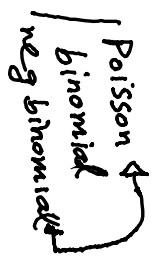


11 Feb 2021

REED-FROST:

discrete time, discrete state, stochastic



GILLESPIE ALGORITHM:
continuous time, discrete state, stochastic

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

RATE ·
Prob(event) =
lim rate · Δt
At $\rightarrow 0$

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

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

$\Delta t \sim$ Exponential (rate = $\frac{\beta SI}{N} + \gamma I$)

$t \rightarrow t + \Delta t$

transm.: $\frac{\beta SI}{N} / \text{total}$
recovery: $\gamma I / \text{total}$

mean time = $\frac{1}{\frac{\beta SI}{N} + \gamma I}$

implement on computer:

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

loop over rates:

\rightarrow is $X < \text{rate}(i)$? \rightarrow do transition

\downarrow
 $X = X - \text{rate}(i)$

$i = i + 1$