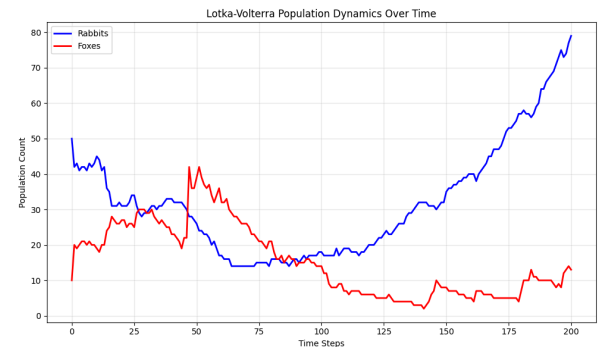


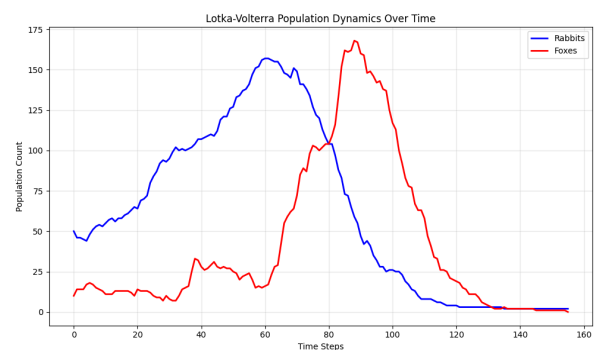
A comparative study between an energy-free scenario and two energy scenarios.

Three scenarios were tested in the fox-rabbit simulation. In figure 1 there was no energy concept introduced. In figure 2 the foxes started with 100 energy and gained 20 energy when they ate a rabbit and in figure 3 the foxes started with 100 energy but gained 50 when they ate a rabbit. The rest of the parameters were not changed

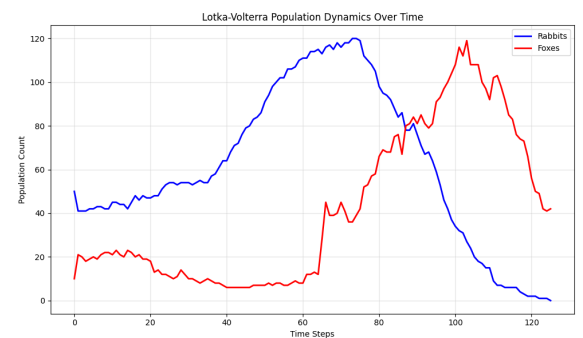
In the no energy simulation the population of foxes increases slightly in the beginning but after start gradually decreasing indicating that there the hunt was successful in the beginning and their population starts to decrease until they all die out due to the random death probability. With the foxes decreasing the rabbits have less enemies to worry about so their population starts to increase rapidly.



In the second simulation we introduced the energy concept (foxes lose energy over time and gain 20 energy per rabbit eaten). The population of rabbits steadily rise and the foxes remain stable but when the rabbits rise in numbers the foxes have more to hunt so they undergo a population boom which causes the rabbits to die out fast and when the rabbits die the foxes die out and both populations almost reach 0 before the simulation end.



In the third simulation we increased the energy a fox gains when they eat a rabbit. They now gain 50 energy per rabbit eaten. The rabbits quickly rise in population in the start which caused the population of the foxes to become steady because there is enough prey. The rabbits continue to grow which caused a boom in the fox population. The result of the rise in foxes causes the rabbits to die out quickly as they did in the second scenario. Because the foxes gained more energy per kill they lived longer and hunted the rabbits to extinction but with less amount of prey the foxes start to die out as well.



Implementing an energy concept in the rabbit and foxes simulation improves the realism of the model. The no energy scenario did not seem that the rabbit and foxes dependent on each other much but in the second scenario they did depend on each other similar in the way it happens in nature. In the third scenario the model will fail because of over predation. These results show that the parameter for the energy concept need to be carefully tuned. Too low and it will die out before it had chance to start and too high leads to the prey being hunted to death.