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ICS4UI: 2D Simulation of Neural Network Evolution

I included the Programmer Comments (PC) within each functions/section of my code. You may noticed that in some functions, there is no PC listed. Most of my PC can be found in the Sprint 3 final project otherwise it will list here. I apologize for any inconvenience in the marking and any section that I forgot to comment.

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| Each bullet within each category takes about 3-5 days or ~a week to complete and to meet the final condition.  Sprint 1:  DNA:   * + DNA → mRNA Application   + Boyer Moore Search Algorithm (NOT implemented into my program)   Genetic Algorithm:  Purpose: To use the process of evolution to create a characteristic change within the individual of each generation   * + Population Mod   + Binary Generator Creator   + Roulette Selection     - Programmer Comment: Selects an individual simply by generating a random int from the total fitness to 1 and subtract by the individual fitness until the random Int = 0. Twice the population are chosen.   + Fitness Calculation     - PC: First, the fitness was calculated by using the binary decoder to decode each of its gene bytes. However, in Sprint 3, I created a food/time based calculator and replaced the binary decoder with it.   + Crossing Over     - PC: Using the Roulette Selection, the breeding pairs are often consists of 2 individuals. Therefore each pair produce a child of its own kind, probability is considered.   + Mutation     - PC: Within the child produced, mutation rate occurs 0.8% of the time, which might occur in individual bits.   Spring 2:  Neural Network  Purpose: To use the genetics info, to create a make-up weights to use in an active neural network system for pattern movement   * + Neural Network     - PC: The main central of the neural network and of where the processing output happen. The output consists of two neurons, which will tell the player to turn left or right.   + Calculating Weights     - Apart of the neural network that is an algorithm to calculate the any sort of inputs to outputs size   + Combining Weights     - PC: Split Weights comes in the size of the genes, meaning every four bits within a byte would be two different weights. The function combines the two alleles into a gene.   + Pre-Sensory Implementation (Field of view Detection)     - Explained in Sprint 3 AISensory   + Connection from Neural Network to Genetic Algorithm     - PC: Implementation between two algorithms, using the gray code of the genetics to represents the genetic makeup of the neural network weight   Gray Conversion   * + FromBinaryToGray     - PC: An algorithm that is used to calculate from Binary Num to Gray Code to limit diverse number pool. Ranging from 0 - 15   + From GrayToWeights     - PC: Converting the Gray Num from Binary into weights that can be then used for the neural network to be compatiblity.   Sprint 3:  Purpose: Provide a simulator for the audience to see the interaction processed by the neural network, as well, to see the difference in the player’s behavior over time (generation) due to the training of the neural network.  SpriteKit   * + Learning Platform and Creating Scene   + Generating Spawn Items Within the Scene   + Set-up Collision and Contact Detection signal within Physicsbody     - PC : Each object(Node) within the scene contain a userBodyBits and if those object.node match-up to their respective bits, the interaction will occur between the object and the player. → Collision Detection     - PC : As well, the contact-on-detection function only signals the system, and does not provide an immediate interaction, processed data.   + Applying 2D vectors to Character’s Movement   + AI Sensory     - PC: The AI Sensory includes 12 sectors, which is divided into 15deg, altogether, it makes up 180 deg as the vision field of view. The AI sensory works with the contact-on-detection of the FOV physicsbody to connect the contacted object and track the object’s and player’s positions. To track, the function considers its distance and angle from the relative position of the player.   + Connection from Neural Network to AI Sensory     - PC: Connect the Sensory Input from the FOV receiving end to the neural network for processing on player’s response. The player’s response will be performed in the 2D vector Character movement   + Connection from Genetic Algorithm to GameScene and Individual     - PC: Implementation of the genetics algorithm into the gameScene in the beginning and the end of the Scene. Explained in Sprint 1. | Weekly Schedule and Time:  1st week  ~2nd - 4th weeks  ~ 5th - 9th week  ~ 7th week  ~ 9th week  10th week  ~ 11th - 12th week |