CP411 Project: BossBattle

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Introduction

This project will be a simple 3D interactive video game. It is inspired by a boss battle in Team Cherry's game "Hollow Knight". The main idea to move your character (the Knight) around and attack the enemy (Nosk), with your weapon (the Nail). Get your enemy's health to 0 to win. Lose all of your health (by running into the enemy or enemy's attacks) and you'll lose the game.

Problem solving and algorithms

Some computing issues to be solved are:
1. Drawing characters accurately. A solution idea is using basic shapes to make complex shapes and/or using textures on basic shapes.
2. Checking for collision. Idea is to check for overlapping objects using their positions in WCS, represented by a matrix.
3. Computing lives. Algorithm Idea: the Knight and Nosk start with 3 health. Check for collisions of you, Nosk, Nosk's attacks, and Nail. Reduce corresponding health. Display win or lose text if yours or Nosk's health = 0.
4. Doing the animations. Idea is using matrix transformations, while checking for collision.
5. SimpleView algorithms might include: drawing basic shapes, matrix transformations, back face culling, (bezier) curve, and (constant or Phong) shading.

Design consideration

System design
1. The Main program sets up the window, connects the mouse and keyboard buttons. Left click to attack/swing weapon, and right click for the menu. Move the character with WASD (for directions) and space (for 1 jump animation).
2. The World class displays all shapes in the WCS, including a floor (a cube), and displays text if win or lose.
3. The Menu should reset, quit, start animation of enemy movement (Nosk constantly moves back and forth on screen), start animation of an infection attack (3-5 balls falling downwards from the ceiling), and stop animations.
4. Point, Vector, Matrix, Shape, Camera, Cube, Pyramid, Sphere, and Light classes will all be from (or similar to) SimpleView.
5. Knight class is a Shape, built with various components. They carry a lantern and Nail.
6. Nail class is a Shape (similar to a Pyramid).
7. Nosk class is a Shape, built with various components. The head is similar to the Knight's head. The belly should be shiny.
8. Infection class is a Shape. Each one is a shiny orange sphere of light.
9. A Health Bar is a Sphere with 2 smaller Spheres for eyes. Draw each Health Bar to correspond to one of your hit points.

10. A Soul Bar is similar to a Health Bar but bigger. It changes colour (blue, green, yellow, red) to correspond to Nosk's hit points.
11. Health Calculator class will check for collision and health logic.

<u>The architecture</u>
This will be an Event Driven architecture model. Since the program waits for events of mouse clicks (for attacking and menu options) and keys board clicks (for movements).

Milestones & schedule

Task ID	Description	Due date
1	Project proposal	Nov 30
2	Main program set up	Nov 20
3	Mouse buttons: left click for attack, right click for menu	Nov 20
4	Keyboard buttons: WASD to move character, space to jump	Nov 20
5	Menu options: reset, quit, start enemy movement, start enemy attack, stop animation	Nov 20
6	Animations: Knight jumping, Nosk moving, infection attack	Nov 25
7	Collision checking, calculating health points, display text	Nov 25
8	Drawing Knight, Nail, Nosk	Nov 30
9	Drawing Health bar, Soul bar	Nov 30
10	Drawing infection attack, floor	Nov 30
11	Code clean up, presentation practice, final details, demo video	Dec 5
12	Project submission and presentation	Dec 7

References

1. "Hollow Knight" by Team Cherry
2. CP411 resources (lectures, assignments, reference designs)
3. Video Game Physics Tutorial - Part II: Collision Detection for Solid Objects
   https://www.toptal.com/game/video-game-physics-part-ii-collision-detection-for-solid-objects