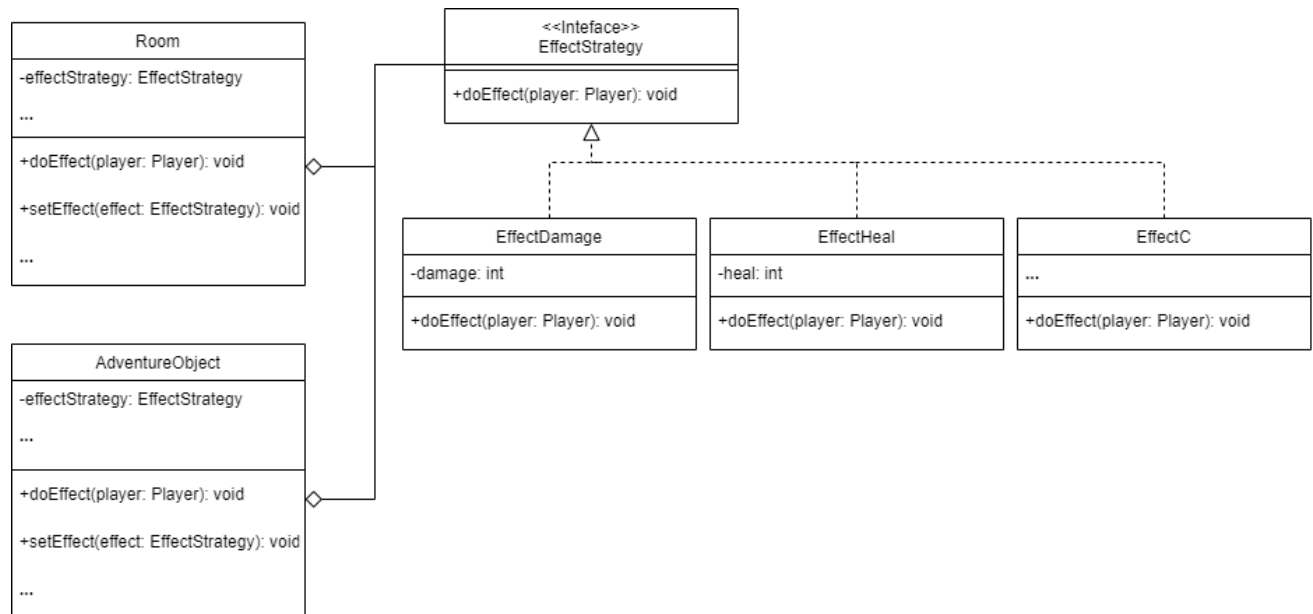
- The NPCStateNoObject class is an NPCState implementation that is used whenever the NPC doesn't have any object. The class has the same attributes as the interface, which are npc and actionList. The class has takeObject which is responsible for changing the NPC state (if necessary) and updating the object's attribute (if applicable). Both of these methods are executed in the action method, which takes a Player class and actionName string. This class also has some getter methods to access the attributes of this class.
- The NPCStateHasObject class is an NPCState implementation that is used whenever the NPC has an object. The class has attributes such as npc, objects, and actionList. The class also has an action method, giveObject, and some getter methods which has the same implementation as NPCStateNoObject. Additionally, this class also has giveObject and giveReward methods, which passes the object passed through the parameter to the player's inventory.
- The NPC class is a class that represents the NPC in the adventure game. This class has attributes such as room, which represents the room the NPC is in, as well as state, which represents the NPCState of the NPC. Additionally, this class also has name, message, sideQuest, doSideQuest, and mainAction attributes, which represents the name of the NPC, introduction of the NPC, associated sideQuest, representation of the status of the sideQuest, and actions available for the NPC, respectively. This class can be initialized by passing the room the NPC is in. This class has methods such as action, which allows the NPC to perform a particular action that is being passed through the parameter. This class also has a changeState method, which allows the NPC to change its state that is passed through the parameter. This class also has some getter and setter methods.
- The NPCFactory class is a class that represents the factory to create the NPCs. This class includes the NPCGenerator method, which receives the buffered reader for NPC and a hashmap of rooms. This class returns a hashmap of integer representing the rooms of the NPC and the NPC itself.
- The SideQuest interface, includes three attributes, npc, type, and question.
- The SQ\_Object class is a SideQuest implementation that is used whenever

the side quest associated with the NPC requires an object from the Player. This class has attributes, such as npc, type, question, required, and accomplished, which represents the NPC associated with the side quest, the type, the question prompt, the required object, and the reward of the side quest. This class has actionInterfere method, which checks whether the action requires the object that is related to the reward of a sidequest. This class also has finishSideQuest method which checks the result of the prompt given by the user, after requesting for a side quest. This method also includes some getter and setter methods.

- The SQ\_Question class is a SideQuest implementation that is used whenever the side quest associated with the NPC is a quiz-based quest. This class has attributes, such as npc, type, question, hint, correct and incorrectPrompt, which represents the NPC associated with the side quest, the type, the question prompt, the correct answer, and incorrect prompt of the side quest. This class also has finishSideQuest method, which has the same purpose as SQ\_Object class.
- The SQFactory class is a class that represents the factory to connect the NPC with the assigned side quest. The class includes a SQGenerator method, which takes a npcHashMap, which is a hashmap of integer correlated with the NPC's room number, and the NPC itself, and a BufferedReader buff, which corresponds to the file that contains the details of the side quests.

With this implementation, users can interact with the NPC with a constraint depending on the state of the NPC.

## Design Pattern #4: Strategy Pattern - EffectStrategy



**Implementation Details:** The UML diagram outlines these main components:

- Room and object class has an instance of the EffectStrategy interface
- Room and object class has a doEffect method that calls the doEffect method of the EffectStrategy interface, and a setEffect that changes the effect in the effectStrategy attribute.
- The EffectStrategy has a method doEffect which accepts the player as and mutates the player based on the implemented effect
- The EffectDamage, EffectHeal, and EffectC, all implements the EffectStrategy interface and adds attributes as necessary, such as damage for EffectDamage and heal for EffectHeal
- Each of the EffectStrategy implementations will have a specific effect implemented in the doEffect method. Such as the EffectDamage's doEffect method will decrease the given player's hp based on damage.

With this implementation, adding various effects are quite easy, only needing to implement a new EffectStrategy, which each can have varying effects as needed. This allows adding various room and object effects fairly easily.