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APCS2 pd2
Project Proposal
01-06-2018

Project Idea: We will be simulating the final level of Plants vs Zombies 1. The conventional PvZ games allow you to expand your garden-army of plants with sun; however, in the Zomboss boss fight (the final boss), there is no sun. Instead, plants are automatically generated for you. See the screenshot for an example:

Our project is an emulation of the boss fight above. The goal of the player is to strategically place his or her plants such that none of the zombies or their weapons come into contact with the house. However, there will be some changes made: the actual level will take place in the Garden setpiece (which is flat with grass), there will be no pots, and there will be no advanced phases (ie. the phase were the Zomboss AoE attacks some of your plants by throwing a van on top of them).

<u>Backend:</u>

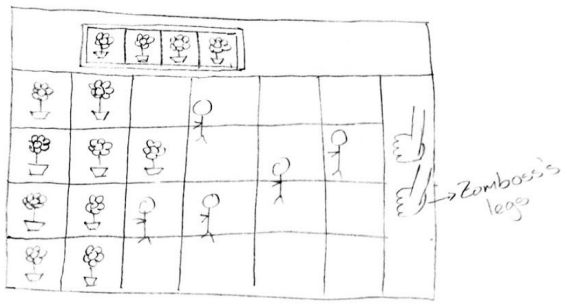
- This will include two data structures we learned this year.
    - Queues
        - See that feeder belt with the plants? We will simulate that with a Queue. We are still unsure of how to do the animation; however, the MVP will be that the card simply appears in the Queue (ie. no sliding along; it'll just pop into existence)
        - To randomly generate zombies and plants, we will be using two queues. At every attempt at generation, the relevant queue will be consulted. Each queue will store the different class types of plants and zombies that could be generated.
    - Quicksort Algorithm
        - Sorting the times for leaderboard after completion of the game.
    - minHeap and maxHeap
        - Running time median to record average time taken to beat the game

    - DoublyLinkedLists
        - Will store the projectiles, plants and zombies currently on the screen. Will allow for O(1) removal runtime, which increases efficiency.
    - Each ADT will be taken by one developer.
- The placement of the plants will be determined via a matrix.
- Zombies will move in fixed lanes.
- There will be two inheritance trees: Plants and Zombies.
    - Plants
        - Peashooter
        - Wal-Nut
        - Melon-Pult
        - Winter Melon
        - Repeater
        - Jalapeño
        - Ice Shroom
        - Cherry Bomb
    - Zombies
        - Regular Zombie
        - Cone Zombie
        - Bucket Zombie
        - Football Zombie
        - Gargantuar (+ Imp)
- Shovels will be used to remove plants.
- Music: We are using the Minim package to play an MP3 file of the Zomboss music. As of 5/26, we have a working program that plays back music.

<u>UI:</u>

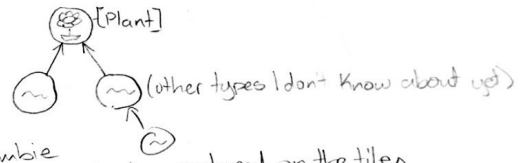
- It will be similar to the screenshot above. See the below image for an example:

Visuals

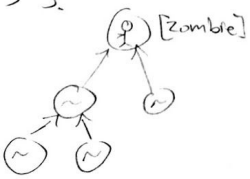



- Plant Queue
* produces the plants used for fighting
* you can only pick up the left-most plant
* randomness

- Plant
* can only be placed centered on the square tiles
* hierarchy system:



- Zombie
* don't have to be centered on the tiles
* walk forward
* popped out of a randomly generated minHeap
* hierarchy system:



- The boss will have two phases, and alternate between them. He can be damaged in both phases.
    - Phase A: Only feet are shown, spawns zombies in random lanes
    - Phase B: Head is shown, spits out fire or ice balls, and sometimes a Gargantuar

UX:

- The challenges here are that there will be no lawn mowers and that the user must follow the rules of the Queue (ie. place the first plant down before the next)
- Possible concerns:
    - Clunky animation
    - Zombies not eating plants correctly
    - Transition between boss phases