ODD of Advanced epiDEM

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1.Purpose and patterns

The model aims to explore issues related to epidemic control methods, such as COVid-19. Specifically, without mandatory intervention, will the epidemic disappear over time? Will the duration of the epidemic be affected after the on-site isolation of specific groups of people? The parameters of the model do not represent a specific disease. Therefore, it is only a hypothesis and simulation of a conventional epidemic disease. Specific parameters do not represent actual life results.

2.Entities, state variables, and scales

The model has two kinds of entities: person and square patches of land. The patches make up a square grid landscape of 25 by 25 patches. Persons are characterized by their location, described as the patch they are on, and colours which represents the diseased state of persons. Persons' locations are in discrete units, the x and y coordinates of the centre of their patch. Patch size and the length of one time step in the simulation are not specified because the model is generic, but when real landscapes are used, a patch corresponds to 1km by 1 km which is a person's normal range of activities in a day. In the model, the unit of time is 1 day. The simulation process will continue until there are no infected persons in this closed population.

3.Process overview and scheduling

There are two process in the model, movement of the persons and change of disease status. On each time step, each person moves once. People who are confirmed may be asked not to move, that is, stay in place until they recover. The disease status will change over time, and there are interactions among the persons.

4.Design concepts

The basic principle addressed by this model is the concept of disease transmission and human behavior. People move and interact with other people under normal conditions, and the virus will spread among people as people move. Everyone has four states. The susceptible state means that the person has not been infected or has passed the immune period after cured. The suspected state indicates that the person has been infected but has not been diagnosed (the incubation period). The confirmed status indicates that the case has been diagnosed. The cured status indicates that the patient has recovered. There is no learning in the model.

In the experiment, susceptible person to contact with suspected person or confirmed person will have a probability of becoming suspected state. This Probability is *infection-chance.* Suspected person a probability of receiving nucleic acid testing every day and become a confirmed state. This Probability is *nucleic-acid-testing.* After the recovery time, the infected person has a probability which is *recovery-chance* to be cured. After the immunization time, the cured person has a probability which is *susceptible-chance* to be susceptible state.

Humans have two states of movement. The first is to randomly select a direction and move forward one unit. The second is to stay in place. We use colours to distinguish people's states. And use 3 different images to detect the trend of the epidemic situation over time.

5. Initialization

Initially, 95% of the population was defined as susceptible state. 5% of the population is defined as a suspected state. The persons are initialized by creating 300 of them and randomly distributed on the map. The *recover-chance* is 40%, *infection-chance* is 50%, and *susceptible-chance* is 50%. The *average-recovery-time* is 60 days, and the *average immunization time* is 183 days. The *nucleic-acid-testing* is 50%.

6. Input data

The environment is assumed to be constant, so the model has no input data.

7. Submodels

There are two submodels in the experiment. First, to "random move" is defined specifically as all persons pick a random direction and move 1 unit in a tick. This means that there is no isolation measure. Second is "isolate the confirmed". All the confirmed people will stay at the place and other persons can random move which represents isolation treatment.

Reference：

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