11 Feb 2021

REED-FROST:

discrete time, discrete state, stochastic | Poisson ← binomial ← neg binomial

GILLESPIE ALGORITHM:

continuous time, discrete state, stochastic

event	rate	transitions
transmission	$\frac{\beta S I}{N}$	$S \to S-1$, $I \to I+1$
recovery	γI	$I \to I-1$

$$\begin{cases} \frac{dS}{dt} = -\beta S I \\ \frac{dI}{dt} = \beta S I - \gamma I \end{cases}$$

RATE:

Prob(event) = $\lim_{\Delta t \to 0}$ rate $\cdot \Delta t$

TOTAL RATE = $\frac{\beta S I}{N} + \gamma I$

$\Delta t \sim$ [Exponential (rate = $\frac{\beta S I}{N} + \gamma I$) : mean time = $\frac{1}{\frac{\beta S I}{N} + \gamma I}$

$t \to t + \Delta t$

[transm: $\frac{\beta S I}{N}$ / total

recovery: γI / total

Implement on computer:

X = random uniform $(0, \text{total rate})$

loop over rates: