I confirm that this work is my own, and I didn't use any external help while doing it.

Questions set 6.

1. Random walk models. What dynamics do you know? How do they differ?

We can define our models by defining the rules of walking via rules for choosing the step and direction. This changes the dynamics of the model and its behavior. There are:

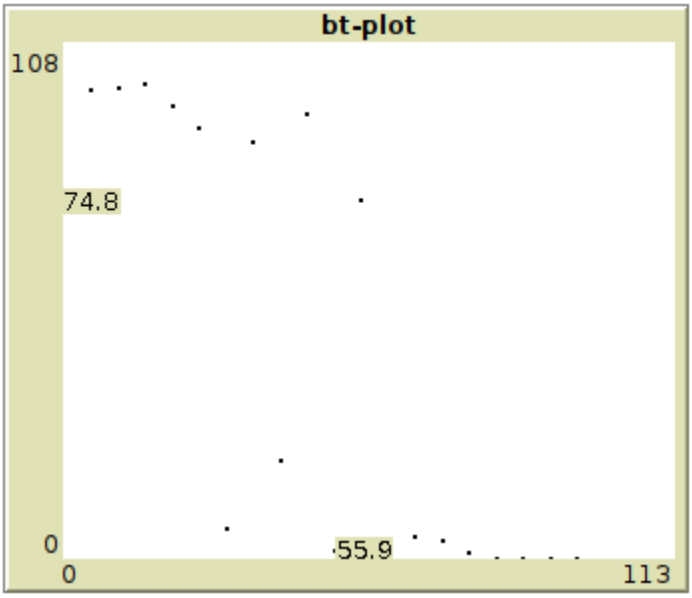
- Pearson RW which has fixed step and random direction
- Lattice RW which has fixed step and direction divisible by 90 degrees (meaning only 4 directions)
- Levy flight RW has random direction and step size drawn from heavy-tailed distribution such as poisson distribution
- Lazy RW has random direction and shrinking steps, which decrease by some function (may be some power < 1)
- Diffusion RW has continuous step and direction

2. Spatial simulation. Define the forest fire model and explain the main findings. Build plot of percent survived vs density.

Spatial simulation is a simulation that takes into account relations between agents distributed over some space with respect to the distance between agents meaning that the smaller the distance between them, the more significant relations between them.

Forest fire is one of spatial models having basic idea of percolation. It is a model of non-deterministic spread of fire in forest having various factors: probability of spreading the fire, wind, direction of wind, speed of wind, area of probable spread of fire, big jumps, etc.

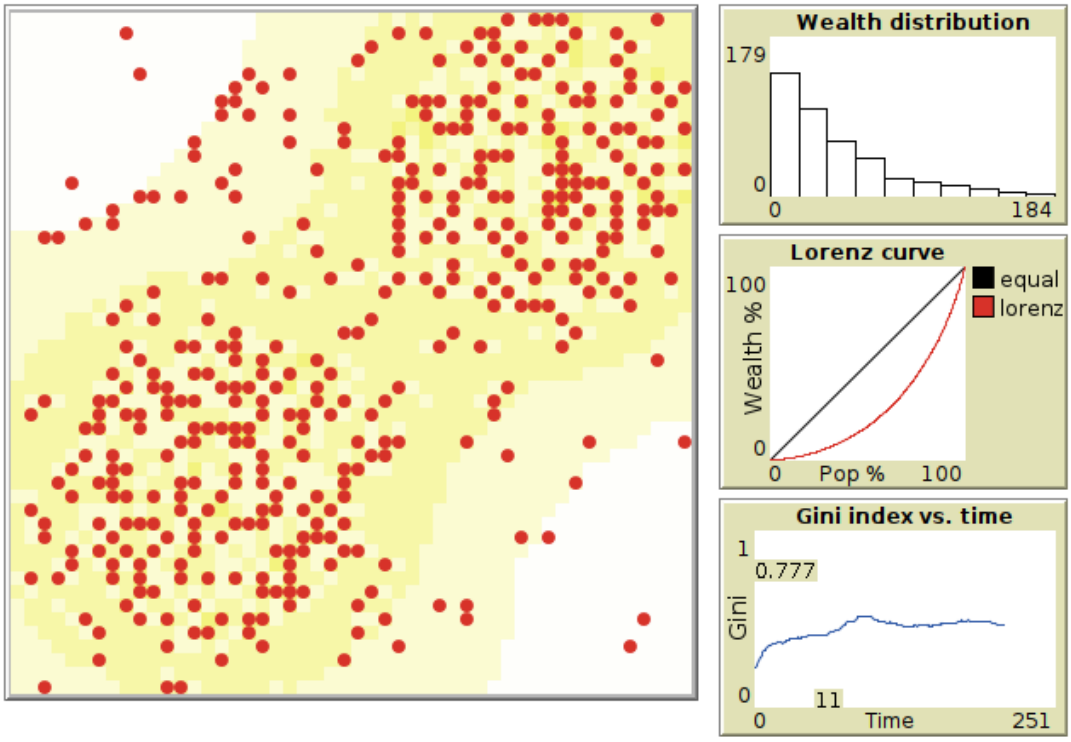
If simplifying the model - all the neighbors of the burning tree gets burned, the density of the fire plays significant role, having some thresholds. With density over 61%, the percentage of burnt trees goes to 100%, while below the threshold this percentage is significantly lower. Forest having density lower than 55% has burn percentage lower than 10%.

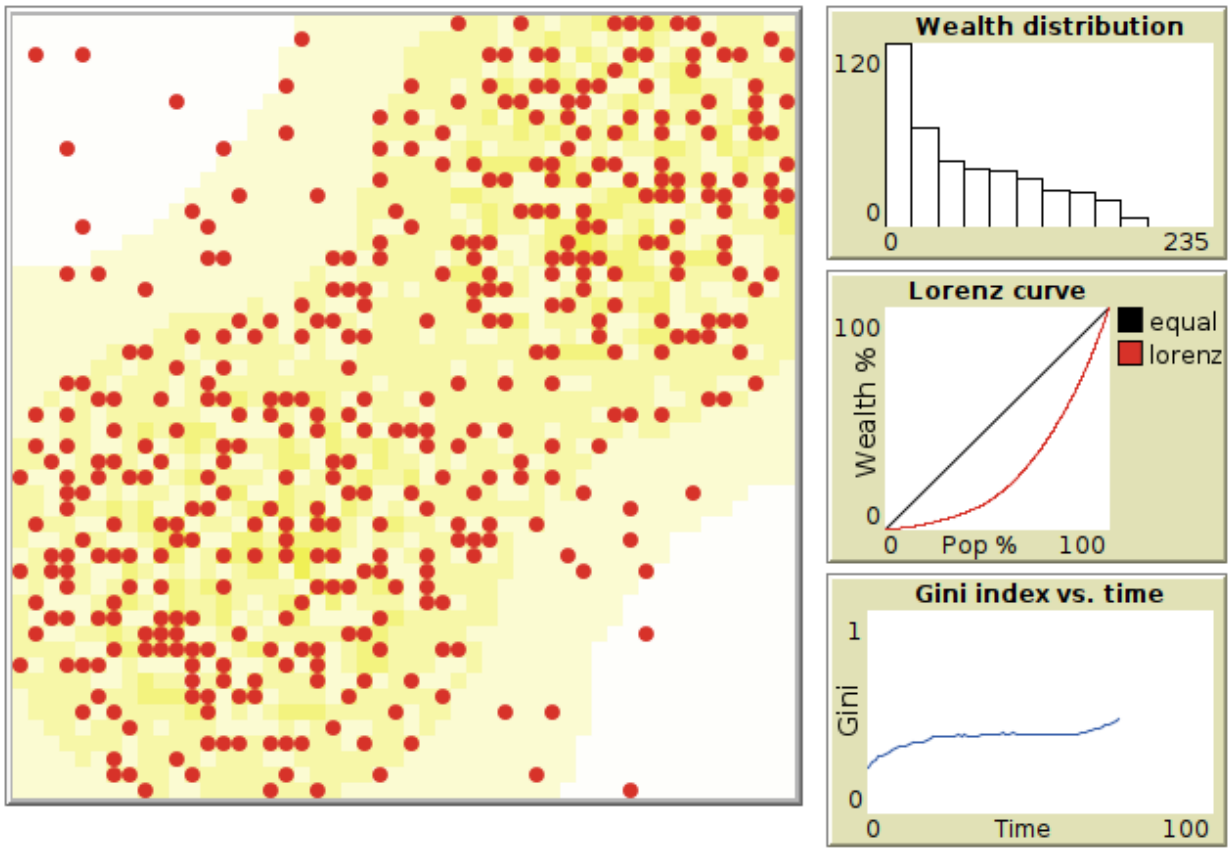


3. Sugarscape model. Implement pollution. Demonstrate the effect of pollution and its influence.

1. Pollution doesn’t change wealth distribution.
2. Due to the pollution agents can move to fields with smaller max-psugar.
3. Agents become more spread in center region because there is a high pollution in some patches where great amount of sugar grows.

Original vs Implemented:


Wealth distribution
179
0
0
184
Lorenz curve
100
Wealth %
0
0
Pop %
100
equal
lorenz
Gini index vs. time
1
0.777
Gini
0
11
0
Time
251


Wealth distribution
120
0
0
235
Lorenz curve
100
Wealth %
0
0
Pop %
100
equal
lorenz
Gini index vs. time
1
Gini
0
0
Time
100