ABMS Assignment 01

Lushaank K
20170010082

Predator Prey Tutorial Model

While simply running model sheep and wolf by tweaking the Sheep and Wolf Reproductive rates, I managed to get at Equilibrium.

The Equilibrium State could be achieved due to difference of Grass Availability from the first tick to the others. So, this could be achieved from changing the Setup of Grass Generation also being randomly generated at the beginning rather full grass. At first Sheep could have plenty of food to start with but then onwards the sheep couldn't get full availability of Food from Second Tick. So, by Implementing Random Grass with double Probability at the beginning would be viable for Equilibrium State.

Two Strategies Evaluated Separately from the Behaviour Space and, Data and Conclusions are given accordingly.

1. **By Changing Reproductive Rates Changing, we get the following Behaviour State**
   Variables for Behaviour Space,
   ["wolf-rep-energy-coeff" [1.3 0.1 1.7]]
   ["sheep-rep-energy-coeff" [1.8 0.1 2.2]]
   ["wolves-depleted-energy-level" 28]
   ["prob-grass-regrowth" 5]]
   ["escape-on" false true]
   ["initial-population" 102]
   ["turtle-initial-energy" 47]
   ["sheep-depleted-energy-level" 5]

   This is with 1 Repetition as the above would take 50 runs for 1 Repetition.
   This data would be available in "Predator_Prey_no_code_1.csv" file

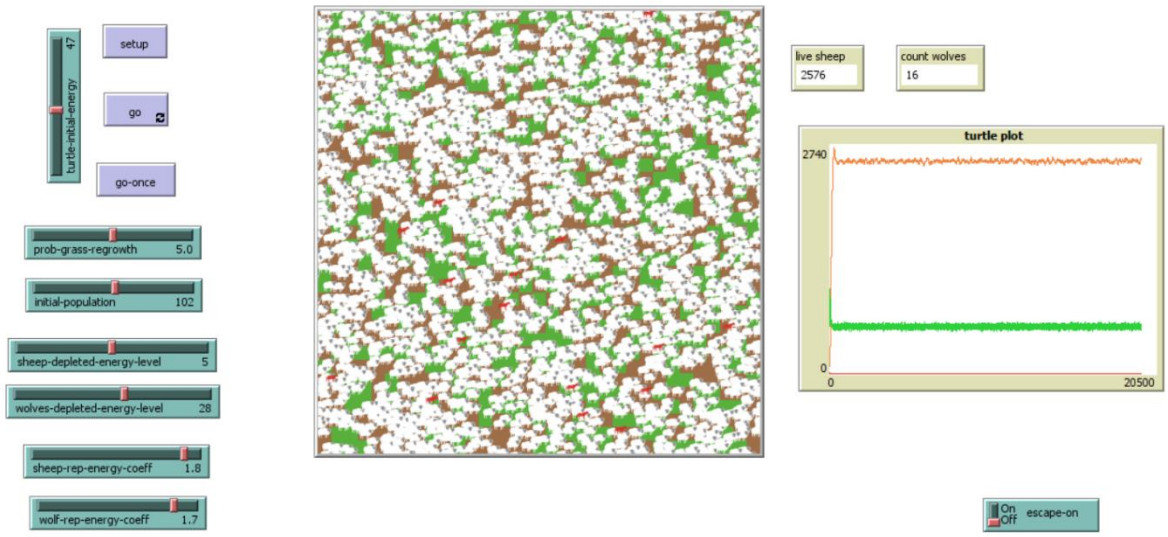
This Simulation have to be aborted abruptly because of finding the Equilibrium State for the above Simulation. The Possibilities which are not mentioned in the File are the ones which have been achieved a Steady State and Keeps on going for countless ticks.

This Simulation is Run for 20,000 ticks and still stays at Equilibrium at the following States.

Here, “escape-on true” cases would take more time in reaching a Saturated State. But doesn’t impact on

Wolf Rep Rate	Sheep Rep Rate	Escape-on
1.6	1.8	True
1.6	1.8	False
1.6	1.9	True
1.6	1.9	False

It couldn’t go to 1.7 Rep Rate for Wolf, but for calculation of Window being 8 at a time we could say that next four values of Wolf Rep Rate being at 1.7 and Sheep Rep Rate at 1.8 and 1.9 also be Steady State.



Here, Average Sheep Population at 2,500 and Wolf Population averaging at 15. But the Grass having regrowth 5, is only at an average of 575, so for every 100 sheep only 23 sheep could be fed at every tick on an average.

Here, the death of sheep is more likely due to lack of food, rather than killed by wolf.

So, I needed to decrease the Sheep Population, but changing Reproductive Rate of Either isn't showing much difference. Then, Keeping the Reproductive Rates at normal and trying with grass being generated at required rates.

2. **By Changing Probability of Grass Growth, we get the following Behaviour State**

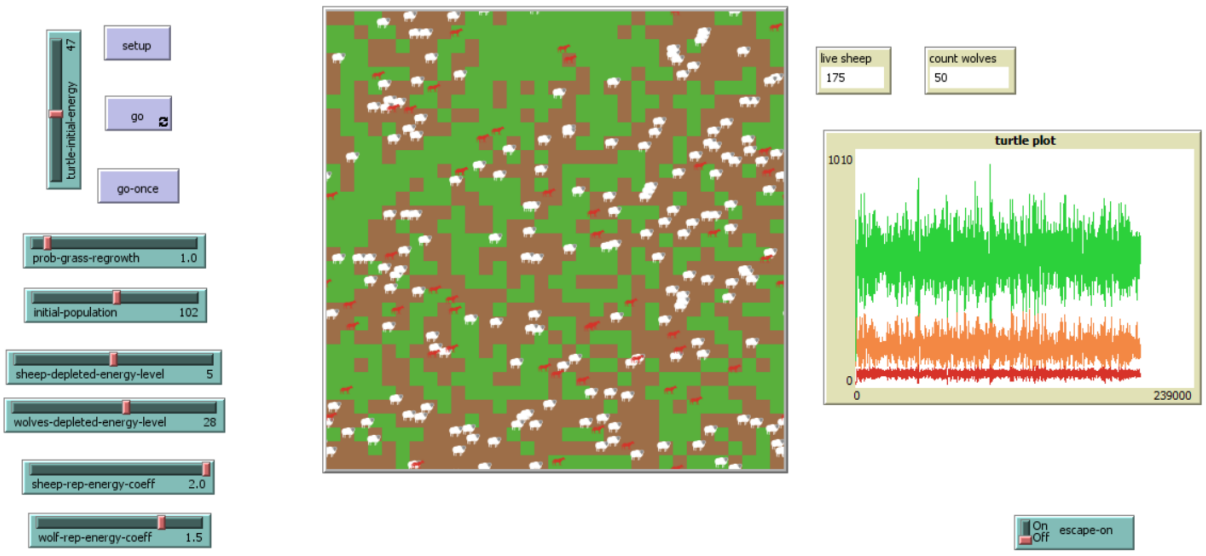
   Variables for Behaviour Space,

   ["wolf-rep-energy-coeff" 1.5]
   ["sheep-rep-energy-coeff" 2]
   ["wolves-depleted-energy-level" 28]
   ["prob-grass-regrowth" [0.5 0.5 2.5]]
   ["escape-on" false true]
   ["initial-population" 102]
   ["turtle-initial-energy" 47]
   ["sheep-depleted-energy-level" 5]

   This is with 1 Repetition as the above would take 10 runs for 1 Repetition.
   This data would be available in "Predator_Prey_no_code_2.csv" file

   This Simulation have to be aborted abruptly because of finding the Equilibrium State for the above Simulation. The Possibilities which are not mentioned in the File are the ones which have been achieved a Steady State and Keeps on going for countless ticks.

   This simulation is Run for 200,000 ticks and still stays at Equilibrium for '0.5' and '1' Rate of Grass Regrowth at "escape-on" be False. But for others it is finite and are terminated at stopping Criteria at one of the Species being dead.



This Equilibrium is more trustworthy because it isn't overcrowded with Sheep in the Population with being dead due to lack of food for Sheep rather than Killed by wolf.

The Equilibrium is attained at Sheep population being Thrice of that of Wolf Population.

But here Grass is Thrice that of the Sheep, making food available for Sheep being Grass Regrowth at 1, bringing Equilibrium. Checking from the previous Equilibrium this Equilibrium seems very Convincing in data of Sheep dying from Wolf rather than Hunger.