Definition (Discrete-time linear systems)**.** A discrete-time linear time-invariant proper open system is defined by three matrices $\mathbf{A}, \mathbf{B}, \mathbf{C}$. Together they give a recurrence of the type

$$\begin{aligned} \mathbf{x}_{k+1} &= \mathbf{A}\mathbf{x}_k + \mathbf{B}\mathbf{u}_k \\ \mathbf{y}_k &= \mathbf{C}\mathbf{x}_k \end{aligned}$$

If $\mathbf{x}$ has dimension $n \geq 1$, u dimension $m \geq 1$ and $\mathbf{y}$ dimension $p \geq 1$, then $\mathbf{A}$ has dimension $n \times n$, $\mathbf{B}$ has dimension $n \times m$, and $\mathbf{C}$ has dimension $p \times n$.