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ODD Description

1. Purpose

This model was designed to simulate the spread of COVD-19 pandemic while adjusting the rate of people wearing mask in closed population defined by slider. Its purpose is to study how wearing mask can help to reduce the spread of COVID-19. Wearing mask is a sufficient way to prevent its spread and this model enable us to take a deeper look on how it affects in terms of data in details.

2. Entities, state variables, and scales

This model only has one entity: individuals. It has following state variables: infected, cured, susceptible, death, wearing-mask, nb-infected, nb-recovered, infection-length and recovery-time. The first five variables are the status of the entity which are Boolean variables, while the latter two characterize the time they are infected and how long they need to recover. Nb-infected and nb-infection are the total number of people who are under corresponding status. The time scale used in this model is days. And the total number counted are discrete integers.

3. Process overview and scheduling

The processes the individuals have are movement (GO function), infecting others (INFECT function) and recovery (MAYBE-RECOVER function). All individuals move randomly on all patches while having a chance to get infected or spread the virus. If somebody is infected while its neighbours do not have their masks on, this model set random number as the possibility of getting infected; on the opposite, it will reduce the infection-chance. In recovery process, each individual has a possibility to get recovered. This model compares their infection-length with recovery-time. If infection-length is longer, it will set random number as its recovery possibility; at the same time, this individual's infected variable is set to false. There is also a possibility of death, if that is the case, the model sets the death variable as true. A dead person is certainly not susceptible or infectious, which mean they both are assigned as false.

4. Design concepts

The basic concept of this model is SIR model to mimic the virus spread within a closed population over time. All individuals move randomly and random numbers are assigned to the possibility of wearing-mask, infection, recovery or death. The rate-of-wearing-mask defines number of people wearing mask which influences the chance of getting infected.

5. Initialization

Initialization includes generating total population, random number of infectious people, rate-of-wearing- masks, infection-chance, death-rate, recovery-chance as well as aver-age-recovery-time. Death-rate of 2 is assigned as current data of COVID-19. Recovery-time of individuals are set randomly to fall on normal distribution. Rate-of-wearing-mask and infection-chance can be manipulated by sliders which decides the initial state of whole model. Colours and shapes of people are assigned to distinguish them from different status.

6. Input data

Input data include:

- Initial-people: 5000
- recovery-chance: 97 (%)
- average-recovery-time: 28 (in days)
- death-rate: 2 (%)

Above data are all found online aligned with current situation of COVID-19. Infection-chance and rate-of-wearing-mask are controlled by sliders.

7. Submodels

The submodels are infection and recovery. In infection submodel, it generates random number as the infection chance. However, if somebody nearby is wearing mask, chances for susceptible people getting infected will be reduced. In recovery submodel, people may die or recover whose possibilities are also decided by random numbers when their infection-time is longer than recovery-time.

State variables like death, infected and recovered are changed according to each individual’s status in both submodels.