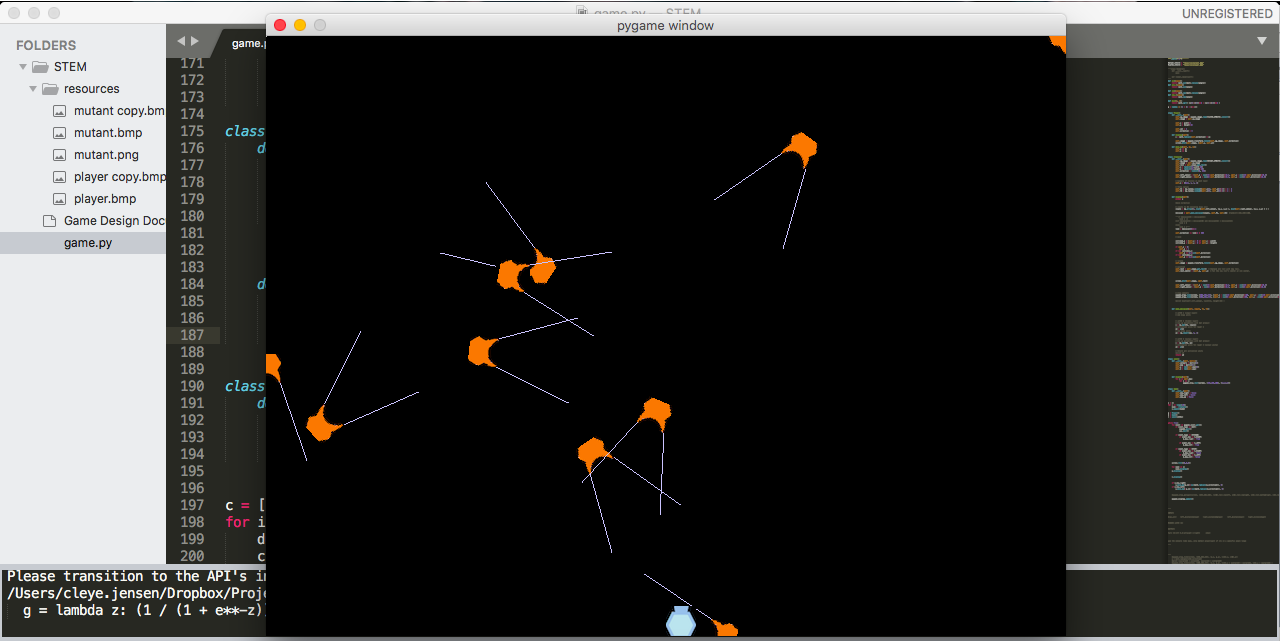
Game Design Document

I didn’t know what my game was going to be until June. Planning for the game began early 2018 when the theme was released. The aspects that stood out the most from Transformation were the mutation and evolution. I had dabbled in machine learning and neural networks before and was inspired by genetic algorithm simulators on YouTube to create something similar. At first I had no clue what to make, early brainstorms developed ideas like evolving from a fish to a human, training a car how to move through mazes and even a plant growing game. In spite of the continual emphasis on planning, planning, planning, at the time of writing this game document in early April I still don’t know what my game will be



Game Title

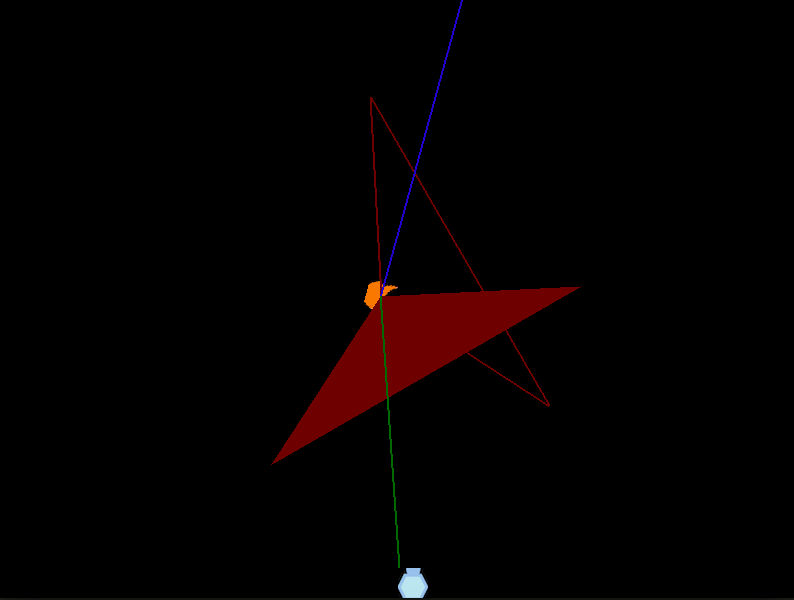
style:

retrofuturism, tron,

problems

first problem – how to rotate an image without it going everywhere, took a week to solve

use the sensors like eyes, only detect player/wall if its in a specific angle range



what inputs and outputs should the nn have

INPUTS bias\_unit left\_distance2player right\_distance2player left\_distance2wall right\_distance2wall

HIDDEN LAYER (4)

OUTPUTS turn (0-left 0.5-straight 1-right) shoot

problem: turn was 3 different outputs (left right straight), creatures starting going straight it looked unnatural

solution: create 0-1 turning values

fitness:

not touching wall

do damage to player

the creatures have limited energy and moving uses up their energy

overall timer (20s)

hopefully too many creatures with nn won’t slow down the game

to do:

music

storyline

gui

game:

4 waves (a wave is 16 specimens of a species) come for each generation

species:

twirlers, sharpshooters

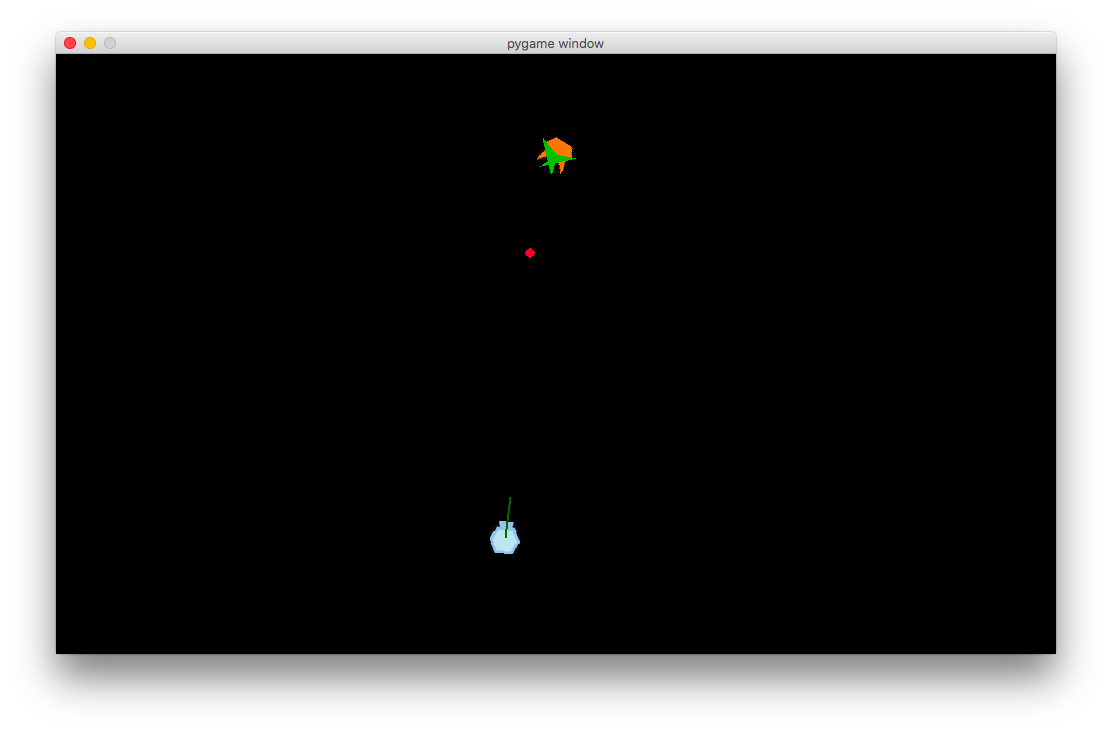
survive as many generations as possible

better start gui

borrowed button class off old program

problem: bullets were sensed even when moving away from them

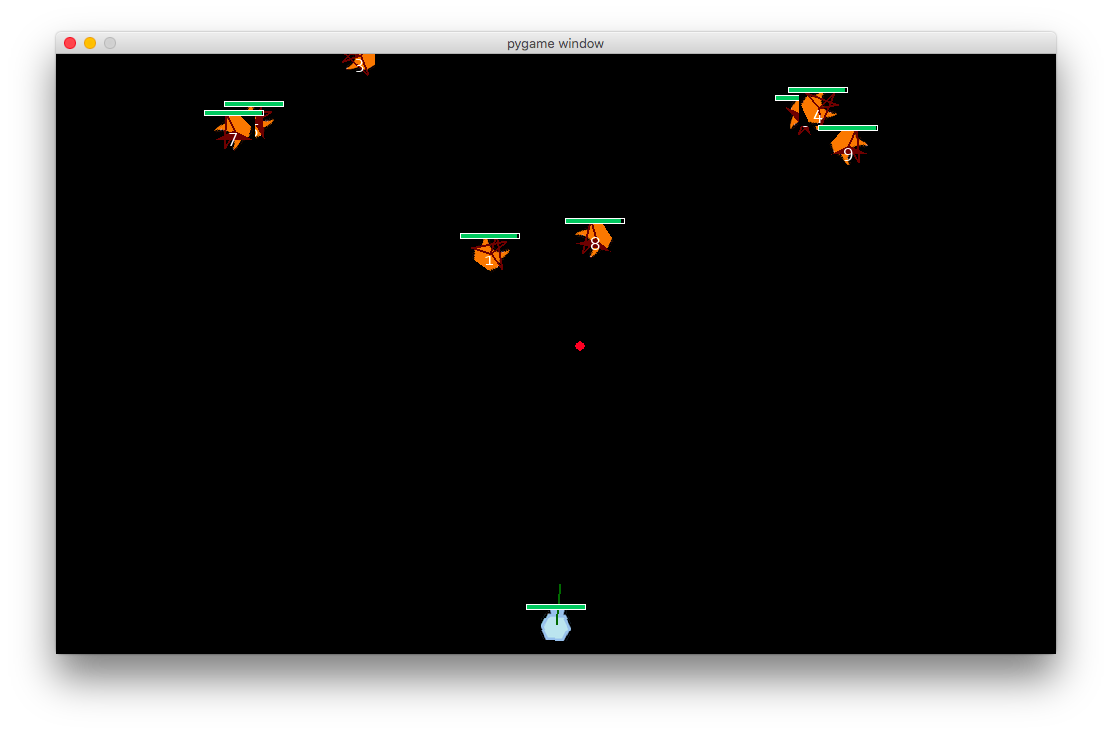
added angles to sensor, add periphery value



added distance to player, bullet sensing, wall sensing as parameters

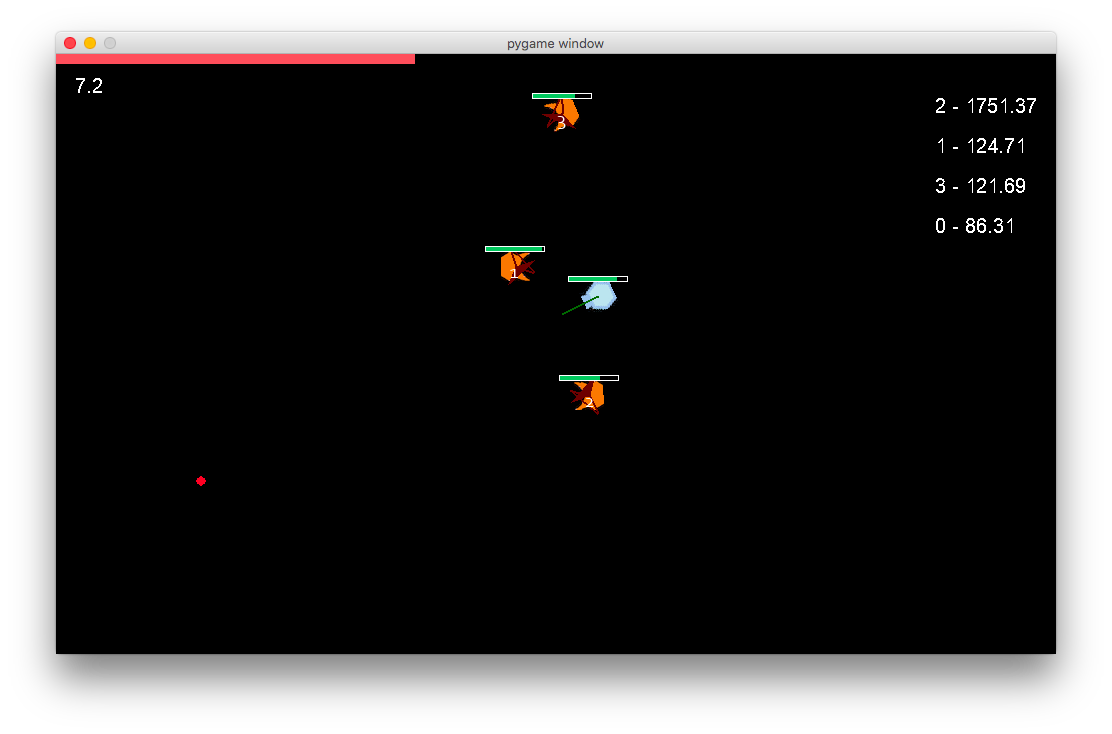
wall proximity function

added speed output



I’ve had the idea that the creature has limited energy or life and this is expended the faster it moves, and also shooting it depletes its life by a random amount

if that’s the case I need an overarching class for movable objects which player and creatures inherit from



techniques:

try lure them into walls

move around them to get beind their back

fitness starts at 0:

reward:

damage done on player

average distance to player

time with player in sight

--ability to sense bullets and dodge them--- too hard

punish:

being stationary

running into walls

hitting bullets

some creatures drop powerups when they die

Creature

- update

- display

- calculate\_fitness ->

- make\_decision -> output units

interesting notes:

some creatures were attracted to the bullets,

half the creatures were really smart, the other half fairly dumb

what inputs and outputs should the nn have

INPUTS(6) bias\_unit, left\_sensor\_detect, right\_sensor\_detect, distance2player, left\_sensor\_detect\_bullet, right\_sensor\_detect\_bullet, wall\_proximity

HIDDEN LAYER (4)

OUTPUTS(2) turn (0-left 0.5-straight 1-right) velocity

optimum creature:

if not detecting the player, rotate

if detecting player with both eyes, move forward

if close to player, move faster

if detect bullet in one eye, move away and fast

if detect bullet in both eyes, move away and fast

if close to wall, rotate

I saved music for last because I didn’t want to hear whatever song I put in played over and over again while im testing the game

approaching

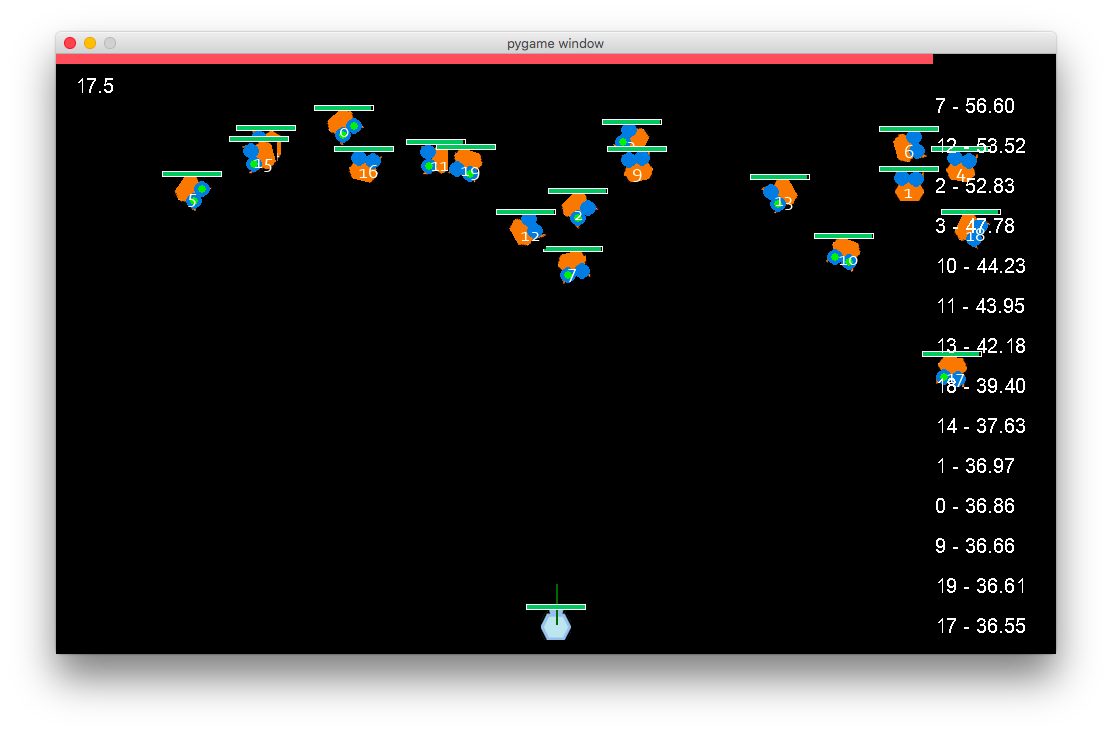
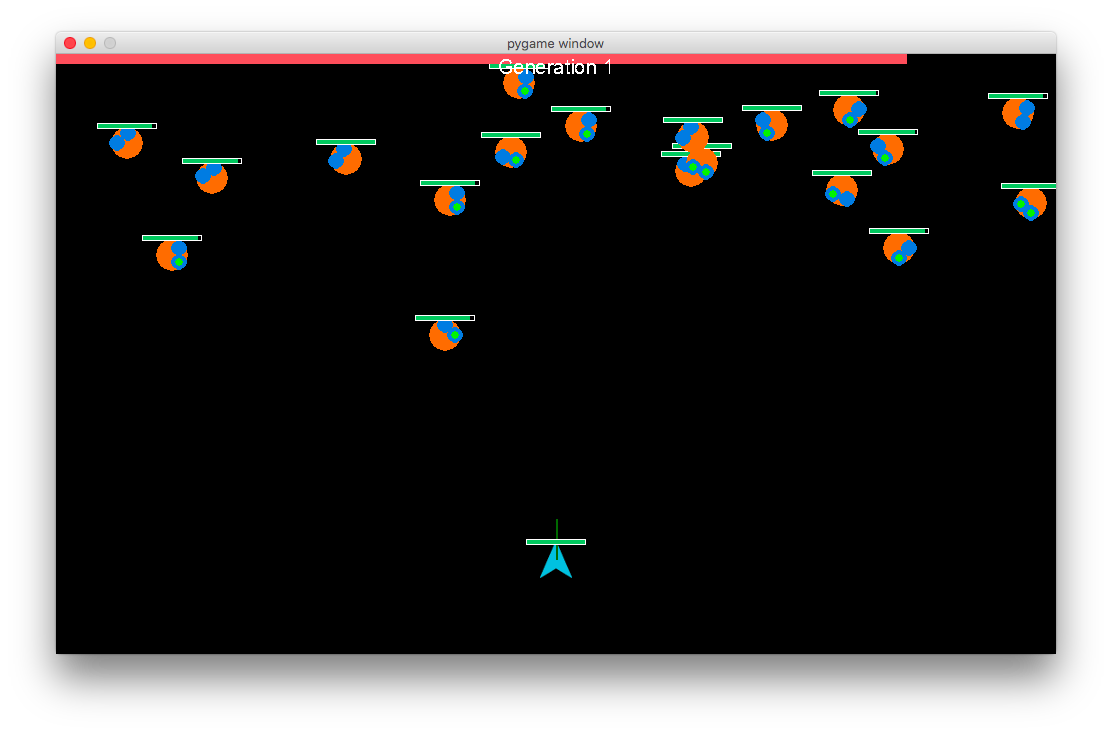
I had no idea how to do the music then I used noteflight and audacity to record a piano sample

todo:

--music--

storyline

graphics



to add difficulty increase speed and rotational velocity with generation

testing:

faster not smarter

player too close to wall, creatures kamikaze into wall

start creatures in centre

mutability don’t mutate fit creatures

win: defeat all in time limit

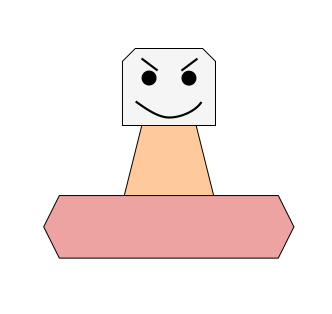
player wins back health if its bullet kills a creature

storyline:

Evil Dr Darwin is trying to breed to ultimate killing creature

Defend yourself by trying to kill them with bullets

Run them into walls



had to implement scene class to control scenes

add animations like creature dying: creatures shrinks then sort of “pops” like Mario