CFTP and repetition

Consider the implementation of the CFTP method for a reflecting random walk, as discussed in Lecture 2. Address the following questions:

1. Devise a random process which is *not* a reflecting random walk, but which has the same kind of order structure (for example, a random process which behaves like a reflecting random walk, but can occasionally jump down by more than 1 step). Modify the random walk CFTP algorithm to produce a CFTP algorithm for this process. Do simulation studies to establish the empirical equilibrium distribution, and compare it to the equilibrium distribution computed using Markov chain theory ($\boldsymbol{\pi}\,\mathbf{P} = \boldsymbol{\pi}$, etc, where $\boldsymbol{\pi}$ is the row vector of equilibrium probabilities, and $\mathbf{P}$ is the matrix of transition probabilities).
2. Given a successful CFTP algorithm, the following question arises. How can one most efficiently devise a way of producing a *sequence* of exact draws from the equilibrium? Investigate various ways to obtain repeated perfect samples as described by Murdoch and Rosenthal (2000), and apply them to your example.
3. Construct an interactive animation to illustrate your findings using Shiny.

References:

Kendall, W. S. (2005). Notes on Perfect Simulation. In W. S. Kendall, F. Liang & J.-S. Wang (Ed.), *Markov chain Monte Carlo: Innovations and Applications* (pp. 93-146). Singapore: World Scientific.

Kendall, W. S. (2015). Introduction to CFTP using R. In V. Schmidt (Ed.), *Stochastic Geometry, Spatial Statistics and Random Fields* (pp. 405-439). Springer.

Murdoch, D. J., & Rosenthal, J. S. (2000). Efficient use of exact samples. *Statistics and Computing*, 10, 237-243.

Shiny (2018) https://shiny.rstudio.com/.