Species Splitting Dynamics

A concept by MirrorMonkey2

Disclaimer: I'm neither a programmer nor a math expert. Maybe this concept will be too hard to implement.

At the moment (Thrive 4.0) AutoEvo is comletely darwinistic. So the mutations are totally random. This concept is based on the assumption that AutoEvo will be smarter in the future and give each species a mutation that hopefully will prove useful.
In this concept, the AutoEvo system measures usefulness in %. So if, for a given population, a vacuoles usefulness is 100%, it will definitely evolve a vacuole. I'm not sure if this is how smart AutoEvo will work. In this concept it works like this.

Each generation, Autoevo calculates the usefulness of evolving each organelle for each species living in each patch. **NPC Species S** lives in **Patch A** and **Patch B**. There are 50 specimens of **S** in **A** and 100 specimens of **S** in **B**.
The player mutates his species, AutoEvo kicks in. It calculates which organelle mutation is how useful for **S** in each biome.

Organelle	Patch A	Patch B
Vacuole	50%	35%
Flagella	30%	30%
Chemoplast	10%	15%
Others	10%	20%

Now the total usefulness is calculated for each organelle. This isn't measured in %, but rather through a simple number. You can think of this like a voting system. The percentiles above show how many inhabitants of the patches „voted" for which organelle. Now the total „votes" of the whole species' population are counted.

Organelle: ((share of **A**)x(total number of **S** in **A**))+((share of **B**)x(total number of **S** in **B**))

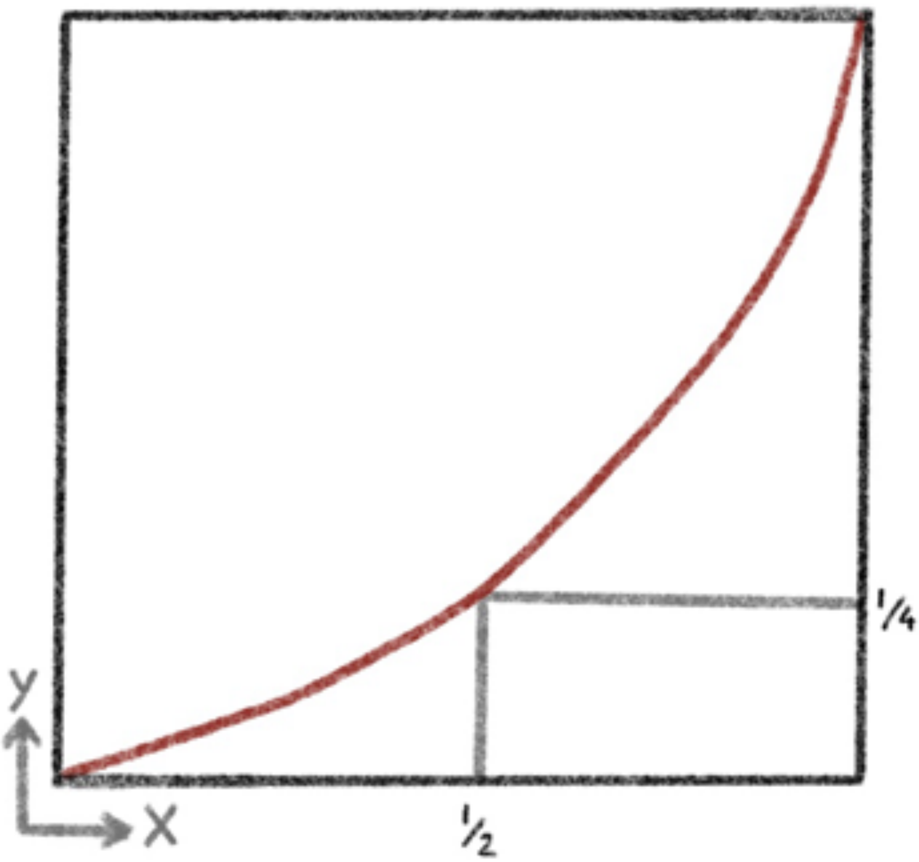
Vacuole: (0.5x50)+(0.35x100) = 60
Flagella: (0.3x50)+(0.3x100) = 45
Chemoplast: (0.1x50)+(0.15x100) = 20
Others: irrelevant for now

Now AutoEvo will roll the dice wether or not to split **S**. If a species splits is determined by a system that is set up on these three tenets:

- If two organelles have the same total usefulness, the species will always split.
- The more abundant a species, the higher the chance of splitting.
- If an average-sized species' second-most useful organelle is half as useful as its most useful organelle, the species has a ¼ chance to split.

For the sake of this example we might say 100 specimens is the size of the average species. In-game this number might even actually be calculated from the different species' size.

Here is a graph depicting how, in the average species, the chance of splitting (the y axis) could relate to the ratio between the usefulness of the organelle in questio and the usefulness of the most useful organelle(the x axis). Wow, that was a lot of usefulness in one sentence.



As you can see, the first and the third tenet are true in this graph: at ½ of usefulness ratio the chance of splitting is ¼. When the usfulness ratio is 1, the chance of splitting is one.

Now we only need to take the second tenet into account. When the species is less abundant than average, the graph gets more sloped, or in other words, the grey rectangle gets smaller. When the species is more abundant than average, the graph gets more linear, the grey rectangle grows. The extremes of the graph, however, always stay the same. No matter how abundant ther species, if the ratio is 0 it is 100% clear which organelle to evolve, so the species can't split (splitting chance = 0). If the ratio is 1 two organelles have the same amount of usefulness, so the species will split regardless of total population (splitting chance = 1)

Again, I'm neither a programmer nor a mathematician, so I can't give you an exact formula for the graph shown above. I hope someone of you is able to flesh this out as this exeeds my abilities.

Now we return to our initial example. We'll calculate the probability **S** is going to split. Forthat, we first calculate the usefulness ratio of each organelle vs the most useful organelle (in this case the vacuole).

(usefulness of organelle in question)/(usefulness of most useful organelle)=usefulness ratio

Flagella: 45/60 = ¾
Chemoplast: 10/60 = 1/6

On the graph above a usefulness ratio of ¾ would approximatly mean ½ chance of the species splitting. Because **S** has 150 specimens and therefore more than average, that chance would be bigger. 1/6 usefulness ratio would mean about 1/10 chance of splitting. Because **S** has more specimens than the average species that number would also be slightly bigger.

Now let the dice roll!

Let's suppose that flagella got a split and chemoplast didn't get a split. What now?
In every biome as many percent of **S** specimens get a flagella instead of a vacuole as flagella got usefulness in that biome. The rest gets a vacuole. That means:

Before:

Patch A	Patch B
50 **S**	100 **S**

After:

Patch A	Patch B
35 **Sv**	70 **Sv**
15 **Sf**	30 **Sf**

Now we add a population boost of 10% (or whatever it will end up being) and we end up with the final result:

Patch A	Patch B
39 **Sv**	77 **Sv**
17 **Sf**	33 **Sf**

Sv with the vacuole and **Sf** with the flagella are now seperate species. With the next generation, the cycle starts again.
„No new organelle" should also be an option for a mutation, as well as the abolishment of an existing organelle.
This species splitting model should ensure that

A) More abundant species have a higher chance of splitting
B) Species can split even if they only inhabit one patch, they don't have to move patch in order to split
C) If their niche is clearly defined and it's clear what mutation they should evolve next, species can spread over many patches without totally being forced to split

All the numbers probably have to be tweaked. The split rate may prove to be too high or too low and can be changed, how much exactly a species' abundance influences ist splitting chance will have to be defined etc. Obviously the average species will probably have more than 100 members.