Sugarscape toy model

- Environment
  - -> 50 x 50 grid
  - -> wraps as a Torus
  - -> Grid
    - Sugar capacity
    - Sugar level
      - Amount of sugar in cell, could be none.
    - Sugar capacity can vary from cell to cell
      - ← Sugar capacity is fixed.
  - -> grow back function:
    - At each cell, sugar grows back at a rate of α units per time-step up to cells capacity.

-> maximum value of sugar that can be in the cell.

Variables

Agents

-> Every agent has characteristics that condition their skills and capacities.

-D These attributes are:

-> A vision $\underline{v}$ which is the max number of cells the agent can see in each of the four principle latticeg N, E, S, W.

-D Metabolic rate $\underline{M}$ which defines the unit of sugar an agent burns each time step.

- A maximum age max_age, which represents the maximum # timesteps the agent can live.

- Sugar wealth S_wealth, a counter that is incremented at the end of each time step by the sugar collected and decremented by the agents metabolic rate

So AgentA(Sugar_w) = SugarCollected − M.

Agent Behavior (functions)

→ Agent Movement (rule)

1. Consider set of unoccupied cells within vision, incl once standing on. Identify
2. the ones with the greatest amount of sugar, select the nearest one (randomly if there is more than one),
3. move there and collect all sugar i. Increment sugar wealth
4. by the sugar collected − Metabolic rate. If Agent.S_wealth <= 0 then die(agent).

-b Agent Replacement rule R.

- whenever an agent dies
  1. it is replaced by a new agent of age = 0,
  2. placed on a randomly chosen unoccupied cell,
  3. having random attributes V, M and max_age, and random initial S_vaccine.
  4. All random numbers are drawn from uniform distributions with ranges specified in Table 1.

Lattice length L	50
Cells sugar capacity distribution	$c = 0$ white $c > 0$ sugar $c = 0, 1, 2, 3, 4$.
Growth rate α	1
Number of agents N	250
Agents init wealth $\$_{wealth}$	$U[5, 25]$
Agents metabolic rate M dist	$U[1, 4]$
Agents vision V dist	$U[1, 6]$
Agents max_Age dist	$U[60, 100]$

C = Cells Sugar capacity.

Table 1

Initial State

- Each cell contains a sugar level $[0, 4]$ capacity C.
- 250 agents are created at a random unoccupied initial location and with random attributes (using the uniform distributions indicated in Table 1).