ABM Exam

If you have trouble downloading the model, use right mouse click 🡪 downloaded linked file.

1. (50/100) You have received a iPython notebook with an implementation of Epstein’s civil violence model 2 (Epstein 2002). The notebook contains a conceptual description of the model, some implementation details, and the code of the model and its visualization. The model does not work and contains 5 bugs. Make the model work and list the 5 bugs here. Indicate the line number, what the error is, and how it should be changed. Figure 1 shows the dynamics of the working model.

**Notes**

* the runtime of the model for the shown results is substantial. Be clever in your debugging strategy
* Read the model description in the notebook carefully!

|  |  |  |
| --- | --- | --- |
| Line number | Error | fix |
| 182 | random.random | self.random.random |
| 212 | #die | self.die() |
| 232 | CitizenColor.GREEN | CitizenColor.BLUE |
| 75 | p > citizen\_density | p < citizen\_density |
| 77 | grievance = self.random.random()\*(Citizen.legitimacy) | grievance =  self.random.random()\*(1-Citizen.legitimacy) |

Graphical user interface, application

Description automatically generated

Figure 1 Performance of the civil violence model 2 with seed 123456789

1. (20/100) The provided model is a highly abstract stylized version of the complex phenomenon of ethnic violence. Considering the real-world case of civil violence described below, how would you *conceptually* adapt the basic model? Carefully motivate any modifications. If no motivation is given, no points will be awarded.

Over the last several decades there have been various examples of ethnic violence. Frequently, the United Nations deploys peacekeeping forces to suppress this violence, but the success of these peacekeeping missions is mixed. Building on the existing model, how would you extend or otherwise modify the model to explain the mixed results of these peacekeeping missions?

**Answer:**

There is no single correct answer to this kind of question. What matters is that you show a clear line of reasoning that is appropriate for analysis using ABM. Thus, your motivation/reasoning is pivotal in getting points for this question.

One possible conceptual extension is to liken UN peacekeeping missions to the temporary increase of cops. So at some time step tinit, tinit>0, additional cops are added to the model, at some later time step tend, tend>tinit, these additional cops would be withdrawn again. Does the violence flare up again with the withdrawal of the cops? A next analysis would be to gradually withdraw cops, rather than cold turkey remove all cops. The key point of this model is to show that peacekeeping without changing the underlying source of discontent is bound to be ineffective and only cause violence to resume after the end of the mission.