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Squirrels and Foxes Writeup

For Phase 4, I incorporated many different rules and tweaks to the way the things in phases 2 and 3 happen. My rules ensure that the populations rarely go extinct (or if they do it takes extremely long and it's under special circumstances – my intention), and they fluctuate up and down as real predator and prey populations do over time. My main special rule is that foxes have the capacity to starve after 6 consecutive rounds of a "starving" phase. The other rules help control the populations and ensure they are realistic/balanced. For example, I restrict foxes from eating if their population is 3x the size of the squirrel population to simulate a cool down period and to prevent them from overeating. This gives the squirrels a chance to mate for a bit. In addition to that, I also prevent both the squirrels and foxes from reproducing if their population is double the size of the other. This prevents one species from completely taking over the board. I restrict foxes a little more because they have more ways to expand than squirrels do. The advantage of squirrels is their hiding period.

In my main starving rule, I do this by creating an eaten board that keeps track of the amount of squirrels each fox has eaten – essentially their hunger amounts. Each fox starts off with 10 food points. In the rounds they are able to eat, we add one food point to their score. When they don't eat and the population of foxes isn't extremely low, they get decremented a food point. If their food score is lower than -6 (my chosen amount of max starving rounds), they get killed off. The board properly corresponds to each fox even after shifting. I do this by making sure the food score gets transferred to the new position after they move in the eatenBoard.

All the rules I implemented create a simulation where – based on the different boards – squirrels might be more than foxes and vice versa, yet the populations will shift. One population might catch up, they become balanced at times, or one might thrive for a while. There are different phases throughout the updates that simulate real prey-predator relationships.

Before the modifications, once I implemented eat and mate, the populations would either drop extremely fast, take over extremely fast, or go extinct. I implemented the eatenBoard very early on as well. Without it, the populations would swell and take up the whole board. After implementing them, the animals interact for numerous updates and stay alive. The only exceptions I've observed are where a squirrel is severely outnumbered or a fox is the last one and it starves for a long time. This is the intended behavior with my rules however, as I feel like this is more realistic to how actual predator and prey relationships work. If I didn't implement foxes dying, there would be no disadvantage they really face. It adds balance and control to the populations. Now, things vary and change based on the numbers we start off with which I find very fascinating.