Towers 1

Due: Friday, May 3 @ 11:59pm

Updates and Pitfalls

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Objectives

1. Add functionality to the existing Towers game
2. Practice editing an existing code base and understanding how your code works in the system

Description

You are given the Towers source code with a few missing methods. Your goal will be to implement the missing methods to add functionality to the game.

With the provided code you should be able to run the game and play it in your browser. In this state the game board will display and multiple players can move around the level. However, this is where the functionality ends. In this assignment you add the features of damaging the enemy base, towers that fire projectiles, and players returning to the spawn point when they are hit by a projectile.

Project Structure

1. Create a new project in IntelliJ
2. Pull the Scala Examples repo and copy the towers package into the src folder in your new project

Testing Objectives (0 points)

There are no testing objectives for this assignment.

Objectives (50 points)

Objective 1 (10 points)

Enemy base takes damage.

Implement the checkForBaseDamage() method in the Game class such that whenever a player reaches the enemy base it will lose 1 point of health and the player will be returned to the starting location of the level. A player is determined to have reached the base if they are closer than the size of the player from the center of the tile where the base is located.

Note: To complete this objective you are expected to read through the provided code and find any variables/methods related to your task, study them, and use them in your implementation.

Verification: When you run your game and move to the center of the enemy base it will turn a slightly darker shade of yellow and you will be teleported back to the start of the level.

Objective 2 (30 points)

Towers fire projectiles.

Implement the fire(String) method in the DodgeBallTower class such that the tower fires a projectile towards the player closest to the tower if that player is within the sight range of the center of the tower. The projectiles are fired from the center of the tile where the tower is placed (the x,y location of the tower is a grid location). For this method, fire at the player's current location by returning a List containing a single Projectile. If there are no players within range, return an empty List.

The input to this method is the entire game state as a JSON string. You are expected to discover the format of this JSON string by reading the code and/or obtaining a sample game state to study.

Verification: When you move within 5 tiles of the center of a tower it will fire from it's center in your direction. The projectile will travel almost 4 tiles before disappearing.

Objective 3 (10 points)

Projectiles hit players.

Implement the checkForPlayerHits() method in the Game class such that for each projectile that is closer than the size of a player to a player will hit that player. When a projectile hits a player that player is sent back to the starting location and the projectile is destroyed (call the projectiles destroy() method).

Verification: When you are hit by a projectile you are sent back to the start of the level and the projectile disappears.

Bonus Objective (25 points)

Towers lead players.

Implement the aimFire(String) method in the DodgeBallTower class in the same way as the fire method (target the closest player that is within range) except the tower will lead the player (fire where the player will be). The projectile should be fired in a way that it will hit the targeted player if they continue to move along the same vector as they were when the projectile was fired. The players must change their direction to avoid these projectiles.

You may choose how to implement this method with two primary options:

- Study the physics involved and compute the direction to fire to hit the player

  OR

- Use the Genetic Algorithm. Write a method that returns a fitness function for this optimization problem and an incubator method then call the genetic algorithm to estimate a solution.

Verification: You will not be able to just run past towers. If you do not change direction after a tower fires at you the projectile will hit you, unless the projectile hits the ground, a wall, or another player before hitting you. To test this you will have to change the call of tower.fire() in TowerActor to tower.aimFire().