1) Snakes and ladders board game

State space: The position of the player in the 100 board after particular move

\[ S = \{1, 2, ..., 100\} \]

Index set: The number of time that the dice was rolled

\[ n = \{0, 1, 2, ...\} \]

This is a discrete time stochastic process with discrete state space. Then some realizations are 0, 4, 6, 3, 20, 15, 60, 61, 25, ... and 1, 58, 63, 12, 0, 40, ...

2) The number of telephone calls arriving at an automatic phone-switching system.

State space: The number of telephone calls

\[ S = \{1, 2, 3, ...\} \]

Index set: An interval of real line

\[ n = \{t \in \mathbb{R} \mid t \geq 0\} \]

This is a continuous time stochastic process with discrete state space. Then the realization is \( \{X(t) ; t \geq 0\} \).
3) Number of customers in the time interval

State space: The number of customers
\[ S = \{1, 2, 3, \ldots\} \]

Index set: An interval of real line
\[ n = \{ \text{time } t \geq 0 \} \]

This is a continuous time stochastic process with discrete state space. Then the realization is \( \{X(t); t \geq 0\} \).

4) The n-th bit in the binary expansion of a number in \([0,1)\)

State space: the n-th bit in the binary expansion of a number in \([0,1)\)
\[ S = \{0, 1\} \]

Index set: the position of bit
\[ n = \{0, 1, 2, 3, \ldots\} \]

This is a discrete time stochastic process with discrete state space. Then the realizations are 1,0,1,0,0,0,1,1,… and 0,1,1,1,0,0,…
5) Digital Modulation: Phase-Shift Keying

State space: The phrase of the transmitted signal
\[ S = \left\{ -\frac{\pi}{2}, \frac{\pi}{2} \right\} \]

Index set: An interval of real line
\[ n = \{ \text{time} t \geq 0 \} \]

This is a continuous time stochastic process with discrete state space. Then the realization is
\[ \frac{\pi}{2}, \frac{\pi}{2}, -\frac{\pi}{2}, -\frac{\pi}{2}, -\frac{\pi}{2}, \ldots \]