

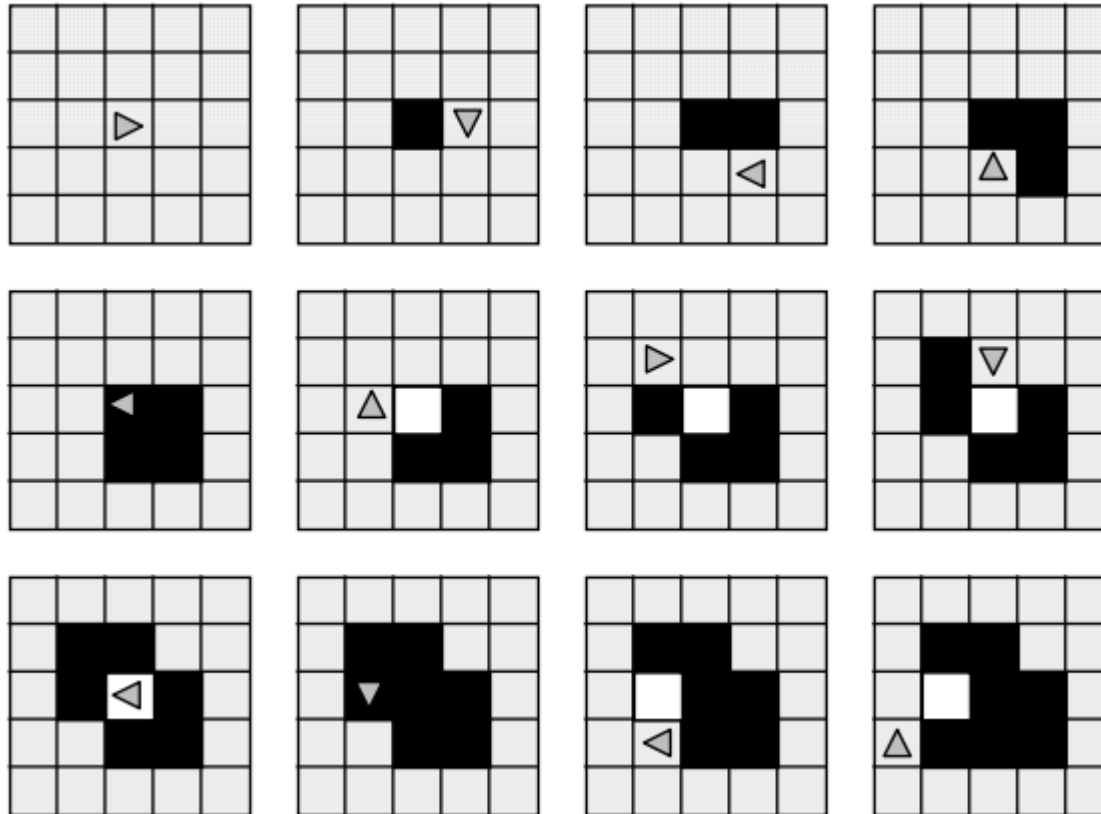
Simple Rules and Complex Things

Emergent Behaviour of Cellular
Automata

Langton's Ant

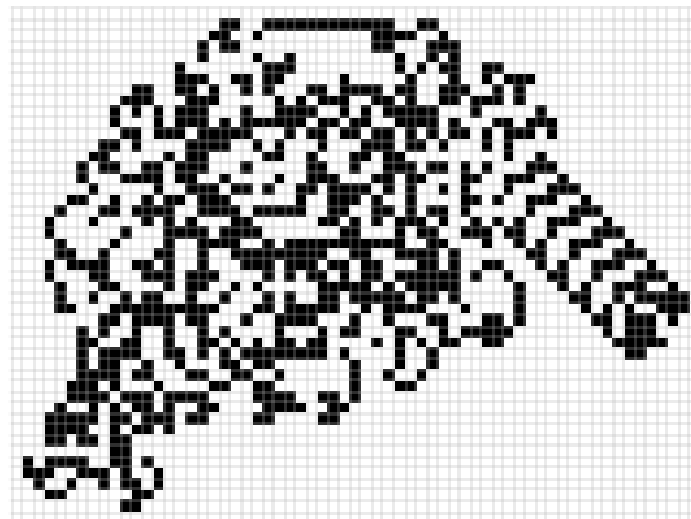
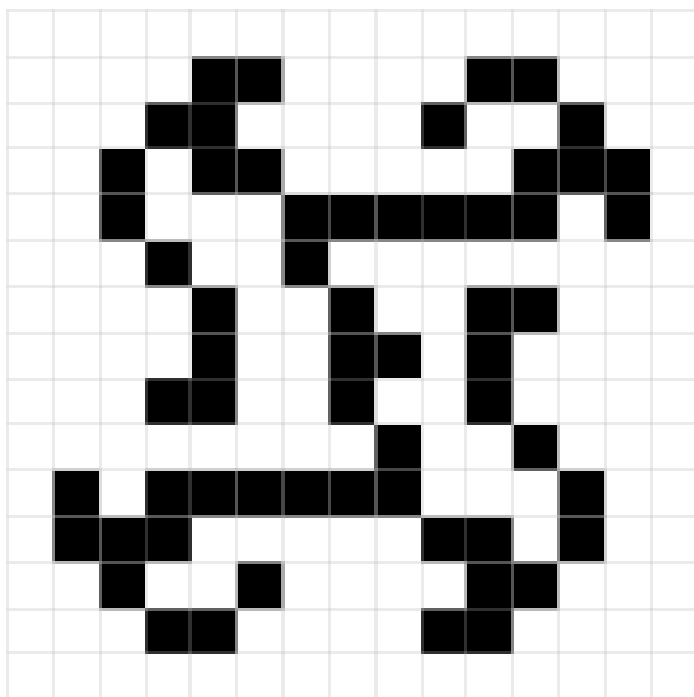
Rules:

- At a white square, turn 90° right, flip the color of the square, move forward one unit
- At a black square, turn 90° left, flip the color of the square, move forward one unit



First 12 steps of Langton's Ant (grey arrow).

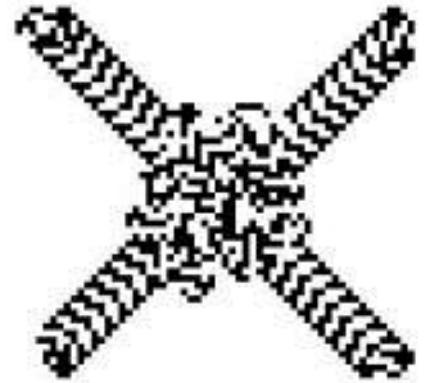
For clarity, squares not yet visited are shown light grey:
these should be treated as 'white' when applying the rules.



Left: First 300 steps (roughly) of Langton's Ant.

Right: First 11000 steps (roughly) of Langton's Ant.

Langton's Ant

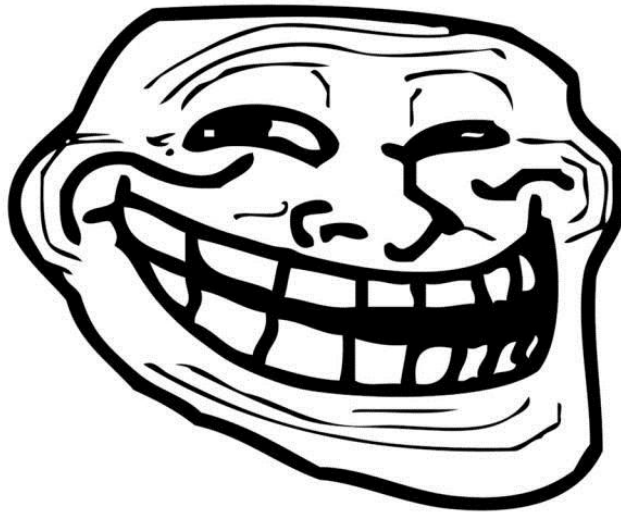


Interesting Questions:

- Will the ant's path always be unbounded?



- Does the ant
matter how



ghway no
coloured?

- What if there
board at a ti

problem?

nt on the

Google AI Challenge

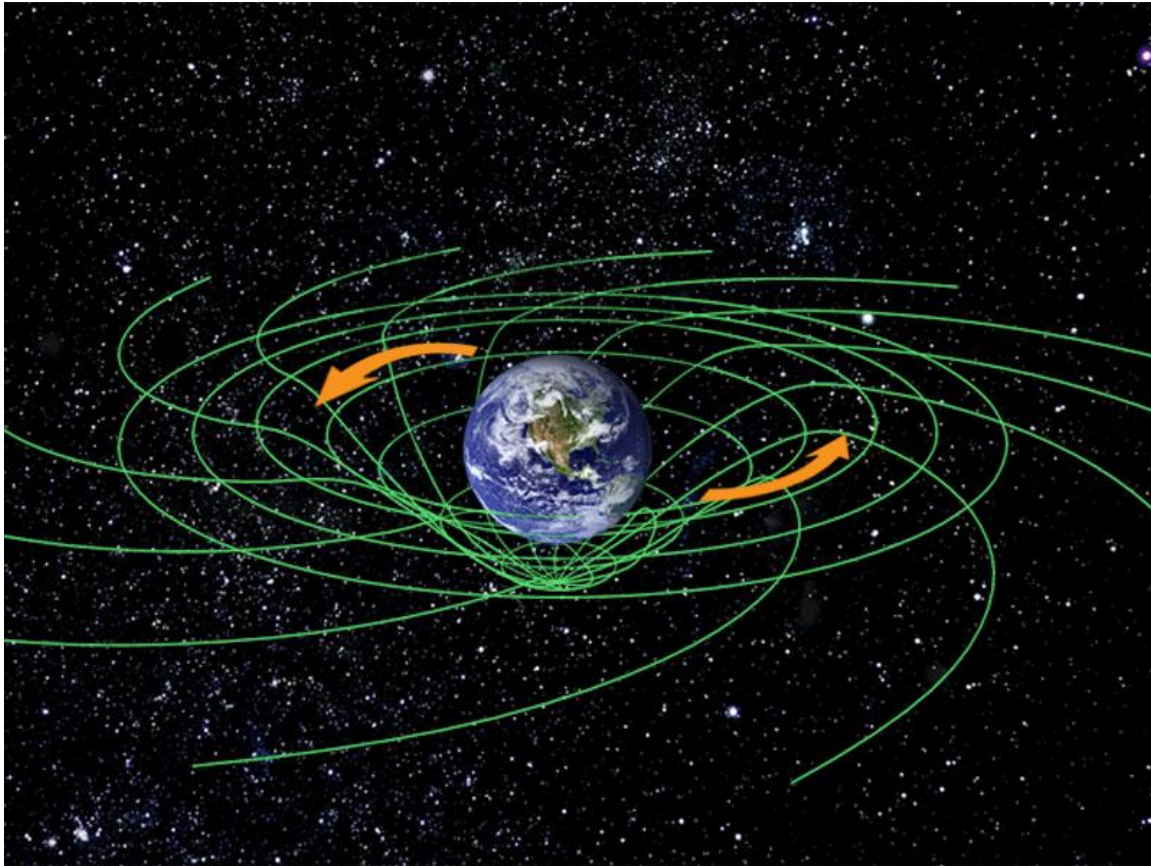
Rules:

- Every ant tries to gather food (pale squares) to spawn more ants from the ant hill (holes)
- Once in range of enemy ants, the side with more ants win. In case of a tie, both ants die.
- Goal: Take over all ant hills by walking on them

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Idea:

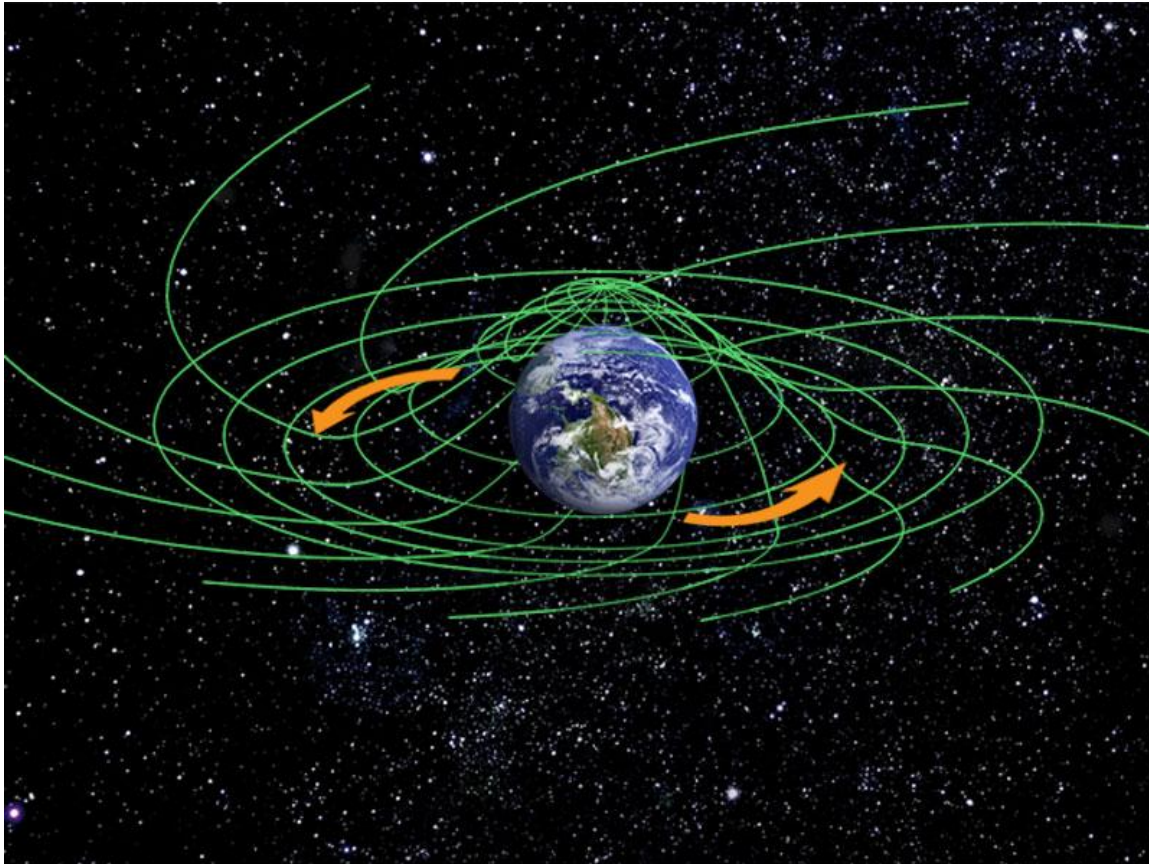
- Pretend the grid is a stretchy rubber sheet. Each food square creates a depression in the sheet.



Pretend the Earth isn't there.

Google AI Challenge

- Likewise, each enemy creates a hill in the sheet.



Pretend the Earth isn't there.

Google AI Challenge

- Each of our ants are guided by “gravity” towards the food and away from the enemy.