Pollination of Flowers

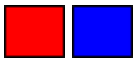
What it models:

This cellular automaton attempts to model how bees pollinate a field of flowers. Bees pollinate through the transfer of pollen between flowering plants. This helps the plants breed, grow, and produce food thus, continuing their cycle of life. When a bee lands on a flower to collect its nectar, pollen gets stuck on their hairs. When the bee ventures to another flower, it transfers the pollen from the previous flower in the process. As the number of bees in a specific area increases, so does the overall health of the flowers and plants. Bees play a crucial role in not only the survival of flowers but also to us, as humans. Almost 80% of all cultivated crops require bees to pollinate them. Hence, not only do flowers and plants need bees but so do the 7 billion humans on our planet. In short, the pollination done by bees may look like a simple task but it is one of the most crucial tasks in the world.

Possible States of a cell:

Unpollinated flower - Grey 

Slightly pollinated flower - Light Red, Light Blue 

Fully pollinated flower - Red, Blue 

Bees - Yellow 

Grass -Green 

Evolution Rules:

If a flower is surrounded by **one** or **two** bees:

- The flower will become “slightly pollinated” from unpollinated
- OR
- The flower will become “fully pollinated” from “slightly pollinated”

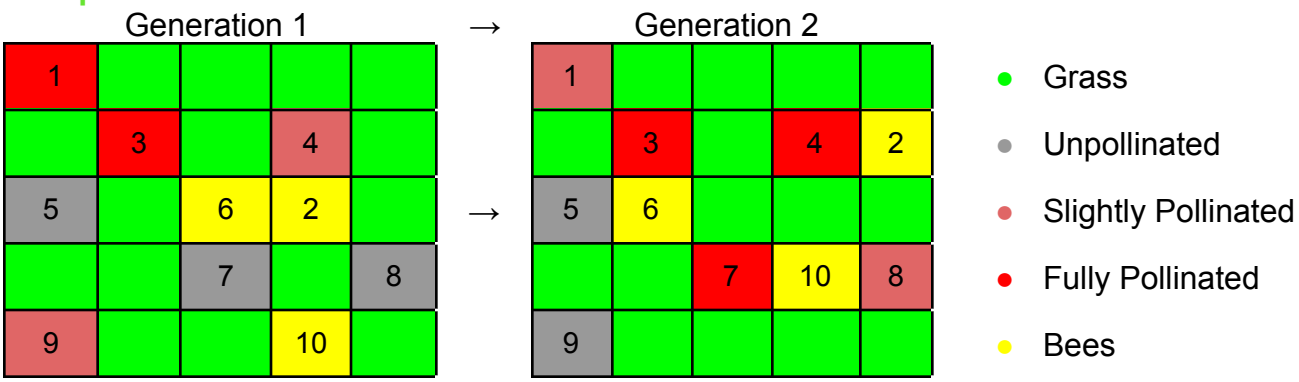
If there are **3 or more** bees around a flower

- The flower will automatically become “fully pollinated” from “unpollinated”

If the life (numberOfLives) of a flower reaches zero (number of lives starts as a changeable number and decreases by one for each frame that a bee is not around the flower).

- “Slightly pollinated” flowers will become “unpollinated”
- “Fully pollinated” flowers will become “slightly pollinated”

Sample Evolution:



1) A fully pollinated flower has zero lives and is not near a bee: it becomes “slightly pollinated”.
2) A Bee moves to a random open spot (in this case one spot up and to the right).
3) A “fully pollinated” flower is near a bee: it stays “fully pollinated”.
4) A “slightly pollinated” flower becomes “fully pollinated” because it is near a bee.
5) An “unpollinated” flower stays “unpollinated” since there are no nearby bees.
6) A bee moves one spot to the left.
7) An “unpollinated” flower is surrounded by 3 bees: it becomes “fully pollinated”.
8) An “unpollinated” flower is surrounded by only 2 bees: it becomes “slightly pollinated”.
9) A “slightly pollinated” flower has zero lives and is not near a bee: it becomes an unpollinated flower.
10) A bee moves one space up.

Differences Between the Cellular Automaton and Real Life:

1. In the cellular automaton, bees are confined to a certain space unlike reality, where they are free to roam wherever they want. This automaton assumes that the existence of bees is limited to a single area.

2. The automaton does not account for the bees’ other necessities, such as aging, dying, and reproducing. In real life, the life span of a bee is limited. However, in this simulation, bees have an infinite lifespan.

3. The simulation does not show the life cycle of a flower It only shows the pollination levels of the flowers. In our world, the flowers would first spread seeds for new flowers and then die. The simulation only looks at a fixed amount of flowers without the number expanding or declining.

4. Bees in real life have to collect pollen from flowers first before they can pollinate flowers. In this scenario, the bees are assumed to be carrying an infinite amount of pollen.

5. Finally, this simulation assumes that the bees have an infinite amount of stamina and can continuously pollinate flowers. Actual bees return to their hive to rest after a hard day of work.