May 25th

I'm starting a blog now because I've forgotten to, but I also would like a way to keep track of my progress

Updated features since Monday

- Smaller map for testing
- Camera can be zoomed in and out and controlled with wasd
- Creatures will now lose energy while moving, but not while idling (will remove idle as default and set as another action
- Creatures that hit 0 energy will die
- Age is a new stat added, because creatures just born were instantly able to reproduce
    - another fix was also decreasing the energy they have when they are just born
- Creatures are able to breed, they currently simply spawn in a new creature with randomized traits from both parents, but do not physically interact thus leading to a weird procreation 10 blocks away
- Each creature spawned/created will be given a unique ID (this makes it easier to give which creature is which without needing to give the entire creature object)

Running the simulation

Notes on the simulation → food will spawn every 1 second

- 3 minutes in, 2 creatures have died but their population has gone from 4 to 9
- Nothing interesting happened, and the fact that their energy goes past max capacity is an issue
- Food is too abundant, they will likely never die out

Issues

- Since the food manager has a list of food, and currently gives the first food found on the list rather than the closest food to the creature, sometimes it will have two creatures constantly trying to get the same food, thus leading them on basically the same path over and over again
    - We can solve this by either choosing the food closest to the creature, or having the food finder get a list of foods in range, then choose one at random
- Creatures have no sense of "full" and will go past their max capacity, this can be fixed with a simple if condition
- The Creatures wander has no bias, so it averages to not go anywhere without a bias
    - perhaps, save the last direction the creature went, and then have that direction have a higher chance of being chosen
- The creature also does not check if they are out of bounds
- The efficiency of how age affects them have not been implemented, so if a creature can find enough food they will simply be immortal

Running the simulation

Food now spawns every 10 seconds

Wander still has no bias

Food should now get the closest one

Creature should no longer go out of bounds

- They all died
- An amount of food should already be spawned before the simulation starts

Running the simulation

Food now spawns every 20 seconds

5 Food will spawn at the beginning

- Breeding is too costly, after breeding if there is no food nearby, they will likely die
- Without proper bias in wandering they are unable to move around the map fast enough to find new food
- Moving around also costs too much, since the max energy is currently set to 50 and every unit costs 1
    - either decrease the amount of energy used, or increase the average max energy

Goals for next time

- Debugging menu / click on creature to get knowledge on stats
- rework the “idle” into an action
- rework movement to include speed
- Wandering Bias
- Include enviromental things, such as rocks and water and what blocks should even be blocked out of view on a grid style map

Possible optimization issues for the future

- instead of looking at a list of all foods on the map, only look at the foods in range by manually checking each tile within x range
    - This is ok for now, but if the map ever gets bigger, then the amount of food on the map will outweigh the amount of tiles you’d need to check

May 26

First feature added Wandering Bias

- Could not get it to stop spitting errors at me, and would Random.Range(x, y) would give me numbers greater than y
- after running it 10 times it just went away? could not explain how

First Simulation of the day

The map starts with 10 food, and spawns 1 food every 5 seconds and creatures have 10 sight range (should be decreased later)

- The bias wander has made it easier for creatures to find food
- Creatures will continue to walk towards food, even if the food has already been eaten
    - Can be fixed by adding a check every step to see if the food is still there

Speed is now added into the game, they now take a varied amount of time in order to wander

Creatures will now stop moving towards food if food is gone

Simulation with speed variations

Map starts with 10 food, spawns every 5 seconds, gives 15 energy

Creatures have 100 energy, and a varied speed from 1 to 10

Creatures will no longer walk towards food when the food is gone

- Slow creatures slowly take over the game, its only able to support 2 - 4 of them at a time, but it is the first iteration where a stat mutates over time and a specific one starts taking over

Creature Info Bar now works

When you click on the creature, it will follow them and display stats on the top left side

May 27 7pm clock in

Big Goal

Change creature manager to a sort of worldstate check

- No creature should need to interact with creature manager
- creatures talk directly to each other and not through creature manager
- creatures have a “communication script”

Change onclick such that the Creature has an onclick script

-

No creature can intersect

- Add one collider for the actual body, and another collider that acts as the trigger
- add a rigid body, and have all movement systems push the rigidbody rather than setting its transform to a new position

Ungrid the entire movement system

- MoveTo gives a stack of grid based coordinates, change it such that it is no longer confined to a grid
- Wander moves up down left right, we can change it to also support diagonal movement?
- Set a specific distance that should be used as a unit of measurement for walking
-

Future Goal

- Change each creature to have an over extending collider that can be used to detect plants, creatures, and other things in the future

Small bug/quality of life fixes

- Game objects will now be named after ID for testing sake
- Added a Time scale, camera will not move faster when the Time moves faster
- Added an escape option to get out of Creature Info
- Added Current Action to Creature Info
- Creature info now updates

Creatures now have a "Scanner" that scans when an object enters its range

They can then check if its behind anything by using a raycast to cast a ray towards the object and see if anything interjects

Change the create creature such that it creates a creature with a rigidbody and two colliders

Changes needed to fit the scanner

- Food needs to be an object not a tile
- Food manager no longer keeps track of all food
- All Actions that request another creature now takes from the scanner
    - BreedRequest now directly goes to the object
    - Actions will need the scanner as well

10pm logging off what was done

- Creatures are now prefabs

- Creatures should now interact directly with each other (strange bug)

    - Here the scanner is being set to the actions
    - The Scanner is first set at Set Scanner where it is tested if it isnt Null
    - Later in "Breed Request" when the class tries to use the scanner it spits out an error because the scanner is Null
    - There isn't any other part of the code where the scanner is set
    - And there are only 4 lines of code where the scanner is ever set in the project
- 

- The above quality of life fixes above
- Collision Range detector

May 28 9:30am clocking in (there is a bat in my room my efficiency is decreased)

Changed Food into a game object with a collider, and a food script such that when a creature has the food in range, it can move towards the food position and eat it (not tested getting the scanner error)

Food Objects are now being spawned into the world

Theories on the scanner returning null

- MonoBehaviors are dereferenced? (shouldnt be the case other monobehaviors work just fine)
- Strange behavior occurs when the scanner is set in script right after its creation
    - could possibly be fixed if it was an added component although BaseCreature is having no issues
- Components of children get dereferenced? Trying to place it such that it no longer is a component of a child
    - Made no difference
- Monobehaviors should only return null of the component is destroyed, but from the game engine it is not only there, but still working so the only thing that makes sense is if I in the code made it point to null

It is 11am I'm going to stop and continue after school (not alot of work at school yet)

12:30am started at 11:30pm

Completely Debugged the Scanner (to my knowledge)

- Food now has a Physics2D.OverlapCircle to check if the creature is in range to eat it

Future problems with colliders

- All movements needs an overhaul since transform.position will have creatures and other colliders ram into each other since they're trying to reach a certain position
- possible fixes
    - transform.position can act on the rigid body instead, this may change all transform

references to instead pass rigidbody
https://youtu.be/tmvZreU-QWI

Goals for May 29ff

- Resting metobolism
- Movement Complete Overhaul

May 29

Added metobolism

Steps for movement overhaul

- Change all references from transform to rigidbody
- Change all transform.position to addforce
    - Wander Bias
        - Check to see if the direction has a obstacle, if so change direction
        - Wander pushes a creature a certain amount of force in x y direction
    - FindFood
        - Add diagonal

After changing all transforms to rigidbodies

- Testing what is the best way to change the position of the creature
- Add force may be great for a furture use like a lunge, but after testing for 15 minutes, its wildly unpredictable and hard to move the creature to the desired position (was my first choice since its what i used for player movement in previous game)
- The next option is to have the velocity set to the direction of the next grid
    - This worked very well

Changes to the diagonal

- For wandering bias, an issue is that now that wandering 4 new directions are included, it would be better if the x and y each had their own Separate bias
- Movement also needs a check to see if there is an obstacle

Without obstacle check they form a rat king and all slowly starve themselves to death

First set all the colliders friction to 0 and add some bounce

- This helps the chances of rat kings to be less likely, but do not help the situations where they are facing each other head on

Then add a small raycast to see if the direction they're facing has a collider

- If yes turn *left*
    - if heading in (x, 0) direction then nudge(0 , 1)
    - if heading in (-x, 0) direction then nudge(0,-1)

    - same with if y is the dominant direction

i think it works, the force of the nudge may need some tweaks but I haven't seen any more rat kings

Also small bonus added colors and their children will inherit a mix of their parents colors

This has led to certain colors dominating near the end, although I don't actually know what this means since I still cant see stats

Turns out onclick is a part of colliders, so all i had to do was implement **OnMouseDown** and the stats started working again immediately

https://youtu.be/co9Oh51rfz4

Goals for next time

- Add MoveTo for breeding
- Add tiles, tiles can have scripts and colliders so possibly small rework to the food prefab

May 30th

Small issue, I'm downtown and forgot to push the onclick change but everything else should be here

Because of that Camera, BaseCreature, Scene, and StatDisplay for merger issues cannot be touched but i think everything else should be fine

Perlin noise

- Get the grid and then do the function perlinNoise (coordinate) which is already part of unity
- It will return a value between 0 and 1f so if we want 1% of the map to be an actual big boulder we can do if PerlinNoise coordinate < 0.01 then tile at coordinate is boulder
- We can also use this for water, so we can do if

Create a Tilemap with a tilemap collider, and that should be it, if a tile is in the tilemap with a tilemap collider it will automatically have a collider

- Tilemap Colliders means all tiles in the tilemap share a single collider

Then we just add tiles to the tile map

Obstacles Generation (specifically boulders) done

If we want water, which can be seen through but not passed through then all we do is create a tilemap with a tilemap collider, but add the tag IgnoreRaycast which means scanner will not pickup on it?

Water should be something creatures can go through, so we can set the collider to a trigger, and decrease the creatures energy when it first enters? something along those lines (possibly a better

way to do this)

Water and Boulders/Enviromental Structures need seperate Tilemaps

List of things that may affect energy usage

- traits
- Enviroment (water)
- All things that use energy should have these two variables which will be set to 1, unless a trait specfically demands it to be changed
- Therefore, traits should be a list of functions that are added to the creature before actions, they are then run on the creature which will change a specific action or actions (like wander) something like that

Pseudo code done

May 31st

How should a creature check if the tile is an obstacle or not

We can have a game manager method that looks at the specific coordinate of the tilemap and returns if it is an available spot to go to or not

Then add the checks to the following

- FindFood
- Wander
- Breed (both)

For breeding, to make it easier one of the creatures will simply stand still until the other comes to breed them

Or calculate the midpoint between the two and have both creatures meet there

Coding will go crazy tmr

Less coding today, more theory on traits/learning

All these implementations should be done by Saturday afternoon

Traits Actions and other mutations

So moving onto traits, how should traits be handled? What are traits?

Traits are modifiers to a creature, however these modifications should be applied to a creature in the beginning

The list of traits actually saved should simply be a list of strings since there shouldn't be a need

to continuously check the trait again and again

The list of traits needs to be created before the actions, but after the stats

Certain actions may require specific traits to exist before being added to a creature, an example

- The creature may need a certain trait to replace bias wander with Proximal wanderer (dont move far away from last found food)

We would need to revisit all the actions, and determine what kinda of modifiers they may need

Actions so far

- Find food
  - All movement modifiers
  - Energy modifiers
  - Range modifiers?
- Wander
  - movement modifiers
  - Energy modifiers
- Request breed
  - Any breeding modifiers and movement modifiers
  - Breeding modifiers

Some levels of intelligence may be needed to use some of these actions, but those actions should cost energy to be used before calculating the physical cost, that way some creatures may deem that the cost of having intelligent strategies are not needed

Traits can be placed into specific categories

- Energy Modifiers
- Movement modifiers
- Breeding modifiers
  - Amount of children born (energy divided between the children)
  - Aesthetic modifiers that may increase/decrease the chance of creatures wanting to mate
- Sight Mutations
  - Placement of the eyes differ from animal to animal which also gives them different blindspots
- Defensive Mutations
  - Running away when danger
- Survival Mutations
  - Fur
  - Horns
  - Resistances —> toxins, etc…
- Teamwork/Social Behaviors
  - Moving in a hoard
  - Caring for offspring
- Enviromental Interactions

    - Climbing onto boulders
    - We can still allow a collider on boulders, but give certain creatures the ability to ignore the collider (the same way the scanner colliders don't trigger on other scanner colliders

Additional Actions / Trait unique Actions

- Aggresive behaviors
- New wandering behaviors
- Advance/Unique behaviors
    - Hording/storing food
- Caring for young
- Defensive Techniques
- Unique Breeding Techniques
    - "winning over a mate" by duel

Tree of unique animals

- What allows an animal to be allowed onto the tree?
- How many generations should the animal need to be on in order for them to be able to be considered a new species?

Procreation

Some important notes on procreation, currently the main check for breeding is simply if they have enough energy, but in order to insure some level of non randomness, creatures should have preferences on who they want to breed with

- Creatures may look for creatures with high energy count (they are fed well)
- Creatures could mate asexually or sexually
- Add pregnancy

Advantages and disadvantages of asexual reproduction

- Requires less energy overall, no parent is needed
- Bad mutations are hard to rid of
-

Stats

- All stats have a cap on how high they are allowed to be ex
- Size has an impact on how much energy they can store
- Their life span

Misc notes to later be organized

Breeding frequency is incredibly important, the more frequently they breed the more mutations may come out

Traits require some level of passed on, as traits are passed onto the next generation they have to be more likely to pass it on until it becomes a staple of their species

Categories of animals in animilia

Active Day Period

Diet

Lifestyle

- Semiaquatic
- Terrestrial
- Cursorial —> animals that are designed to run fast
- Arboreal —> lives in trees
- Burrowing ones
- Aquatic
- Apex predator and meso predator (mid ranked)
- Ambush predator / Pursuit predator / Pack Hunter
- Egg laying

Mating behaviors

- Monogamy
- Polygamy
- Polygyny
- Polyandry
- Polygynandry
- Serial Monogamy
- Cooperative breeder

Seasonal behaviors

Social Behaviors

- Eusocial —> a single female produces all the offspring for the colonies
- Dominance Hierarchy —> forms an inner structure of a society which allows society members to stay together without repeated fighting
- Highly Social
- Social
- Herding
- Solitary
- Flocking

Sources:

https://www.nature.com/scitable/knowledge/library/mating-systems-in-sexual-animals-83033427/

https://www.animalia.bio/index.php/animals-that-start-with-a

https://www.britannica.com/science/life-span/Animals

https://study.com/learn/lesson/asexual-reproduction-plants-advantages-disadvantages.html

June 6

❓

implement the base creature flowchart changes

implement the create world change

get rid of monobehaviors that dont need to be mono behaviors

June 7

The movement implementation works

June 9

Was doing homework on June 8th

Implementing logging

- Isn't writing to file seems to have forgotten about the /Log.txt insteado f just Log.txt
- Also forgot to reset the timer

Re-add action is running, I believe that it is better if creatures are picky on what food they want to eat for the future, the idea of automatic eating is actually bad since if we want to add changing enviroment/unique foods in the future creatures need to be picky on what they want to eat

Cleaning up code in creating creature etc

Strange bug where creatures are running into rocks which shouldnt be happening since

- Possible fix, if a creature cannot reach xy square in x amount of time, then simply abort
- I think its because its diagonal, but the rocks have a square collider making them stuck
  - untrue
- Fixed its because it was calling cell to world and not cellcenter to world

Strange bug where when food is found the game crashes

- It let me compile dispite it not complying with the interface???
- The creature now sways back and forth going in and out of going towards the food
- The game now simply freezes for 10 seconds when food is located

Bug

- If the initial position is set such that it is either out of bounds, or is a rock the thing will glitch out

Note: Never add any while loops, the game seems to consistantly break whenever a while loop is added no matter what

June 10th

Optimizations and bug fixes

- Food Action investigation
- More Bug fixes

Path finding finds that if a path is

0 | x

x | 0

where x represents the rocks and 0 represents open space, the path determines that it is an open path even though two rocks actually block the diagonal path

June 11th

Created Debugging tools

- mouse to coordinate display
- path visualizer

June 12th

From testing the Move to, there seems to be only one issue

Since moveto starts by setting a border, if the coordinates are on either the same x or y with a rock in between, since its not allowed to go beyond the border its unable to find any path

Possible solution is removing the border or increasing the border size theshhold, if its out of bounds it wouldnt be added to the neighboor/path anyways

Goals

- Remove all unneeded code/variables

Scripts

- [x] FoodManager
- [x] FoodScript
- [x] TerrainGenerator
- [x] CameraControl
- [x] GameManager
- [x] TimeManager (unused in current version)

- [x] StatDisplay
- [x] RangeScanner
- [x] CreatureValues (unused delete)
- [x] CreatureManager
- [x] CreatureData
- [x] CreateCreature
- [x] BaseCreature
- [x] GenericMovement
- [ ] FindFood
- [ ] Ignore All Response methods (for now) and breeding

Goal now

- Debug everything

Scripts

BaseCreature depends on

- [x] RangeScanner
- [x] GenericMovement
- [x] FindFood
- [ ] CreatureData

Thus BaseCreature will not work until those 4 are tested beyond a reasonable doubt

Before bounds removal, no crashes but could not find path in straight line if an obstacle was in the way

After, worked until one freeze/crash with no clear indication why

All random coordinates now have the same x

Was able to replicate crash with no clear indication what cause it since it crashed before logging the coordinates, changing the coordinate debug log to be before the path is calculated

The Log was not played before the crash

Added World Boundries, no more crashes

No path found

- A = -13, -5 B = -13, 1
- A = -14, 1 B = 14, -12

Dissect the Path finder even further, have the neighboors actually be shown

- From dissecting it, without the a and b bounds, the calculation can become way too big since it is no longer bounded by a and b

Within Creature data, theres two set new path

June 13th

Implemented the new classes and ensured Find Food works

June 14th

Continuation of new classes

Tested pathfinding with the added four directions, could not find a single bug, it seems the previous problem was not because of path finding, but because of wrong coordinates being placed and if the path finding is told to do a large calculation, it fails and crashes

Could add if distance is x units away, return empty due to too far away

Actions needed to be implemented

- Wander
- Find food
- Wanter can go into find food and vice versa
- Wander's condition should (for now) always be true

Within the creature creation, data must always be creature before the actions,

June 15th

—> movement overhaul

add in roomba collider

rough cycle

- First head towards a direction
  - Have wander set a random target location
- Then if there is an obstacle start heading in some random direction instead
  - Switch the direction of the creature
  - change the raycast to store an array of obstacles
- if there was an action, cancel it?
  - run action.OnEnd() to properly end everything
  - find the next valid action which should be wander

June 19th

Movement redo

—> roomba movement

movement cycle

- Pick a target (done in action)
- Set velocity **once**
- Case 1:
    - Target is reached do next action etc
- Case 2:
    - Target is blocked
    - End action early
    - **Option 2:**
        - Try for next option

June 20th

The roomba cycle does work, BUT the detector (ray cast) does not have the correct distance

—> need to learn more about raycast

Learned more about raycast

- Theres tons of different types of raycast
- Some need ContactFilter2D
- Some need LayerMasks
- For our purposes, since colliders are either there, or not there, we only need to check for layers that do not ignore raycast, as such no Layer Masks or Contact Filters are needed
- We could however, add a terrain layer mask such that the raycast only works on terrain, and not water for example

Additionally, the main units of the random numbers should always revolve around one unit, one unit should be 0.16f which is the size of one square

The speed currently is way too fast, I have temporarily changed the number to multiply against 0.02 but further testing on speed numbers are needed

A new method ForceNextAction is needed if a new action is ever needed to be canceled

If there are no available actions, return the root node

Roomba cycle 100% works from what I can tell, further debugging and such can be done at a later date

Goals for tommorow,

—> add a Unit utilities tool for 0.16

—> add a layer mask to all the specified layers

—> comment and clean up the rest of the code

June 28th

Enviroment factors to consider into traits

- night/day time
- temperature
- seasons
- sunlight
- terrain
    - mud
    - water
    - rock
    - tree (might require elevation)
- Vegetation
    - grows vegetation
- Biomes
    - plains
    - desert
    - grasslands
    - forrst
    - tundra

Creature behaviors

- terrortorry (scent)

Crashing issues

- crashing while booting up the world (on mac)
    - Possible culprit being the food do while loop