Analysis of Underlying Causes and Mechanics of Civil Disorder

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Abstract

The suppression and alleviation of rebellious elements in a society has been an intractable problem for political leaders for millennia and is a current issue for the United States in the Middle East. Modeling the behavior of dissidents in a conquered state therefore has practical applications. By examining the various historically tested options for restoration of order, one might come to a conclusion as to the most effective means among these choices. When viewed in a manner that is conducive to visualizing geographical as well as demographic patterns, the usefulness of any given model would be extended significantly.

1 Background

As long as there have been governments, the problem of maintenance of order in a government's territory has been an intractable problem, especially when one attempts to extend control over a previously independent region. In modern times, the problem of keeping order with a professional, postmodern military has increased, and the efforts to which a government goes to keep a region from rebelling have in many respects become more difficult with increasing transparency and scrutiny by the media, the so-called "Fourth Estate". This is most clearly seen in the modern day efforts by Russia in Chechnya, the People's Republic of China in Tibet, and the United States in Afghanistan and Iraq. Thus, simulation of various methods used in maintaining order has a practical application in demonstrating the superiority of

one over the other or at the very least their respective merits in how the civilian populace reacts to them.

1.1 Agent-Based Modeling

Typical agent-based models act on the idea that if one gives a group of agents a set of rules within which they must live, add a small element of randomness, and then let them loose in a virtual environment, their activity will simulate that of actual living things. Originally growing out of the concept of cellular automata, in which "cells" in an environment take on one of several states and then influence other agents through those states, agent-based models currently can involve not only a more obvious simulation of agents moving in an environment but also simply giving the agents a problem and seeing if they can work within the rules to "learn" the solution.

1.2 Rebellion

A preexisting model that examines the effects of various policies and conditions implemented by and on a conquering government in a new territory is the eponymous "Rebellion", using the NetLogo interface. Within a set territory, several different kinds of agents react with one another: the "regular", inactive agents; the "rebelling", or active agents; the agents that serve the constituted authority, i.e. "cops"; and jailed agents, formerly rebelling ones. In addition to these, one can adjust parameters for various factors with which the agents must work: the "legitimacy" (basically the popularity) of the constituted authority), a maximum jail term for agents that get caught, initial cop density, and whether or not non-cop agents are allowed to move throughout the region.

1.3 Modification Possibilities

Rebellion's main current problem is that it doesn't track geographical factors; the environment (i.e. the actions of other agents) doesn't actually impact a given agent. The original creator of Rebellion suggested possible avenues for improving the geographical correlation between Rebellion and the real world:

1. Altering an agent's level of antigovernment GRIEVANCE by accounting for proximity to active agents

2. Altering an agent's level of progovernment LEGITIMACY by accounting for the effect of government success in jailing nearby agents

I hope to implement these two modifications. I also plan to implement a reporter that indicates whenever the system is in "revolt" (determined by a proportion); this should aid in future extensions.

2 Testing

While the metric for testing such a series of modifications is somewhat subjective, key indicators should prove to be sufficient in determining success or failure. Consistency based on similar inputs is desirable, as are similarity to the results of the original, unextended model in purely demographic statistics, as the original model doesn't attempt to show the effects of location. Reliance on the generally accepted wisdom by social historians with respect to maintenance of order also is necessary: for example, a given populace reacts differently to decreases in various progovernment effects and to increments or decrements of various magnitudes as well.[1] While somewhat subjective, patterns can be discerned over the course of repeated testing. Aids in testing include the prepackaged visual representations, some of which are graphs of the numbers of the different kinds of agents, and one of which is a map-style output.

3 Procedures

3.1 Software

The model takes advantage of the NetLogo interface, which is based in Java for simpler extensibility. Since object-oriented languages are superior for agent-based models, Java works well here too.

3.2 Rules

1. Agent Rule A: If the level of agent grievance less the perceived element of risk is higher than threshold T, agents become active, else they are quiet.

2. Cop Rule C: Cops inspect all sites within their local vision (relatively small compared to the larger picture) and arrest a random active agent within that space. Arrest probability is given by

$$P = 1 - \exp -k(C/A) \tag{1}$$

where k is a constant of roughly 0.1, and C/A is the cop-to-active agent ratio within the cop's vision.

3. Movement Rule M: Agents and cops move to a random site within their vision. This only occurs for cops if they have no nearby active agents to arrest.

4 Conclusion

When running the vanilla model, the results were largely the same as originally posited: while "government legitimacy" can be slowly lowered without the agents getting overly worried very quickly, the cop density must stay at around a relatively constant level, because after a certain "tipping point" the number of active, rebelling agents begins to multiply very quickly, overwhelming the number of cops. This threshold, at around a fiftieth of the original population (varying with the usual random element of less than a percent), represents the brink. One sees parallels to this in the course of the revolutions of 1848[3] and in the the relatively similar course of the fall of the Roman Empire.[2]

In addition, the geographical functionality appeared to be aided. Instead of a random distribution, active agents had clearly delineated lines of control, which, while still remaining somewhat chaotic, had a minimum of the "wrong" kind of agent in certain areas. After an examination of results from the testing, preliminary conclusions indicate that increasing "government legitimacy", i.e. the carrot, is more effective that relying on cop increases or increases in maximum jail time, although of course combining the two methods remains superior to either alone.

References

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[3] Lamartine, A. M. L.. (1849). "Confidences". Paris: (?).

[4] Wilensky, U. (2004). NetLogo Rebellion model. http://ccl.northwestern.edu/netlogo/models/Rebellion. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.