Simulation of Schelling's model of segregation

Two Twins

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Introduction

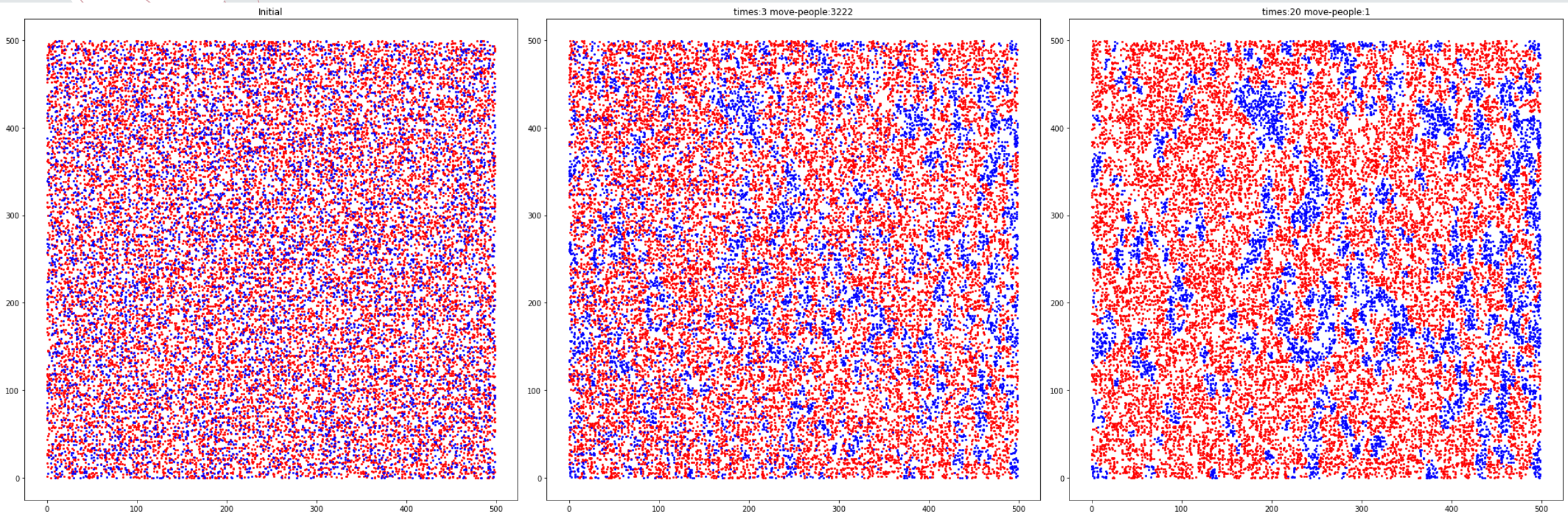
- Motivation:
  - Schelling's model of segregation (by Thomas Schelling in 2010)
  - Model: Without external factors, people's in-group preference may have impact on segregation among different groups.
- Our interests:
  - By simulations with different conditions and criteria, discover how different groups segregate.

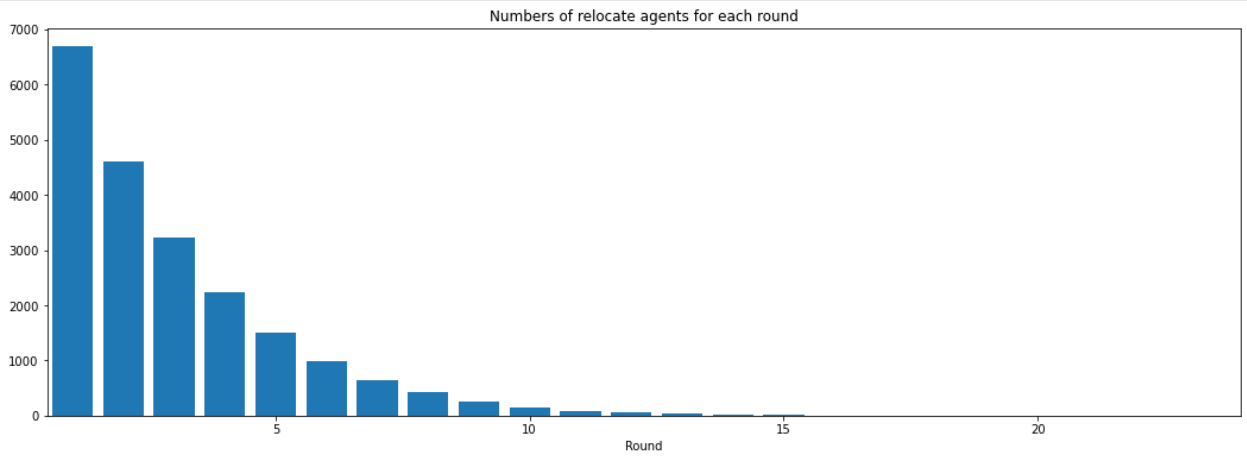
Model Setup

- The model is set in a n*n grid, where each point is a space that an agent could occupy.
- Only one agent can occupy one space at one time.
- Agents are split into two or more groups randomly.
- Assume agents have tendency to move to where more same—group agents live in.

Model 1

- 500*500 grid, with population of 25,000 (90% empty ratio)
- Two different groups
  - Group 1 colored in red; Group 2 colored in blue
- No agents moving in or out (population stays constant)
- Agents are randomly distributed
- Relocation Criterion: If the number of same-group agents out of the nearest s(=5) agents is less than t(=3), then this agent relocates.





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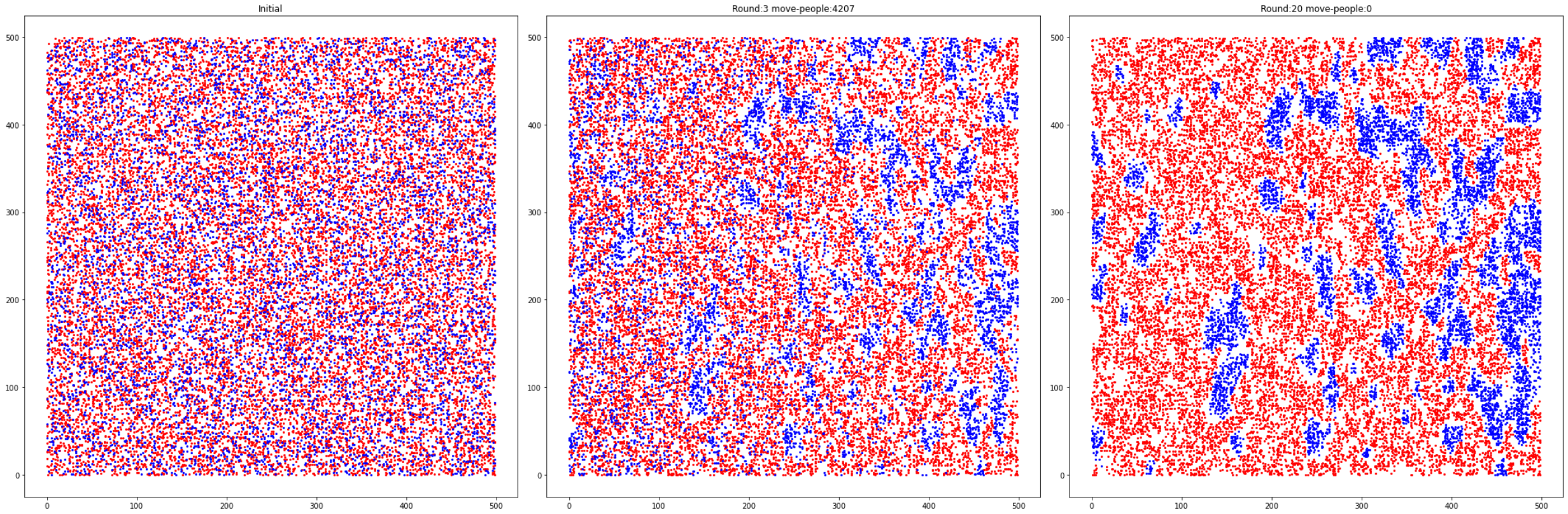
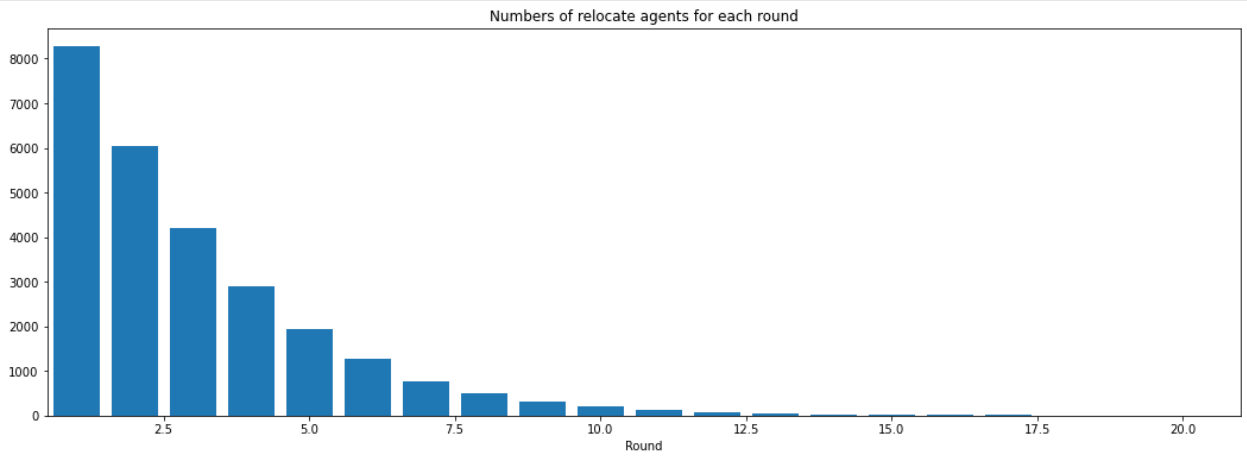
- The process ends after 22 rounds;
- Small group (blue in this case) are more likely to form small clusters, surrounded by large group (red)

Model 1.5

- 500*500 grid, with population of 25,000 (90% empty ratio)
- Two different groups
  - Group 1 colored in red; Group 2 colored in blue
- No agents moving in or out (population stays constant)
- Agents are randomly distributed
- Relocation Criterion: If the number of same-group agents out of the nearest s(=8) agents is less than t(=5), then this agent relocates.





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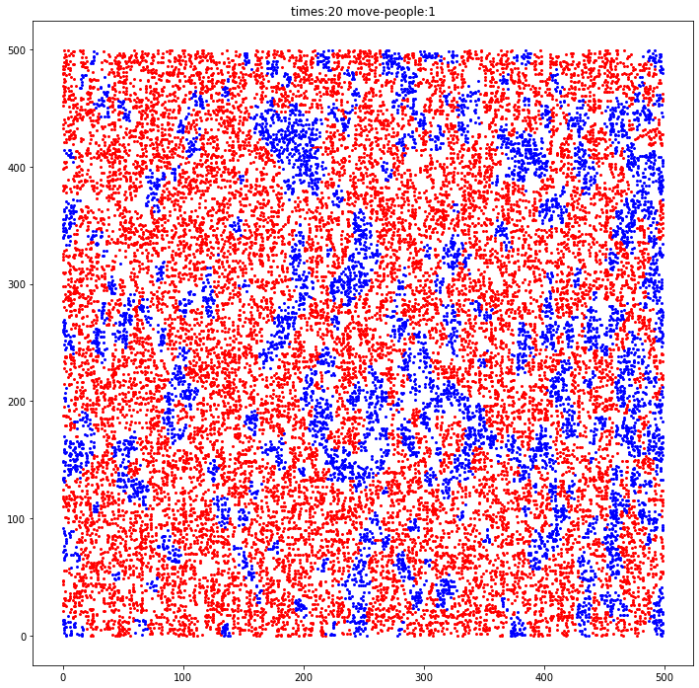
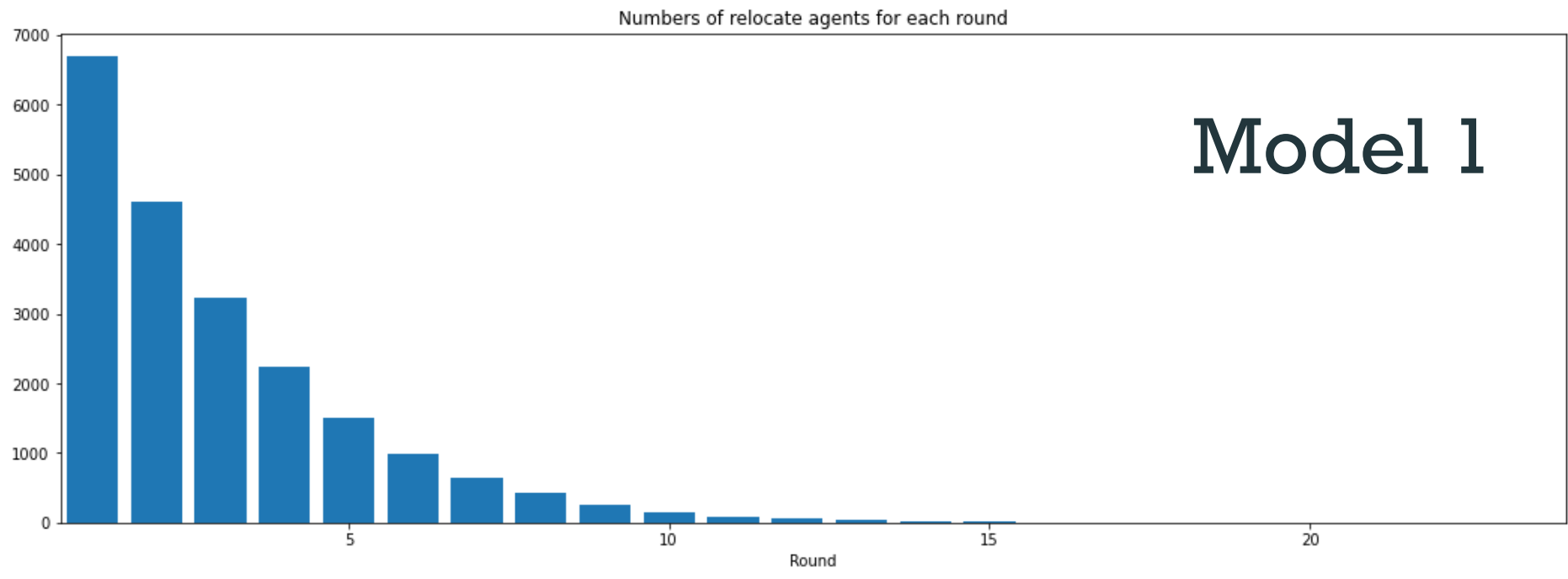
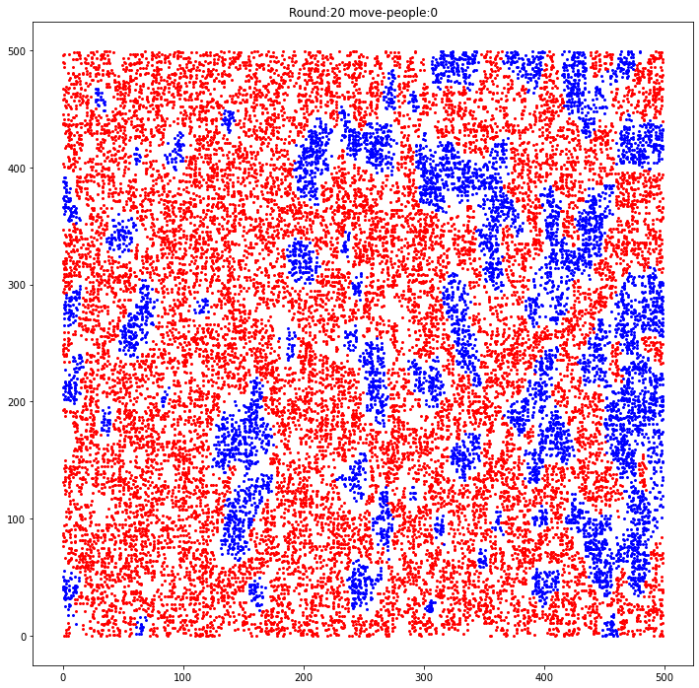
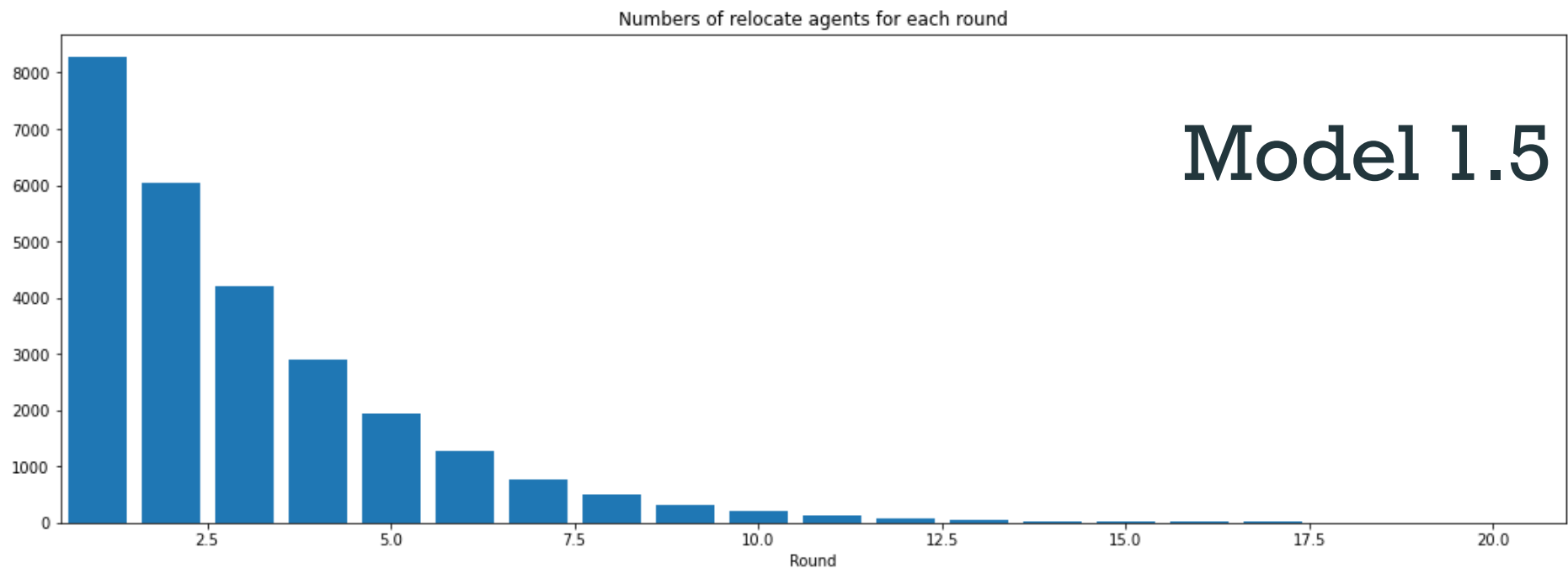
+ The process ends after 19 rounds;
+ The numbers of moving agents in the first few rounds is larger than Model 1;
+ Segregation is more obvious;





Model 1

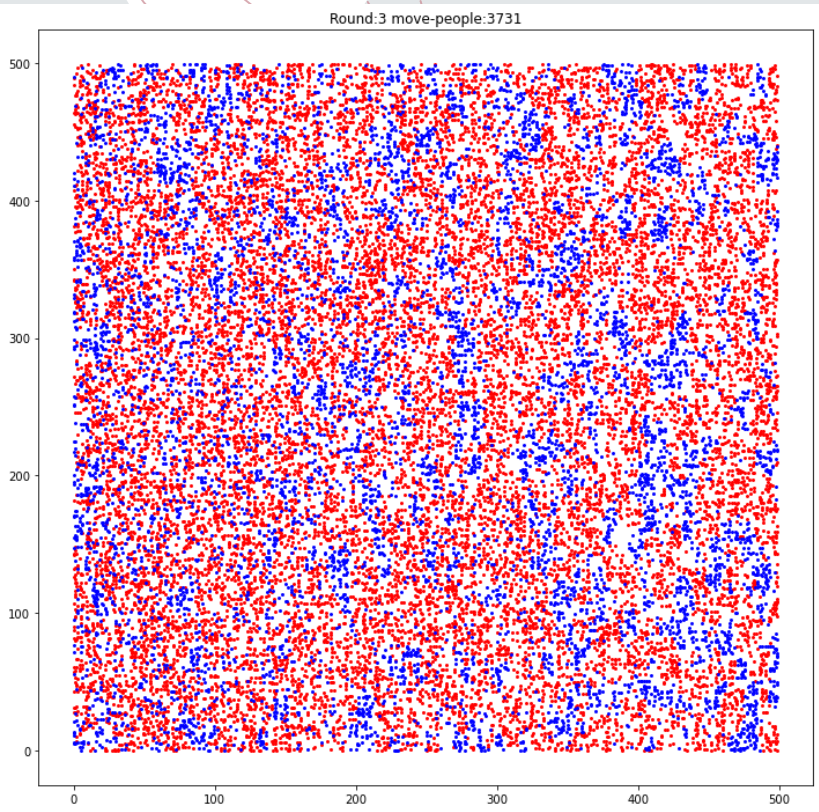


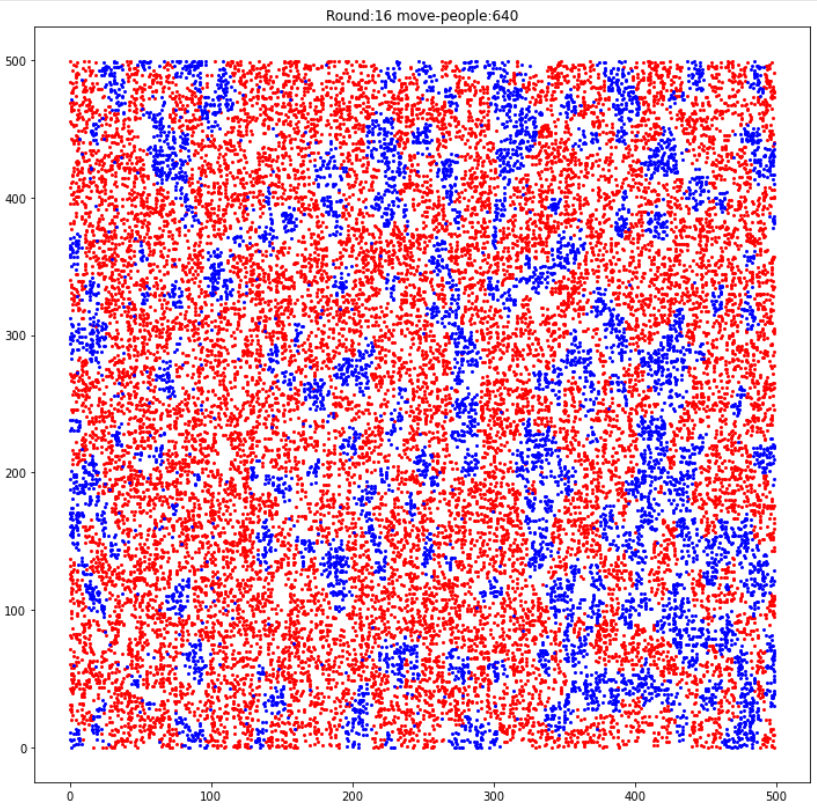


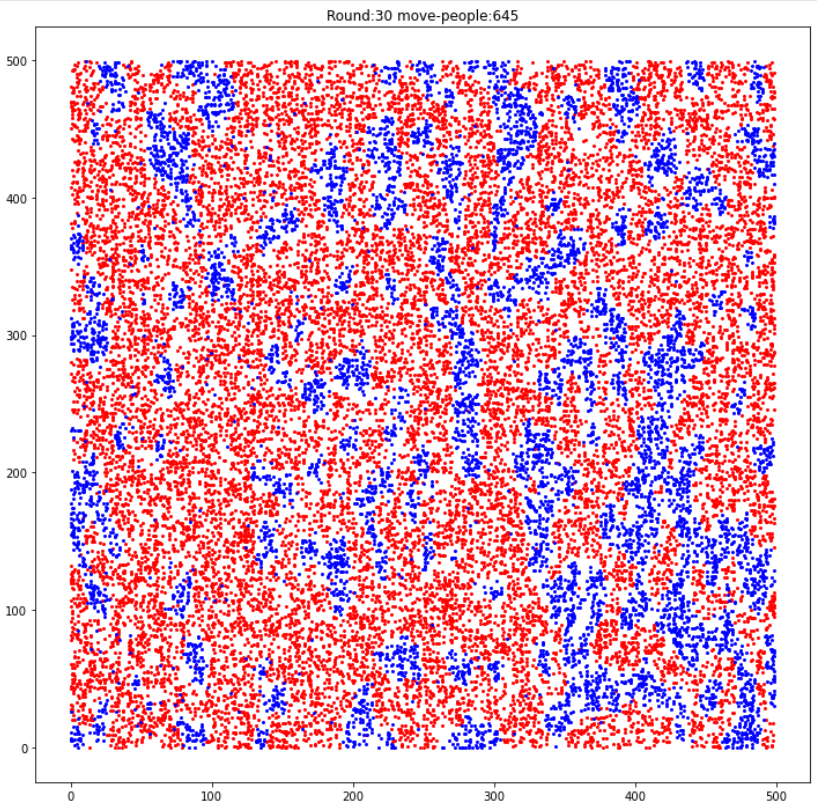
Model 1.5

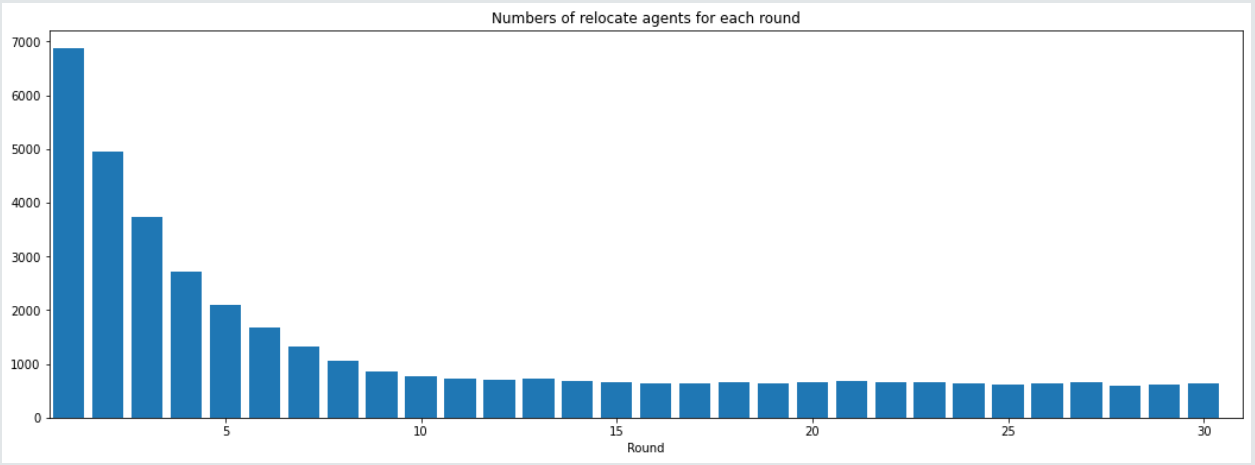
Model 2

- 500*500 grid, with population of 25,000 (90% empty ratio)
- Two different groups
  - Group 1 colored in red; Group 2 colored in blue
- A certain ratio(2%) agents moving in or out; this rule's priority higher than relocation criterion
- Agents are randomly distributed
- Relocation Criterion: If the number of same-group agents out of the nearest s(=5) agents is less than t(=3), then this agent relocates.









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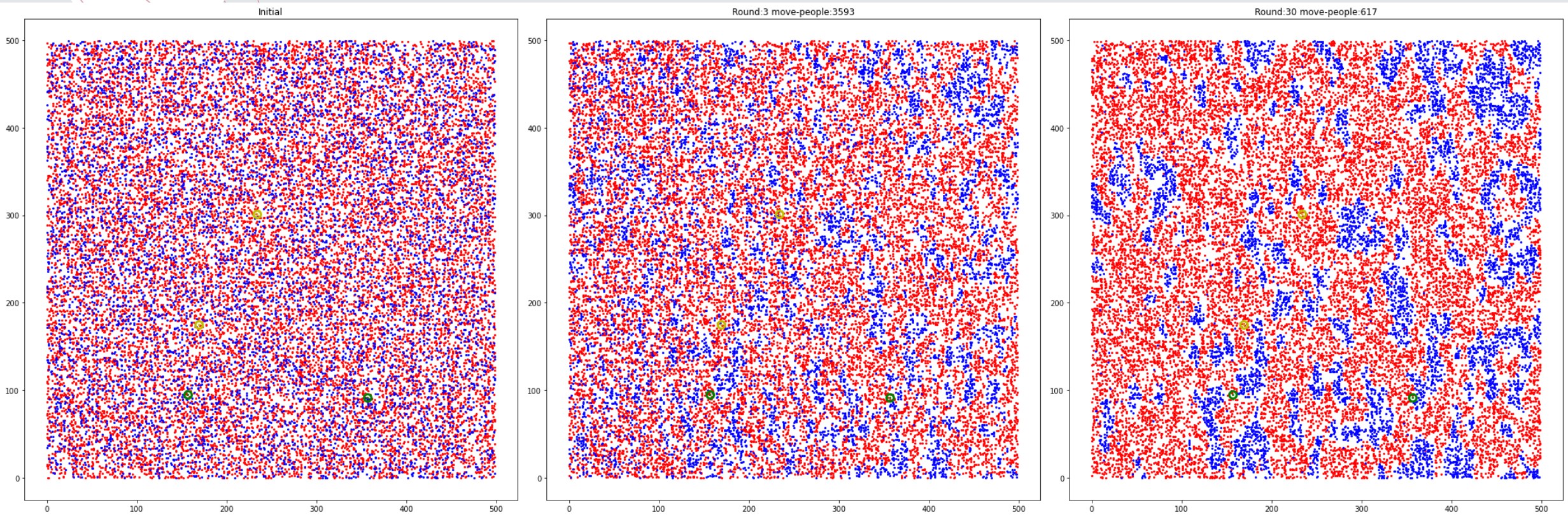
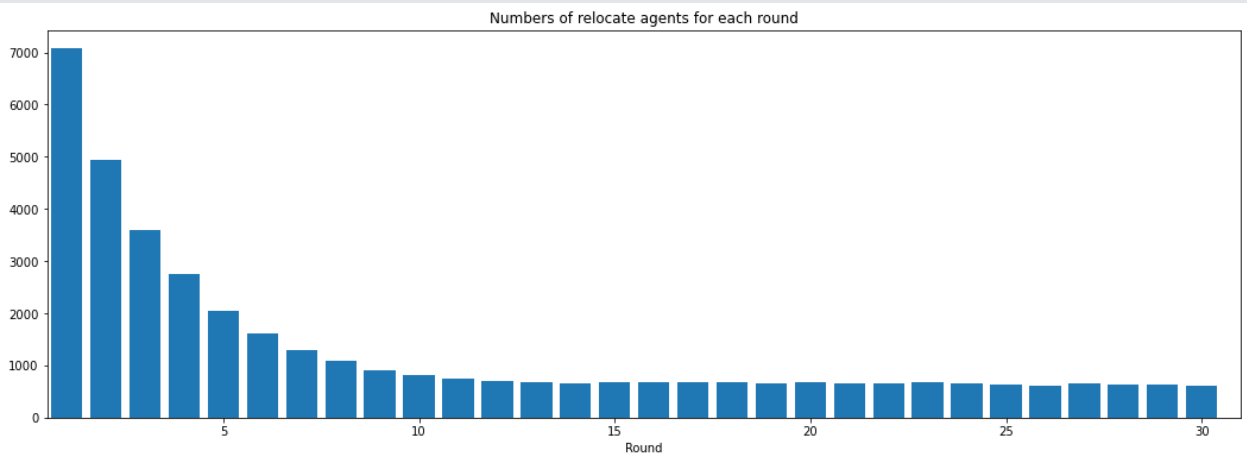
- Moving number stabilize at 650 after 15 rounds;
- Segregation doesn’t change too much due to new agents’ moving-in;

Model 3

- 500*500 grid, with population of 25,000 (90% empty ratio)
- Two different groups, each with two leaders
  - Group 1 colored in red, leader yellow; Group 2 in blue, leader blue;
- Agents adjacent to leader of his group won't move; (highest priority)
- A certain ratio(2%) agents moving in or out; this rule's priority higher than relocation criterion
- Agents are randomly distributed
- Relocation Criterion: If the number of same-group agents out of the nearest s(=5) agents is less than t(=3), then this agent relocates.





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- Moving number stabilize at 650 after 13 rounds; rapider than Model 2;
- Agents form clusters around leaders;
- Segregation is more obvious than Model 1 & 2;

Follow-up Works

+More group leaders for each group

+Agents are split into three or more groups

+Different groups have difference level of in-group preference

References

+ [1] Thomas C. Schelling (1971) Dynamic models of segregation, The Journal of Mathematical Sociology, 1:2, 143-186, DOI: 10.1080/0022250X.1971.9989794