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SIR model simulation takes place in a circular city with fixed radius 500 units occupied by fixed 3000 people over the course of fixed 100 timesteps. Parameters include:

- p – probability of infection
- r – infection radius
- q – probability of recovery
- d – distance moved per tick
- i – initial number of infected

The following assumptions are made:

- A susceptible person incurs a probability p of becoming infected for every infected person nearby
- Dead people are considered recovered, and cannot infect others or interact with non-recovered people in any way
- Infection/recovery checks are done every time step. All infected and susceptible people move D units in a random direction afterwards

The results are consistent in that most graphs of S, I, and R with respect to time show similar behavior with those of standard SIR simulations.

With constant p = 0.4, r = 5, q = 0.05, i = 20, and d evaluated at 0, 2, 8, 10, 20, 30, 40, 50, and 60 units of distance, the author found that low and high values for d increased the infection rate while middle range values of d (10 – 40) decreased the infection rate.

With constant p = 0.4, d = 20, q = 0.05, i = 20, and r evaluated at 5, 10, 15, 20, and 25 distance units, the author found that higher values of r dramatically increased the infection rate.

With that in mind, the author proposes the following model:

$$\frac{dS}{dt} = -(p - (d - 20)^2)rSI$$

$$\frac{dI}{dt} = (p - (d - 20)^2)rSI - qI$$

$$\frac{dR}{dt} = qI$$