1. (This question still in progress.) Simulation in Sociology, Moretti (2002) (3 points). Read the paper, Moretti (2002), and write a one-to-two-page paper responding to the following questions

(a) The author discusses the role of simulation as a tool for exploring theory. She also highlights the importance of establishing "validity" of the simulative model of the theory. That is, validity is the degree to which the theoretical constructs and their computational implementation are representative of the real-world. What are some potential weaknesses in validity that the author describes with regard to multi-agent systems and cellular automata?

Computer simulation techniques provide us new opportunities to develop social research. The author mentions that the most important aspect is its capacity to include the dynamics of social phenomena. At the meant time, the weakness remains. The author concludes this as validity, the degree to which from the real word to the model of the virtual world.

Multiagent simulation is based on a theory of individual behavior. The author believes that the future of simulation in social sciences is closely linked to the evolution of multiagent systems. From this theory, we can observe what happens about human behaviors if some specific conditions arise. The simulations regarding archaeology are based on individuals collaboration in a situation of economic variability. In these types of applications, the definition of agents is based on the concept of bounded rationality developed by Simon (1957). As the author mentions, this notion is much weaker than standard economic rationality because this is still progressively refined by a lot of procedures that considers the limited knowledge and abilities of the decision maker. Therefore, the author concludes: Use of theories and models of rationality that are realistic, understandable, and can be applied in the case of limited knowledge will be the next direction for research in multiagent systems.

Cellular automata are interesting tools in the simulation of complex dynamics. One of the aims of this simulation is to verify if a system tends to one point of stability where there are no longer other changes. The other objective is to determine what kind of final state configuration emerges. A limitation of this simulation is the use of synchronous updating of states; we assume that there is a global clock according to which all cells are updated simultaneously. This assumption is very dangerous and may not be found in any real social process. Because individuals modify their opinions and behaviors at different moments. The author also proposed a wat to alleviate this problem: Instead of applying transition rules simultaneously to all units, we can choose to modify only some units. The positive side is that, it's true that it is impossible for a person to interact with all the individuals in a population. However, it is very difficult to define the neighborhood of a unit. In the real world, interactions can also take place among individuals who are not "physically" close to one another.

(b) The author highlights “dynamic feedback” as a key characteristic that computer simulation is good at modeling. Dynamic feedback is where some initial stimulus changes behavior, and then that change in behavior creates new stimuli which in turn cause further behavioral change. Give an example of a model that the author cites from Sociology that exhibits this characteristic. Come up with an example of a research question on a political science topic where the underlying system exhibits dynamic feedback.

The author mentions an example about dynamic social impact, which is what the necessary and sufficient conditions are that cause the clustering and the polarization of opinions. In this context, the behavior of each agent will have some influence on others and will then change their opinions and behaviors. All those cross effects may also have influence on the primary agent. Eventually, this will cause the clustering and the polarization of opinions. The author then mentions the computer simulation about this research. A multiagent system model can be explored by changing the initial configuration of the environment or some functions or rules that define the behavior of each agent. In Doran et al. (1994), the simulative experiments make it possible to discover the circumstances that influence the formation of hierarchies in a social group. Finally, in a simulation with genetic algorithms, we can observe the results derived from different rules of crossover and mutation. And the author also gives us an interesting research conclusion: Reynolds’ (1994) application, which studied the emergence of cooperation in a population of Peruvian herders. Comparing some experiments, he concluded that the process of cooperation evolves only if it is supported by a belief system.

Well, after today’s class, I come up with this political science related research question: Will the candidate still win when people believe he is going to win? For example, before 2016 U.S. election, a lot of my professors asserted that Hillary was going to win. They made an “elaborate analysis” based on political experience, politic view, reputation and so on. After that, maybe some Hillary supports won’t vote for Hillary because he firmly believed Hillary was going to win by overwhelming superiority and his one vote won’t change the result. And his “neighborhood” is very important here. Maybe he is a faculty in university. His all friends and other faculty have the same political belief like him. It is impossible for one person to interact with all the individuals in a population. At the same time, most of the people around him may be those who share similar characteristics and beliefs with him, which strengthens his view. However, if everyone will think like him, then no one will vote for Hillary! And the result will change! I think this is an example that the underlying system exhibits dynamic feedback.