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Professor Nath
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Individual Project Proposal

My project is going to be a maze-type game. The game will use a maze generation algorithm based on Depth-First-Search algorithm to create a maze, where the player will be put in at the top-left corner. The game will then generate enemies and random items across the maze that the player will run into. The player and enemies will have stats like HP, attack, speed, and defense. The various items across the map will allow the player to regenerate their HP and increase their other stats. The goal is to escape the maze at the bottom-right corner without dying.

For this project, I will be making it in Java. I will not be incorporating a database as I believe there is no data that needs to be stored; this will be a simple single-player game with no saves. All data will be stored in the local session. For the user interface, I will be using the JavaFX framework, along with CSS for styling. For unit testing, I will be using the JUnit framework for Java. Also, upon doing research, I found out that it's best to incorporate some build tool for Java, so I will be using Maven, which I am completely unfamiliar with. To accomplish the requirements of the project, these are not essential, but I prefer to use Java over C++ with Qt and Catch2. The project would be extremely hard, but possible, to do without a GUI and instead use a text-based interface, but a GUI is preferable. Following is my familiarity with the tools on a scale of 1-5:

- Java: 5
- CSS: 4
- JavaFX: 2
- JUnit: 1
- Maven: 1

The overall objective of the game is to escape a maze, so I can not do this project without a maze. It is not essential to have a maze generation algorithm, but I have already researched into this, and it does not look too hard to implement (1). The back-up plan if I can not get it to work is having a library of hand-made mazes that the game will choose from. Having enemies is not essential, but that is essential to the requirements of project; mainly inheritance to have different types of enemies, and random generation of different types, which would incorporate a factory design pattern.

I would also require outside graphical resources for rendering enemies, a sprite map for the player-walking animation, and possible some attack animations when a player must fight an enemy. I also need a basic "wall" for the maze. The point of view will be birds-eye, and will render a small circle around the player as he/she walks through the maze. Therefore, I need some way to draw in the walls, with a possible shadow. Also, if I get to it, I would add some music and sounds to the game, so I would need outside resources for that.

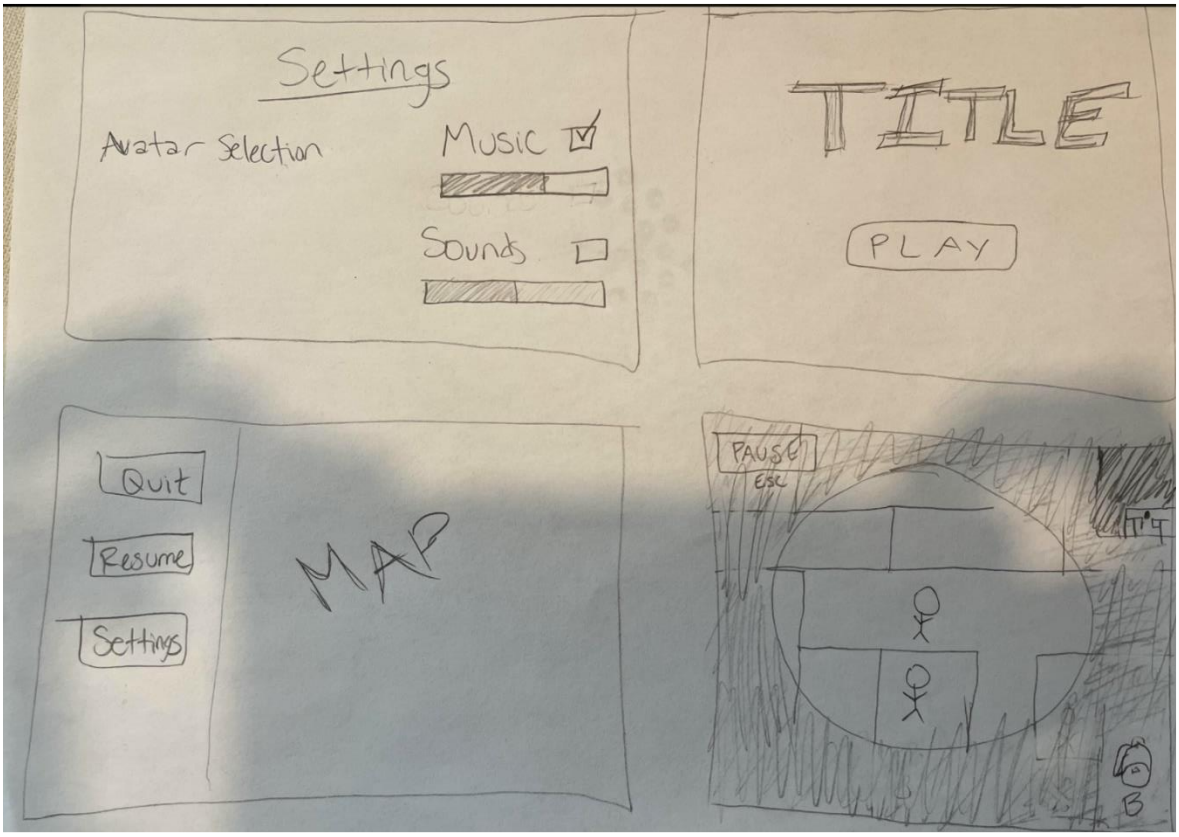
(1) https://www.baeldung.com/cs/maze-generation

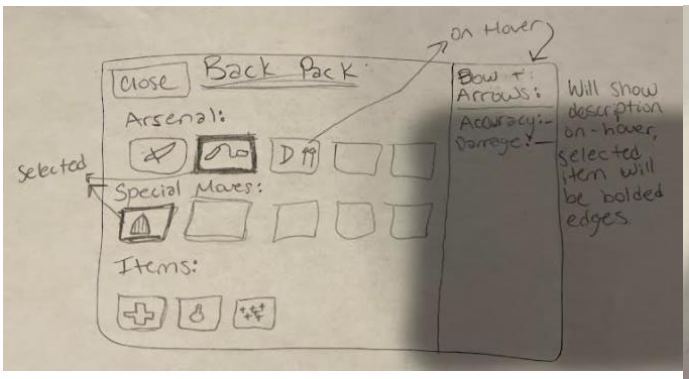
I plan on having an overall Entity object, which all Objects inside of the Maze will inherit from. There will be an Item object which inherits from Entity, and various Item subclasses, which inherit from Item. I also plan on having a LivingEntity inherit from Entity, and the Player and Enemy classes will inherit from LivingEntity.

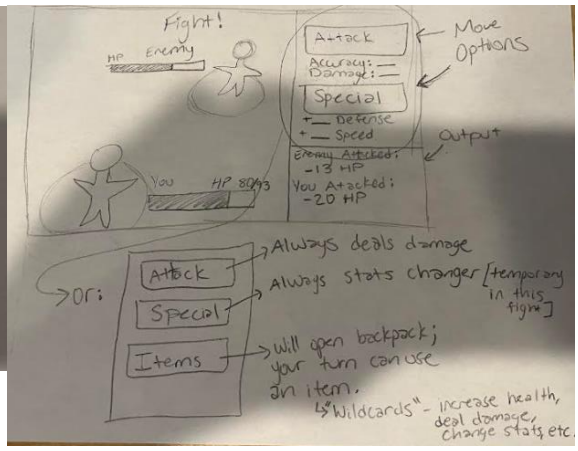
There will also be a Main object, which will contain a Game object. The Game object will have methods related to the overall game (like start, stop, pause, etc.). The Game object will contain a Maze object. The Maze object is composed of various Entity objects (described in the previous paragraph), Wall objects, and a single MazeGenerator object. When generating the entities in the maze, I will use a Factory Design Pattern to place these objects in random places throughout the maze.

Each LivingEntity will have two types of behaviors in a "fight" (an encounter with another LivingEntity of the opposite type; Player vs. Enemy): an AttackBehavior, and a SpecialBehavior. The AttackBehavior will be some sort of algorithm that will attack the opponent in a certain way. These will also have different animations. The SpecialBehavior will be a move that will modify the stats of either yourself or the opponent in the fight. In order to implement this, I will use the Strategy Design Pattern.

Below is a picture of 6 frames in the GUI: On the top right, we have the title screen. The bottom left, we have the pause screen, top left is the settings menu, and the bottom right is what it looks like as you are playing the game. There are also two other pictures of the backpack menu and fighting screen:







In order to plan out the timeline for this project, I must consider everything else going on in my life (17 credit hours, my tutoring business, my dental office job). Therefore, I will create a playable game as the baseline, and add stretch features as I go, so that I have something to present. As a baseline, I have the following goals:

- Maze Generation
- GUI
- Player functionality
- Mini map
- Enemies and their functionality
- Movement animations
- Pause menu, with a blown-up version of the mini map
- Different weapon item-types
- Different special power-ups
- Battle animations
- HP (Health Points)

If I get all these working, I have prepared a list of stretch goals:

- Backpack
- Potions to be used in battle
- Experience levels
- Different levels that become increasingly harder
- Save feature (database incorporation)
- Different characters with different starting stats
- Music and sounds

Here is a detailed plan of what I want to accomplish for each milestone:

- February 27th:
    - Setup GitHub
    - Learn JavaFx: https://www.youtube.com/watch?v=9XJicRt_FaI

        - There isn't much code for this first sprint; I want to begin by focusing all my attention on learning JavaFX as most of this project will have a LOT of JavaFX coding.
- March 11th:
    - I want to get a simple GUI going that renders a random maze, which will verify that you can get from the top left corner to the bottom right corner via a breadth-first search (will be a test-case).
    - I also want to render a simple circle for the player and allow for movement throughout the maze.
    - I want to be able to check if the player has reached the finish game, and get a finish screen with the option to play again.
    - At this point, I should have a working "blind" maze
- April 8th:
    - I want to get a mini map going that renders as you visit each room in the maze.
    - A pause menu that shows a blown-up version of this mini map.
    - I want to get enemy logic, which will generate a certain number of enemies in random locations, which will start a "fight" when the player goes near the enemies. The fight screen should show the player and enemy's HP and allow the player to select one of two moves in each turn and the enemy chooses a random move.
    - Check if the player is out of HP and get a death screen with the option to play again.
    - Get random weapon generation going and create a backpack for the player. Outside of a fight, the player can select which weapon the player wants to use in a fight, and give the stats of that weapon (attack, speed and accuracy).
    - Get random special power-up going, and allow a player to select the power-up outside of a fight. This will give a description of what it does (the stats change).
- April 19th:
    - Add sprite maps
    - Add animations
    - Add a health bar (instead of just numbers)
    - Basically, add all graphics related to the game.
- April 28th:
    - Presentation
    - Add other items that can be used during a fight

I don't believe I will have a problem staying engaged in this course. I have been planning on dropping tutoring for a while, and will consider removing that commitment from my life to dedicate more time to school projects (I have 3 projects I'm working on this semester).