Epidemic Simulation

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Project Agreement

INTRODUCTION
The software simulates the behavior of an epidemic.

COMPONENTS

1. Grid
   - Contains streets and blocks of houses.
2. Block
   - Each block contains 4 houses and is surrounded by streets.
3. Street
   - Straight lines that the residents travel on.
   - Street is where resident are exposed to the disease.
4. House
   - Houses are where the residents reside. One resident per house.
5. Resident
   - Residents are individuals who carry and pass the disease.
   - A resident can be in one of the following health conditions:
     - Healthy: not infected
     - Cured: recovered from the disease
     - Incubation: infected but not contagious
     - Contagious: the resident can pass on the disease to others.
     - Deceased: the resident cannot be cured and no longer exist

USER INPUT

1. Size of Grid (Program Configures grid).
2. Percentage of the Grid inhabited by residents.
3. The percentage of time the resident spend traveling or at home (i.e 60% on the road 40% at home).
4. The initial percentage of population that is infected
5. The disease is fatal or not
6. The disease has immunity or not

7. Probability of getting infected after exposure
8. Duration of incubation period (Time Until Contagious)
9. Time until cured/dead
10. Probability of being cured/dead

SIMULATION

Residents spend about 60% of the time on the street and the rest at home.

At home:

- The residents are safe at home. They cannot either get infected or pass the disease to other.

On the street:

- Healthy residents can get infected if they come in contact with a contagious individuals.
- If a healthy resident is infected, his health condition will be changed from healthy to incubating.
- After a predetermined period of time, an incubating resident's health condition will change from incubating to contagious.
- Contagious individuals can pass the disease to others if they meet on the street. After a duration of time, the contagious individuals will be either cured or dead.
- For diseases that the residents can develop immunity, cured individual won't get infected again. For diseases that residents cannot develop immunity, they can get infected again.

The simulation ends when one of the following events occurs:

- The user presses the Stop button
- All residents are cured or dead

GUI

Streets are presented by thick lines.
Houses are presented by rectangles.
Residents are presented by circles with colors according to their health condition.
The movement of circles presents the traveling of the residents.

OTHER REQUIREMENTS

The simulation should not give the same result every time. A simulation with the same parameters run twice should produce different results since the movement of residents is produced randomly (different number of people will meet at different time and different rate) and since the incubation period varies randomly from one resident to another (some infected residents will be cured or die faster or slower than others).

At the end of the simulation the program will output a graph of  the progress of the disease over time, it will show on the same graph a function of the people infected over time, a function of the people cured over time and a function of the number of people dead over time.