CMPT 276 - Phase 2 Report

Group 22:

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Overview of Implementation:

The implementation of our game took several steps. First, we set up the classes based on our UML diagrams. Generally, this step includes creating the new class, writing attributes for it, and writing getters and setters. Then, we pieced together the relationship between each class by figuring out which classes depend on what and how the game flow would work. The game flow was simple at the beginning where the player would spawn and move to the exit; Gradually, the flow became more complicated as we added exit conditions and obstacles. In parallel to writing the classes and setting up the game flow, we also designed the user interface and implemented it within our program.

As this was the first time anyone in our group was making a video game in Java, we drew inspiration from YouTuber RyiSnow's series "How To Build a 2D Game in Java" to create the game's framework and learn the fundamentals of Java game development. We also have used his sprites during the initial development of our game just so that we didn't test our game with a bunch of different coloured boxes. Our intention in the next phase is to use his tile editor to import our own tilesets; however due to time constraints, we will be using open source game art and sounds for now (RyiSnow, 2022).

Adjustments:

- UI classes:
  - We added the UI classes to the program; they were missing in the initial design phase
- Added "private int ticks" to Game class
  - This was made to keep track of the time passed in the game as a method of scoring for the game
- Board should contain a list of the enemies and list of items
  - To keep track of what is on the board and so the player can collect items and collide with enemies
- Board should have attributes of map
  - To keep track of what elements are on the map and how the player can interact with the map

- Add door class
    - We needed an starting and exit position for the game
- Enemy class is abstract
    - We never need to create an instance of the enemy class and all subclasses are based off of Enemy class with their own implementations.
- Renamed ‘Character’ class to ‘Player’
    - it conflicted with java.lang.character class
- Created a generic ‘Entity’ class for characters in the game to inherit from
    - This abstract class was created so all entities can be related
- Added collision detection and player hitbox
    - Created so we can check if the player hits an enemies and ends the game
- Made door a child of item
    - it made sense that it was an interactable object that ends the level
- Implemented UI and game states
    - Needed an UI so users can play the game and game states so that we can start and end the game appropriately
- Implemented title screen
    - For aesthetics
- Bat to move in a straight line instead of patrolling
    - To add variety in how enemies move
- Skeleton to move in a random fashion
    - To add variety in how enemies move
- Deleted Board, Game, Door (under GameMap), Tiles
    - These classes became obsolete in our implementation

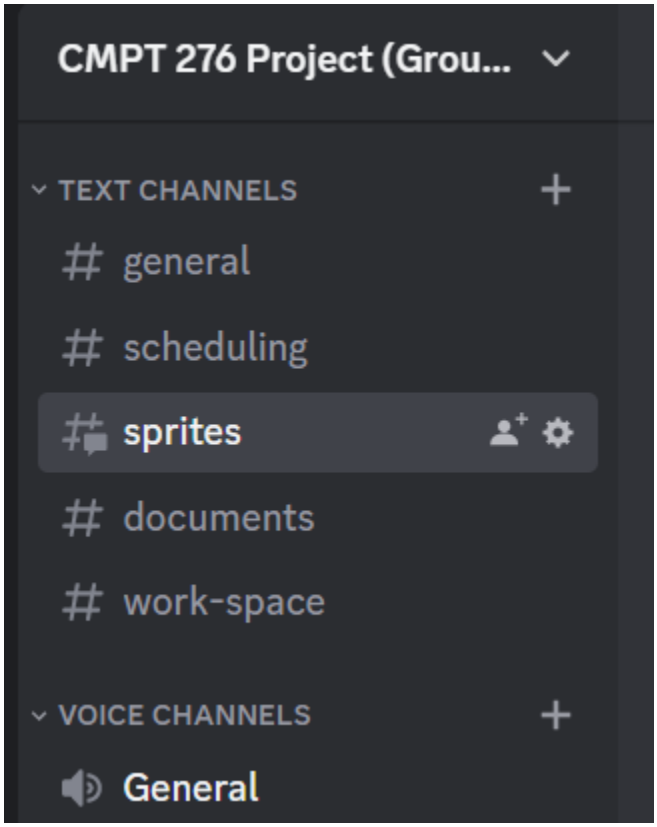
Roles and Responsibilities:

- Skeleton structure of classes/methods: Dina
- Javadoc comments: Michael, Sameer
- Game and Board: Michael, Dina
- UI: Sameer
- Items: Michael
- Entities: Sameer
- Map Design: Salman

We did not assign concrete roles and responsibilities throughout our implementation process. Each person worked on a feature or section that was connected to the code that needed to be done. The features were loosely assigned based on the availability of each person

and their skill sets. Whenever a teammate needed help, another teammate would step in and work on the feature with them.

In terms of communication, we set up a discord server to keep track of our documentation, update our project design, and schedule meetings. We held meetings once a week to keep each other updated on our progress.



External Libraries Used:

- Sprites:
  - Author youtube: https://www.youtube.com/@RyiSnow
  - Note, might change sprites later to these: https://pixel-poem.itch.io/dungeon-assetpuck
- Java extensions (javax)
  - Swing (javax.swing)
  - ImageIO (javax.imageio)
- Abstract Window Toolkit (AWT) (java.awt)
- Utility (java.util)

Quality of Code Considerations:

Initially, most classes had long lines of spaghetti code and needed to be reconfigured into their own classes. We wanted to keep our classes highly cohesive and loosely coupled. We strongly considered the 4 principles of object oriented programming: abstraction, inheritance, polymorphism, and encapsulation and implemented the principles consistently throughout our program.

For example, all of the Entities in our program inherit from our Entity class; they share attributes and methods where necessary so we could have highly cohesive classes. Classes that do not depend on Entity or should not be associated with Entity were separated from Entity to ensure that our classes are loosely coupled. We ensured that attributes for all Entity classes were private to prevent other classes from accidentally and unknowingly changing Entity class attributes.

Additionally, all classes were appropriately grouped in directories: all entities and related classes (Player, Enemy) were grouped under “People”, all items and related classes were grouped under “Drops”, all game/map elements and related classes were grouped under “ GameMap”, the UI class was under “UI”, and all game flow classes were grouped under “app”.

To keep track of what was written and how each method works, we wrote JavaDoc comments for each method. This also has the added benefit of allowing us to understand each other’s code.

Generally, the principle for each class was “if this method/class/attribute can be associated with another method/class/attribute, try to merge them and delete the unnecessary code”. We wanted to ensure our code was as effective and efficient as possible and redundant code only made our program unreadable to each other.

Challenges:

The biggest challenge we faced during phase 2 of the project was implementing the game flow of the program. Although we did not make many changes to the overall design of the game structure, much of it was hard to put together with the UI and implemented. For instance, we had a hard time implementing how the player and enemies moved with the time/time ticks. We decided that the player makes a single move with a time tick however, we could not decide on the move speed of the enemies. One of the conflicts we faced was in regards to movement speed of the enemies and player. If the player could only make a move during a time tick, creating the opportunity for the player to “miss” a move, but the enemies always moved, then the enemies would have a higher movement speed than the player. The player could not outrun the enemies and so the game would end quickly. We decided that the difference in movement

speed would cause frustration to the user and would cause the game to be more difficult than what we intended.

Another issue we faced during phase 2 was the design of the sprites. None of us had experience in designing sprites so we decided that it would be more efficient if we searched for a free stock sprite on the internet. Since we had a fantasy dungeon theme, our options for sprites were limited from the internet and we ultimately decided to reach out to a couple of artists to see if we could use their sprites with permission for our assignment.

References:

1. Ryisnow. (n.d.). *How to Make a 2D Game in Java*. YouTube. Retrieved March 14, 2023, from https://www.youtube.com/playlist?list=PL_QPQmz5C6WUF-pOQDsbsKbaBZqXj4qSq